Lifelong Learning
Education for the Future World

Edited by Filippo Gomez Paloma

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Contributors

Achilleas Gkamanis, Anne Namatsi Lutomia, Avhurengwi Samson Mabade, Carlos Juiz, Catherine Conradty, Claudio Vanhees, Cristina Bernad, Czarecah Tuppil Oropilla, Dave Van Breukelen, Davide Brancato, David Orok, Dinska Van Gucht, Filippo Gomez Paloma, Franz X. Bogner, Ghada Nafie, Hanneke Theelen, Hidekazu Sasaki, Joan Thormann, Joseph Akpan, Julia Bello-Bravo, Karolien Adriaens, Katja Gilly, Katrien Strubbe, Laila Nordstrand Berg, Laura Eeckhoudt, Ma. Lovena Veladiez Moneva, Milou De Smet, Noriyo Colley, Oksana Chaika, Oludolapo Olanrewaju, Paola Damiani, Patricia Fidalgo, Paula C Herring, Pedro Juan Roig, Ruben Vanderlinde, Salvador Alcaraz, Styliani Giossi, Tina Gryson, Tony Valcke

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Education and Human Development is an interdisciplinary research area that aims to shed light on topics related to both learning and development. This Series is intended for researchers, practitioners, and students who are interested in understanding more about these fields and their applications.

Meet the Series Editor

Katherine Meltzoff received her BA in Psychology from Trinity College, in Connecticut, USA and her Ph.D. in Experimental Psychology from the University of California, San Diego. She completed her postdoctoral work at the Yale Child Study Center with Dr. James McPartland. Dr. Meltzoff' doctoral dissertation explored neural correlates of reward anticipation to social versus nonsocial stimuli in children with and without autism spectrum disorders (ASD). She has been a faculty member at the University of California, Riverside in the School of Education since 2016. Her research focuses on translational studies to explore the reward system in ASD, as well as how anxiety contributes to social challenges in ASD. She also investigates how behavioral interventions affect neural activity, behavior, and school performance in children with ASD. She is also involved in the diagnosis of children with ASD and is a licensed clinical psychologist in California. She is the Assistant Director of the SEARCH Center at UCR and is a faculty member in the Graduate Program in Neuroscience.

Meet the Volume Editor

Filippo Gomez Paloma is a Full Professor of Didactics and Special Pedagogy in the Department of Education, University of Cassino e Lazio Meridionale, Italy. He holds a master's degree in psychology, two degrees (Italian and French) in Motor and Sports Sciences, three specializations in special education, a master's degree on International Qualification of "High Education Level" in Sports Science, and a Ph.D. in Pedagogy. He is a member of many international scientific societies and a member of the board of directors of the Italian Society of Educational Research. Dr. Paloma was previously the director of the Special Education School, European University of Rome, Italy, and a senior expert pedagogical consultant for the National Institute for the Evaluation of the Education and Training System (INVALSI), Italy. Currently, he is a member of the National Commission for Scientific National Habilitation on his way to becoming a Full and Associated Professor of Teaching, Special Education and Educational Research in Italy.

Contents

Preface

Welcome to *Lifelong Learning – Education for the Future World*. As the editor, it gives me great pleasure to present you with a range of new, exciting viewpoints from the ever-changing field of education. In a society where technology is developing at a breakneck pace and social norms are always changing, lifelong learning is more important than ever before. This volume gathers work from various experts in the field, each of whom provides deep and insightful commentary on the importance of lifelong learning.

The chapters of this volume cover a range of aspects of lifelong learning, from its role in personal development to its impact on the educational system and procedures and social ramifications. These chapters provide an overview of the many possibilities and opportunities associated with lifelong learning, with discussions on how to use technology to enhance learning experiences and studies of brand-new, cutting-edge teaching approaches.

There are various important themes in this volume, one of which is the importance of flexibility and adaptability in the face of constant, unrelenting change. As the world around us keeps changing, our teaching methods must change as well. Lifelong learning is not just a different way of gaining new knowledge and skills. It also requires the capacity to learn, unlearn, and relearn as time moves forward. These chapters offer new and insightful information on how lifelong learning can be used by educators and individuals to explore a more complex and interconnected world that is rapidly evolving.

Justice's value and inclusivity in education is an important subject. Everyone should be able to engage in lifelong learning regardless of background, circumstance, or ability. The chapters examine a wide range of approaches for advancing equity and inclusivity in education, including tackling disparities in technology and aiding more vulnerable groups across the globe.

Lifelong Learning – Education for the Future World is a statement of the transforming potential of education. By accepting lifelong learning as a core value, we can empower people and communities to prosper in a world that is always changing. What I am hoping for is that this volume's ideas and points of view will inspire dedication to lifelong study and the search for knowledge.

I would like to thank the contributing authors for sharing their knowledge, views, and efforts. Without their help and contributions, this project would never have seen the light of day. I also want to express my sincere gratitude to the publishers for all their help and advice during the publishing process.

I hope that readers will find this volume informative, engaging, and thought provoking. Regardless of whether you are a student, an educator, or a lifelong learner, this book will help you on your journey of exploration and discovery.

Filippo Gomez Paloma
Department of Human, Social Sciences and Health,
University of Cassino e Lazio Meridionale,
Cassino, Italy

Section 1

Introduction

Chapter 1

Introductory Chapter: Embracing Technological Solutions for Learning Enhancement

Filippo Gomez Paloma

1. Introduction

In today's rapidly evolving world, the field of education finds itself on the brink of a monumental transformation. The infusion of innovative tools and methodologies promises to reshape traditional learning paradigms, opening up new avenues for knowledge acquisition and skill development. This introductory chapter serves as a gateway into the dynamic intersection of technology and education, shedding light on emerging trends and approaches that are revolutionizing the educational landscape.

2. The evolving educational landscape

Education has traditionally been synonymous with the physical classroom, where students gather to absorb knowledge imparted by their teachers. However, the advent of technology has disrupted this conventional model, starting a new era of dynamic and interactive learning experiences. Artificial Intelligence (AI) and Distance Education (DE) are at the forefront of this transformation, empowering learners to take charge of their educational journey and explore topics that align with their interests and aspirations.

The traditional model of education, with its emphasis on raw memorization and standardized testing, is increasingly being surpassed by more dynamic and personalized approaches. AI-powered algorithms analyze individual learning styles and preferences, allowing educators to tailor instruction to meet the unique needs of each student [1]. Similarly, DE platforms provide flexible access to educational resources, breaking down geographical barriers and enabling learning to take place anytime, anywhere [2]. This shift toward adaptive and personalized learning experiences is revolutionizing education, making it more accessible and engaging for learners of all ages and backgrounds.

3. Empowering lifelong learning

In the past, education was often viewed as a one-time endeavor, with students completing their formal schooling and then entering the workforce. However, the rapid pace of technological change has rendered this model obsolete. Today, learning

is a lifelong pursuit, with individuals constantly seeking to acquire new skills and knowledge to adapt to a rapidly evolving world. Technology plays a central role in this process, providing access to a wealth of educational resources and enabling individuals to learn at their own pace, on their own terms [3].

The concept of lifelong learning has gained increasing strength in recent years as individuals recognize the need to continuously update their skills and knowledge to remain competitive in today's job market. Technology plays a crucial role in facilitating lifelong learning, providing learners with access to a wealth of educational resources and opportunities for skill development [4]. Online courses, webinars, and interactive learning platforms empower individuals to acquire new skills and knowledge from the comfort of their own homes, enabling them to stay ahead in an increasingly competitive and fast-paced world.

Furthermore, the integration of technology into education has made learning more engaging and interactive. Virtual reality (VR) and augmented reality (AR) technologies, for example, allow students to immerse themselves in realistic simulations and interactive experiences, enhancing their understanding of complex concepts and fostering deeper engagement with the material [5]. Similarly, gamification techniques, such as educational games and quizzes, incentivize learning by turning it into a fun and rewarding experience [6]. By harnessing the power of technology, educators can create dynamic and immersive learning environments that captivate students' interest and inspire them to explore new ideas and concepts.

4. Enhancing socioemotional skills

In addition to academic knowledge, the digital age demands that learners develop socioemotional skills to navigate an increasingly interconnected world. Digital tools provide new avenues for self-expression and collaboration, but they also present challenges that require empathy, resilience, and communication skills to overcome. Educators must therefore integrate socioemotional learning into their pedagogical practices, ensuring that students are equipped with the skills they need to thrive in the twenty-first century [7].

The integration of socioemotional learning into the curriculum is essential for preparing students for success in the digital age. In today's interconnected world, the ability to collaborate effectively, communicate clearly, and navigate complex social dynamics is crucial for success in both academic and professional settings. By incorporating socioemotional learning into their teaching practices, educators can help students develop the skills they need to thrive in an increasingly interconnected world [8].

Moreover, the development of socioemotional skills is essential for promoting well-being and mental health among students. The digital age has brought about new challenges and stressors, such as cyberbullying and social media addiction, which can have a detrimental impact on students' mental health [9]. By teaching students how to manage stress, build resilience, and cultivate healthy relationships, educators can help them navigate these challenges more effectively and lead happier, more fulfilling lives.

5. Innovative teaching methodologies

Beyond AI and DE, technology is driving innovation in assessment and teaching methodologies. Educational escape rooms, for example, offer an immersive

and engaging alternative to traditional evaluation systems, challenging students to apply their knowledge in a gamified environment [10]. Similarly, no-code tools (NCT) empower entrepreneurs to develop minimum viable products (MVPs) without the need for coding skills, democratizing access to product development and innovation [11].

Educational escape rooms are an innovative teaching methodology that engages students in hands-on learning experiences. By presenting students with real-world challenges and puzzles to solve, escape rooms encourage critical thinking, collaboration, and problem-solving skills [12]. Similarly, no-code tools (NCT) are revolutionizing the way entrepreneurs develop and launch new products. By providing users with intuitive drag-and-drop interfaces, NCTs empower individuals with limited technical skills to bring their ideas to life and launch successful businesses [13].

Moreover, technology has the potential to personalize and adapt instruction to meet the diverse needs of learners. Adaptive learning platforms use algorithms to analyze students' performance and provide personalized recommendations for further study, enabling students to progress at their own pace and focus on areas where they need the most help [14]. Similarly, interactive learning environments, such as virtual labs and simulations, allow students to explore complex concepts in a safe and controlled setting, enhancing their understanding and retention of the material [15].

6. Addressing challenges

While technology holds tremendous promise for education, it also presents challenges that must be addressed. Issues such as digital equity, data privacy, and the need for ongoing professional development require careful consideration to ensure that technology enhances, rather than detracts from, the learning experience. By confronting these challenges head-on, educators can harness the full potential of technology to enrich teaching and learning for all students.

Digital equity is a critical issue that must be addressed to ensure that all students have access to the educational opportunities provided by technology [16]. In today's digital world, access to technology and the Internet is essential for success in school and beyond. However, many students lack access to reliable internet connections or devices, putting them at a disadvantage compared to their peers. Educators must work to bridge this digital divide by advocating for policies and initiatives that ensure equitable access to technology for all students.

Furthermore, data privacy is a growing concern in education, as schools and educational technology companies collect increasing amounts of data on students' activities and performance [17]. It is essential for educators to prioritize the privacy and security of students' personal information and ensure that data is collected, stored, and used responsibly [18]. By implementing robust data privacy policies and providing students with clear information about how their data is being used, educators can build trust and confidence in the use of technology in education.

7. Conclusion

In conclusion, technology has the power to revolutionize education in ways that were previously unimaginable. From personalized learning experiences to innovative

assessment methodologies, the possibilities are endless. By embracing technology, educators can create dynamic and engaging learning environments that empower students to reach their full potential. As we continue to explore the intersection of technology and education, let us seize the opportunities it presents and work toward creating a more inclusive, equitable, and enriching educational experience for all.

Author details

Filippo Gomez Paloma
University of Cassino e Lazio Meridionale, Cassino, Italy

*Address all correspondence to: filippo.gomezpaloma@unimc.it

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Section 2

AI and Technology in Future Education

Chapter 2

The Future of Lifelong Learning: The Role of Artificial Intelligence and Distance Education

Patricia Fidalgo and Joan Thormann

Abstract

This chapter explores the transformative use of Artificial Intelligence (AI) and Distance Education (DE) in the context of lifelong learning. Traditional classrooms give way to dynamic, technology-enabled education transcending age, time, and place. The shift from fixed curricula to adaptive learning experiences is presented in this chapter, emphasizing education as a continuous journey rather than a static destination. The use of technology in lifelong learning, particularly AI and DE, emerges as a catalyst for change, breaking the confines of rote memorization and routine tasks. It empowers individuals to direct their educational paths, promoting self-directed learning aligned with personal interests. The integration of AI and DE not only redefines education but also fosters global connectivity, collaboration, and cross-cultural understanding. This chapter delves into how these technologies reshape attitudes toward education. Innovative practices, success stories, and emerging challenges in the use of AI and DE will be shared as tools to shape a future where education promotes curiosity, adaptability, and continual exploration.

Keywords: artificial intelligence, distance education, educational settings, future education, lifelong learning, technology

1. Introduction

In a rapidly evolving world where information flows continuously, the concept of learning is changing. Education is no longer confined to traditional classrooms' walls, and the school's role extends beyond disseminating knowledge. Technology is vital to unlocking the potential for lifelong learning experiences that transcend the boundaries of age, time, place, and learning modalities. Currently, schools are providing students with skills that can be used in the future. This means that education is about what you know and how well you can learn and adapt. However, traditional schooling often limits the scope of education to a fixed curriculum. Exploring various subjects and perspectives beyond the classroom can enable learners to understand the world better using technology. Education should transcend rote memorization, routine tasks and summative assessments. Progressive education is a dynamic process that can empower individuals to adapt, innovate, and thrive in an ever-changing world. Technology is critical in cultivating this adaptability by offering many resources,

from online courses and virtual libraries to collaborative platforms and immersive simulations.

Furthermore, technology's ability to facilitate self-directed learning empowers individuals to chart their educational journeys, tailoring them to their interests and goals. It encourages a proactive approach to lifelong learning, where individuals can harness the power of technology to continually expand their horizons, challenge preconceptions, and seek out new knowledge independently.

Technology can help redefine education as a lifelong journey, highlighting what you know and how well you can adapt and learn in the face of change. By embracing technology, learners can navigate a world of information, forging a path toward a future where knowledge is not a stagnant endpoint but an ongoing exploration. Technology connects learners with resources, educators, and peers worldwide, promoting cross-cultural understanding and collaboration, which is essential in today's globalized society.

To truly usher in a new era of lifelong learning, educators and policymakers must focus on reshaping the concept of learning beyond the confines of traditional schooling while embracing individual perspectives on lifelong learning. It is crucial to acknowledge that schools wield a lasting impact on our perception of learning. Schools can instil a culture of curiosity, adaptability, and a thirst for knowledge that persists throughout life. Schools can also shape students' attitudes and behaviors toward lifelong learning, highlighting technology's transformative potential in education.

By using the diverse capabilities of technologies, including AI and DE, schools can enhance their abilities to broaden their horizons and deepen knowledge continuously. AI and DE also offer flexible learning environments, allowing individuals to learn at their own pace and schedule. This flexibility is particularly beneficial for adults with work or family commitments. These technologies can empower individuals to acquire new skills, stay relevant in the job market, or satisfy one's intellectual curiosity.

The increased interest in lifelong learning has surged as governments worldwide prepare for a future where AI becomes integral to daily life. Numerous national and international initiatives have been launched to address this, such as the UK's Adult Education 100 campaign, which focuses on researching the history and impact of adult education and engaging with communities [1]. In Singapore, the SkillsFuture initiative of 2015 has reintegrated lifelong learning into mainstream policy to reskill the existing workforce [2].

In this chapter, we will explore how integrating AI and DE can aid educators in shaping students' attitudes and behaviors toward lifelong learning. Learners can explore their passions, address weaknesses, and adapt to the ever-evolving knowledge ecosystem. How AI and DE can empower educators and lifelong learners will be presented, as well as innovative practices, success stories, and emerging challenges. These technologies can make education accessible to all, one of the central pillars of lifelong learning.

2. Lifelong learning and distance education

2.1 Benefits and challenges of distance education

DE has been defined by [3, p. 6] as "Education that uses one or more technologies to deliver instruction to students who are separated from the instructor and to

support regular and substantive interaction between the students and the instructor synchronously or asynchronously." The instructional tools utilized in this approach can encompass various options, such as the Internet and one-way and two-way communication.

DE, facilitated by technology, makes learning more accessible to people of all ages and backgrounds. This inclusivity ensures that geographical, economic, or physical barriers do not restrict learning opportunities [4]. DE can potentially democratize access to education. With the pervasive adoption of the Internet and online tools as the primary communication medium, DE has amplified the flexibility of educational opportunities.

One of the most significant advantages of DE is its capacity to transcend geographical limitations [5]. In traditional educational models, individuals residing in remote or underserved areas often face considerable challenges in accessing quality academic resources. However, technology-enabled learning platforms and online courses have removed these barriers. This has implications for individuals in rural communities, developing nations, or even those who lead nomadic lifestyles, as they can now access a world of knowledge from the comfort of their homes or on the go.

The cost of education has historically been a significant deterrent for many individuals, preventing them from pursuing further learning opportunities. DE mitigates these financial barriers through its cost-effective online courses and open educational resources. Learners no longer need to bear the costs associated with on-campus education, such as tuition fees, housing, and commuting expenses. Instead, they can access high-quality educational content at a fraction of the cost, democratizing education and making it accessible to individuals regardless of economic circumstances.

For individuals with physical disabilities or health constraints, attending traditional brick-and-mortar institutions can be challenging. DE eliminates these physical barriers by providing flexible learning options. Learners with disabilities can access digital content and choose learning formats that accommodate their needs, ensuring no one with a disability is left behind.

DE, which includes online courses and virtual learning environments, offers many advantages for lifelong learning, as indicated above. However, it also comes with several challenges and disadvantages. Among the challenges are the technology requirements that may not be available to lifelong learners. Also, a lack of digital literacy can hinder navigating online courses, accessing resources, and engaging in online discussions effectively. A strong self-discipline and motivation to succeed in DE are required. In addition, some subjects, such as lab-based sciences or vocational skills, are challenging to teach effectively in a DE format, limiting hands-on learning opportunities.

There are other challenges involving DE. The quality of instruction can vary significantly. Some courses may lack engaging content, effective teaching methods, or learners' support. Timely and meaningful instructor feedback can be challenging to provide online, impacting the learning experience. Also, online assessments and exams can be more susceptible to cheating and plagiarism, as it can be difficult to monitor learners effectively.

In early 2020, the COVID-19 pandemic triggered a global shift in education practices, with DE, remote teaching, and online instruction taking on significance, often referred to as "pandemic pedagogies". Education technology companies, recognizing the need for remote learning, offered their services for free for a limited time, helping educators transition to online teaching during the crisis while also supporting parents in facilitating their children's education during lockdowns and isolation [6]. This

approach aimed to keep students engaged and intellectually stimulated during these challenging times.

While the choice between DE and face-to-face learning was imposed as a non-negotiable solution during COVID-19, it has always been a potential alternative and will remain so. However, when making shifts in education between face-to-face and DE, educators should remain vigilant for potential risks, most of which can be seen in student satisfaction surveys [7].

2.2 Use of distance education in lifelong learning

DE and lifelong learning have different origins and approaches. DE evolved organically from the bottom up, while lifelong learning is being actively promoted from the top down in an international campaign [8]. DE has a proven track record, while lifelong learning remains an ambitious and innovative educational pathway. Despite these structural differences, there are striking similarities between the two approaches [8]:

- Both address significant societal changes and challenges.

- Both have a substantial innovative impact and challenge traditional educational patterns.

- They can introduce new pedagogical approaches, unconventional learning methods, and varied learning environments.

- Collaboration and self-directed learning may be used in both approaches.

- Both allow self-development and the integration of learning with work.

- They aim to make education accessible on a large scale and cater to learners of all ages.

- Both have a social mission to advance disadvantaged and underrepresented groups and enhance their quality of life.

- Unconventional organizational structures and financing models are often employed.

DE empowers individuals to take charge of their learning journey. Whether individuals are full-time professionals, parents, or someone with physical limitations, DE can allow them to learn at their own pace and terms. This type of flexibility enables learners to integrate their education into their existing commitments, ensuring they can continue learning [9].

DE makes it easier to establish diverse and active learning communities. Learners from all over the world can connect and collaborate through discussion forums and virtual classrooms. These communities promote a culture of shared learning, enabling individuals to exchange ideas, seek feedback, and engage in meaningful discussions. The diversity of viewpoints and experiences within these communities enriches the learning process, offering learners a global network of peers and mentors who can inspire, support, and challenge them in their lifelong learning experiences [10].

In today's competitive job market, continuous professional development is critical. DE can equip professionals with the skills and knowledge they need to stay current and competitive in their fields. Through online courses and certifications, individuals can enhance their skills, learn new ones, and gain industry-specific expertise. The flexibility of DE allows professionals to pursue learning opportunities while still working, helping them bridge the gap between their current skills and the evolving demands of their professions [11]. It may also provide the opportunity to gain new expertise, allowing career changes and new job prospects.

Employers value employees committed to professional development. DE courses provide a way to grow an individual's value and credibility. Moreover, acquiring new skills through online courses can improve job performance, potentially resulting in promotions and higher salaries. It's also an excellent way to expand professional networks, as online courses often connect learners with a global community of professionals in their field [12].

2.3 The future of distance education in lifelong learning

According to [9], the future challenge for DE lies in assembling numerous personalized study programs using a wide array of available open educational resources. In the forthcoming era, both traditional and distance universities will track individual student competencies over time, fostering lifelong learning hubs. Based on this data, universities can provide recommendations for further open educational resources that align with students' competence goals while adhering to legal and data privacy requirements (referred to as learning analytics). Media technology innovations are pivotal in facilitating the transformation of learning from the passive consumption of mass-media-produced knowledge content to the active promotion of individual competence through personalized educational materials.

In Ref., [13] reports that for a growing number of learners who are used to electronic interactions in various aspects of their lives, recreating traditional learning settings might not be sufficient to promote their learning. Instead, it may be a missed opportunity to leverage their information-seeking and communication skills, which they regularly employ in other contexts, including the modern workplace. These skills are expected to become increasingly important in a lifelong learning framework that prioritizes the processes over the learning content.

Assessing electronic learning environments from a lifelong learning perspective is a complex task. The challenges involved stem from various factors. Some are rooted in the disparities between electronically mediated and face-to-face social interactions. Other challenges are linked to the evolving communication preferences in workplaces and the wider community. Furthermore, complications arise when considering variations in individuals' preferred learning styles and determining how to accommodate these best to benefit both learners and their communities in the long run [13]. Additional questions arise concerning the suitability of different pedagogical interaction modes for learners of various ages and how to balance two distinct imperatives: the need to teach individuals how to learn and the demand for just-in-time acquisition of new knowledge and skills [13].

An individual's social standing influences their digital skills and engagement with DE. Those who are younger, come from higher socio-economic groups and possess higher education levels tend to have better digital skills and participate more in online learning [14]. Additionally, structural factors like age, gender, and location directly impact the benefits gained from DE, regardless of digital skills and Internet use for

learning. This underscores the importance of considering social structure when discussing Internet-based lifelong learning. In Ref., [14] state that recent developments in DE do not reduce inequalities but seem to perpetuate them. Social structure remains vital in understanding online learning patterns, outcomes, and individual actions.

Over 20 years ago, DE was included in educational delivery formats for lifelong learning in an agreement signed during the World Education Forum in Dakar in May 2000. DE can play a significant role in contributing to more equitable access to appropriate knowledge for lifelong learners. During the Forum, nations committed to a comprehensive life skills objective, aiming to guarantee that all young people and adults have their learning needs addressed through fair access to suitable educational and life skills initiatives [15]. Equitable access to appropriate learning encompassed all forms of education delivery, including formal and non-formal education, vocational training, distance education, on-the-job training, and self-directed learning [16].

3. Artificial intelligence and lifelong learning

3.1 Challenges and risks of artificial intelligence

According to the Council of Europe, "AI is a collection of sciences, theories, and methods aimed at replicating human cognitive abilities through machines. Current advancements strive to enable devices to undertake complex tasks once exclusively handled by humans" [17]. UNICEF defines AI as machine-based systems guided by human-defined objectives that predict, provide recommendations, and make decisions impacting real or virtual environments. These AI systems interact with humans, exhibit autonomy, and adapt their behavior through context-driven learning [18].

AI encompasses functions similar to human mental processes, including perception, logical reasoning, knowledge acquisition, problem-solving, and creative thinking [19]. Machine learning, a subset of AI, focuses on machines autonomously learning from data patterns, distinguishing it from AI, which simulates human intelligence for various tasks. Examples of AI in daily life include voice assistants like Siri and Alexa and customer service chatbots, while machine learning is essential due to the growing complexity of data [19].

Machine learning models, such as learning analytics, merge data mining and AI for predictive and prescriptive purposes. Generative AI utilizes unsupervised and semi-supervised machine learning to create text, audio, video, images, and code content. Notable technologies in this domain include Generative Adversarial Networks (GANs) and models like the Generative Pre-trained Transformer (GPT) [19]. To use generative AI effectively, it is essential to structure models for generating novel content based on existing data.

A summary of the UNICEF key risks and concerns about using AI is presented in **Table 1**.

In lifelong learning, various groups perceive and shape AI differently, influenced by their interests, goals, and motivations in the field. Different social, political, and economic backgrounds can result in distinct interpretations of AI, each unique to a particular social group. These diverse interpretations of AI and the practices related to its development and application in lifelong learning have substantial consequences for the design and, ultimately, the experiences and opportunities within lifelong learning [20]. However, according to [20], there is the potential for constructive change by engaging diverse groups in AI and lifelong learning. It is essential to recognize the

Key risks and concerns about using AI (Adapted from [18])	
Discrimination and exclusion through bias	Systemic bias in AI systems, especially against children.
	Causes of bias include biased training data, context blindness, and lack of human oversight.
	Attributing data alone for the problem of bias is insufficient.
	Bias also results from the social context of AI development and use.
	The lack of regulations of AI can perpetuate discrimination against children.
Constraints on children's prospects from AI profiling	AI-based profiling can perpetuate biases and limit opportunities.
	Relying on inconsistent data can restrict personal development.
	User profiles may reinforce stereotypes and negatively impact self-esteem.
	Profiling threatens children's privacy and freedom.
Violation of data protection and privacy rights	AI's use of private data challenges data protection principles.
	Children who may not grasp data risks require special protection.
	Parents often lack the means to ensure their child's privacy.
	Unforeseen data uses compound privacy concerns.
Exacerbation of the digital divide	The digital divide disproportionately affects marginalized communities and children.
	Unequal access to technology and limited digital skills widen the gap.
	Variations in technology access and education influence AI engagement.
	Developed regions benefit most from AI, leaving others behind.
	The International Telecommunication Union emphasizes the impact on under-resourced areas.

Table 1.
Risks and concerns about using AI.

involvement of various social groups in shaping technology and to expand the range of stakeholders involved in discussions about AI and lifelong learning.

3.2 Integrating artificial intelligence into lifelong learning

Integrating AI into lifelong learning can potentially enhance individuals' learning experiences, but it must be done responsibly and ethically. This means ensuring that individuals develop critical thinking skills and problem-solving abilities while actively addressing and minimizing biases and discrimination. Responsible and ethical AI use in lifelong learning is vital to the broader AI ethics discussion [21].

Regarding the job market, companies will set themselves apart not only by possessing advanced AI tools but also by how effectively their employees utilize these tools and navigate the intricate decisions required in their work [22]. As the use of information-rich tools grows, the significance of decisions made by human individuals becomes even more pronounced. Consequently, continuous learning becomes increasingly vital. Employees, managers, and executives must stay abreast of technological advancements and be capable of comprehending and interpreting the outcomes produced by these

machines. In Ref., [22] suggest that in such an environment, traditional classroom learning no longer holds the key to the future of education. Instead, it is about learning to use AI through practical experience and improving one's skills while actively performing tasks. This transition requires a deliberate effort to exemplify learning behaviors and dedicate resources to advancing learning methods that include AI.

AI can play a significant role in the future of lifelong learning, changing how individuals acquire knowledge and skills throughout their lives. **Table 2** presents some critical ways AI is expected to impact lifelong learning.

While AI holds tremendous potential for lifelong learning, it also raises concerns about data privacy, algorithmic bias, and the role of human educators. Striking a balance between the benefits of AI-driven personalized learning and the need for human guidance and ethical considerations will be critical for the future of lifelong learning [21].

Key ways in which AI may impact Lifelong Learning	
Personalized Learning [20]	AI can assess individual learning styles, preferences, and strengths to create highly personalized learning experiences. This tailored approach ensures learners receive content and resources that are most relevant and effective, making the learning process more engaging and efficient.
Adaptive Learning Systems [23]	AI-powered adaptive learning platforms can continuously adjust the difficulty and pace of learning materials based on a learner's progress. This helps learners stay challenged but not overwhelmed, optimizing their learning journey.
Skill Assessment and Gap Analysis [24]	AI can assess a learner's existing skills and knowledge, identify gaps, and recommend specific courses or modules to address those gaps. This enables individuals to focus on areas needing improvement, making their learning more effective.
AI Tutors and Assistants [25]	AI-driven virtual tutors and educational assistants can provide instant feedback, answer questions, and offer guidance 24/7. These AI companions can enhance the learning experience by providing on-demand support.
Content Generation and Curation [26]	AI algorithms can generate educational content like quizzes, practice problems, and textbooks. They can also curate and recommend relevant learning resources from a vast pool of online content.
Accessibility and Inclusivity [27]	AI can improve accessibility for disabled individuals by providing features like speech recognition, text-to-speech conversion, and adaptive interfaces, making learning more inclusive.
Lifelong Credentialing [28]	Blockchain and AI technologies can enable the secure verification of lifelong learning achievements and credentials, making it easier for individuals to showcase their skills to employers and educational institutions.
Continuous Learning in the Workplace [29]	AI can support ongoing professional development by identifying relevant training opportunities, tracking progress, and ensuring that employees remain up-to-date with industry trends and technologies.
Data-Driven Insights [30]	AI analytics can provide valuable insights into learner behavior and performance, helping educational institutions and organizations optimize lifelong learning programs and resources.

Table 2.
AI impact on lifelong learning.

3.3 Lifelong learning and AI across various work environments

In an era where adaptability and agility are essential, the insights gained from AI implementation redefine industries and underscore the importance of a learning

ecosystem where humans use machines to navigate the evolving landscape of work and knowledge acquisition. The use of AI will require and reshape lifelong learning, demanding a paradigm shift in how individuals approach education and skill development. As AI becomes increasingly integrated into diverse facets of work environments, embracing lifelong learning becomes imperative to stay relevant in a rapidly evolving environment.

Enterprises that succeed with AI have a common trait: they quickly learn from their AI endeavors, whether successful or not, and apply these insights to their core business operations. Only 10% of companies are reaping financial benefits from AI, despite many piloting or deploying AI technologies [31].

These successful AI adopters can sense and respond rapidly to changing conditions, such as new competitors or global disruptions like a pandemic, making them more agile and adaptable. They create an environment where executives and employees can understand, adjust, and adapt to AI-driven processes rather than having automation thrust upon them without preparation [32].

According to [33], to achieve AI success, these organizations employ specific strategies:

- They foster systematic and continuous learning between humans and machines, emphasizing that AI learning is a collaborative effort between machines learning autonomously, humans teaching machines, and machines teaching humans.

- They develop various modes of interaction between humans and machines, tailoring the interaction methods to specific contexts. For instance, AI systems make recommendations in some situations, and humans decide whether to implement them.

- They adapt and evolve their processes in response to the insights gained from AI. Instead of merely incorporating AI into existing processes, they modify them based on what they learn from AI.

AI detectors profoundly impact society and the economy, notably in healthcare, where they contribute to early disease diagnosis and transportation, enhancing safety by identifying hazards and preventing accidents. Economically, AI detectors boost productivity by automating tasks and processes, improving customer experiences and competitiveness. Ethical concerns, however, must be addressed to ensure responsible and unbiased use [34].

AI, particularly in disease detection such as cancer, can identify abnormal cell patterns indicative of cancerous growth, potentially aiding in early diagnosis and treatment. Google's AI-powered breast cancer detector demonstrates remarkable accuracy compared to radiologists [35]. AI's role in early disease detection extends to conditions like diabetes and heart diseases, as exemplified by IBM Watson's healthcare AI detectors, contributing to more accurate diagnoses [36, 37].

In transportation, AI plays a vital role in object detection for autonomous vehicles, enhancing safety and efficiency. Tesla's self-driving cars integrate AI technology, showcasing enhanced safety and efficiency through continuous real-time data analysis [38]. As demonstrated by Barcelona's smart traffic management system, AI detectors in traffic flow monitoring facilitate real-time data collection, predictive analytics, incident detection, and adaptive traffic control [39].

AI detectors, such as barcode scanners and image recognition software, automate inventory management in business operations. Walmart's successful implementation showcases benefits like enhanced predictive capabilities, reducing stockouts, increasing customer satisfaction, and optimizing inventory management through real-time predictions [34]. AI detectors also play a crucial role in customer behavior analysis, offering valuable insights for personalized product recommendations, as seen with Amazon's use of machine learning algorithms [40].

In security, AI detectors, particularly facial recognition technology, enhance measures for potential threat detection. Despite privacy concerns, NEC's NeoFace system in airports employs AI-powered facial recognition to swiftly and accurately identify individuals in crowded areas, improving security [41].

Several other instances showcase the integration of AI into companies' and individuals' daily lives, as outlined in **Table 3**, adapted from [37].

Practical Applications: Machine Learning in Action	
Technology Applications	**Summary**
Email Automation and Spam Filtering	Machine learning impacts email functionality, powering automation and effective spam filtering by adapting to patterns in undesirable content. It analyzes data from domains, sender locations, message text, and user-marked emails, improving accuracy—successful spam filtering results from ongoing learning from user feedback and data references.
Social Media Optimization	Social media platforms utilize big data and AI, employing machine learning to enhance functionality and combat inappropriate content and cyberbullying. Deep neural networks process data, learning user preferences for content suggestions and targeted advertising. Machine learning plays a crucial role in maintaining platform integrity and user loyalty.
Mobile Voice-to-Text and Predictive Text	Voice-to-text applications like Siri and Cortana utilize supervised and unsupervised learning to transcribe audio into writing. Predictive text learns contextual words and phrases, even adapting to unique terminology. The technology suggests personalized words and phrases, showcasing its ability to understand and predict user language.
Financial Accuracy	Machine learning in the financial industry enhances digital systems, monitoring abundant transactions for fraudulent activities. It enables features like mobile check deposits through handwriting and image recognition. Machine learning, data analytics, and AI influence credit scoring, lending decisions, and improved customer experiences in banking.
Predictive Analytics	Predictive analytics, a form of advanced analytics, utilizes machine learning and AI to analyze current and historical data for predicting future outcomes. Techniques like data mining and statistics help identify patterns, minimizing human errors and increasing the speed of analysis.

Table 3.
Practical applications of AI adapted from tableau (2023).

3.4 Artificial intelligence use in educational settings

AI is actively shaping various aspects of education that may be applied to lifelong learning. Examples include plagiarism detection, maintaining exam integrity, employing chatbots for enrollment and retention, utilizing learning management systems, transcribing faculty lectures, enhancing online discussion boards, analyzing student success metrics, and contributing to academic research [42]. The application

of AI is expanding daily, with technologies like Thinkster Math, Jill Watson (an AI-enabled virtual teaching assistant), Brainly (a social media platform for classroom questions), Nuance (speech recognition software), Cognii (AI-based products for education), KidSense (AI educational solutions for children), and Content Technologies (AI-driven instructional design and content application solutions).

AI plays a crucial role in promoting inclusion and universal access to education. It facilitates global classrooms for diverse language speakers and those with visual or hearing impairments, enables access for students facing illness or unique learning needs, and strives to create equal opportunities for students regardless of socio-economic status, race, gender, sexuality, ethnicity, or physical and mental abilities. Additionally, AI holds promise in individualized learning, empowering teachers to tailor lessons to each student's needs, eliminating the challenge of teaching to the middle when students have varied skill levels and learning abilities [43].

4. Recommendations

Integrating AI and DE in lifelong learning can significantly enhance the learning experience, making it more adaptive, engaging, and accessible for learners of all ages. However, it is essential to approach this integration thoughtfully, addressing ethical and accessibility considerations while keeping the learner's needs at the forefront.

The following provides some guidelines on how to use AI and DE in lifelong learning experiences.

- Flexible learning pathways

  ○ Implement AI-driven learning management systems that adapt to individuals' needs and preferences.

  ○ Offer asynchronous learning options, allowing learners to access materials and complete assignments at their own pace.

  ○ Provide a mix of short-term courses, micro-credentials, and longer-term programs to cater to different needs and time commitments.

- Intelligent content delivery

  ○ Develop AI-powered content recommendation systems for Learning Management Systems that suggest relevant articles, videos, courses, interactive simulations, and gamified learning experiences based on learners' interests and goals, ensuring high-quality, engaging educational content.

  ○ Use data analytics to assess each learner's progress and recommend personalized learning resources and activities.

- Adaptive assessments

  ○ Create AI-powered assessment tools that adapt the difficulty of questions based on the learner's performance, providing a more accurate measure of their knowledge.

- Incorporate various assessment methods to cater to different learning styles, including quizzes, essays, peer reviews, and project-based assessments.

- Use natural language processing (NLP) for automated essay grading, reducing the burden on educators.

- Enhanced engagement and feedback

  - Employ AI to analyze learner behavior and engagement patterns to provide timely feedback and interventions when a learner is disengaged or struggling.

  - Foster a sense of community by creating discussion forums, chat rooms, and virtual meetups for learners to interact and collaborate.

  - Gamify elements of the learning experience to boost motivation and retention.

- Professional development

  - Offer continuous training for professionals to use AI tools and platforms effectively in their work.

  - Provide access to mentors or instructors who can guide lifelong learners, answer questions, and offer personalized support.

- Ethical considerations

  - Ensure the ethical use of AI in education by addressing concerns such as data privacy, algorithmic bias, transparency, and establish guidelines and standards for maintaining fairness and equity.

  - Ensure that all educational materials and platforms are accessible to individuals with disabilities.

- Accessibility and inclusivity

  - Develop marketing and outreach strategies to reach a diverse audience and raise awareness of the lifelong learning programs.

  - Promote diversity and inclusion in course content and ensure representation of various backgrounds and perspectives.

- Research and evaluation

  - Promote ongoing research and evaluation of AI's and DE impact on lifelong learning to refine and improve DE and AI-powered systems.

  - Share findings and best practices across the educational community.

- Collaboration and partnerships

○ Foster collaboration between educational institutions, edtech companies, government agencies, and other stakeholders to create a cohesive approach to AI and DE in lifelong learning.

○ Collaborate with businesses and employers to develop customized training programs that address industry-specific skills and knowledge.

5. Conclusion

In conclusion, DE, facilitated by technology, democratizes education, breaking barriers imposed by geography, economic constraints, and physical limitations. While inclusive, DE is not without challenges, including varying instructional quality and technological requirements.

Schools are crucial in expanding students' interest in continuing to learn. Technology, specifically AI and DE, creates flexible and inclusive environments. The chapter explores its benefits, including responding to competitive job market demands, credentialling, continuous learning and skill assessment. The evolving job market emphasizes possessing advanced AI tools and developing human capabilities to navigate complex decisions.

Looking ahead, the chapter envisions DE, fueled by AI, assembling personalized study programs and tracking individual competencies. Learning analytics can guide students toward open educational resources, fostering lifelong learning hubs. Challenges persist, including balancing pedagogical approaches, accommodating diverse learning styles, and addressing social inequalities in digital skills.

AI is reshaping the lifelong learning landscape, offering immense potential while introducing critical risks and challenges. Key risks associated with AI, such as discrimination, privacy, algorithmic bias, the digital divide, and the delicate balance between AI-driven personalization and human guidance, necessitate responsible and ethical AI use in lifelong learning.

As lifelong learning evolves with AI and DE integration, careful attention to flexibility, adaptive assessments, enhanced engagement, ethical considerations, accessibility, research, and collaboration is essential for a comprehensive and inclusive lifelong learning experience.

Author details

Patricia Fidalgo[1*] and Joan Thormann[2]

1 Emirates College for Advanced Education, Abu Dhabi, United Arab Emirates

2 Lesley University, Cambridge, Massachusetts, United States of America

*Address all correspondence to: pfidalgo@ecae.ac.ae

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Chapter 3

Navigating the Landscape of Blended Higher Education: Didactical Design Principles for Students' Broad Development

Hanneke Theelen, Milou De Smet, Dave Van Breukelen, Laura Eeckhoudt, Dinska Van Gucht, Karolien Adriaens and Claudio Vanhees

Abstract

In recent years, blended teaching formats have become increasingly important in higher education. Designing effective blended education is challenging and requires a profound knowledge of digital tools and technologies, as well as the didactical proficiency to deploy them effectively and efficiently within the learning environment. However, little is known about didactical design principles to support teachers in creating an effective blended design. This chapter reports on the combined results of two independently conducted extensive literature reviews that investigated (a) didactical strategies, methods, and techniques concerning online education in the existing empirical research on higher education, and (b) the effects of different blended teaching formats, compared to face-to-face education, on learning outcomes and/or psychosocial outcomes in higher education students. It was found that blended education can enhance student achievement and psychosocial well-being, yet that the instructional approach plays a crucial role. Combining the insights of both studies has subsequently led to a series of evidence-informed recommendations to design effective blended education with a view to the broad development of students. Readers will be provided with practical guidance on how to implement these design principles in educational practice.

Keywords: blended education, didactics, instruction, design principles, achievement, psychosocial well-being, higher education

1. Introduction

In recent decades, technology has claimed an increasingly prominent role in education. This encompasses the use of hardware (e.g., computers, tablets, interactive whiteboards), e-learning platforms, educational software, online learning resources, and a variety of communication tools for both teachers and students. The COVID-19

pandemic further sped up this process by forcing many educational institutions to abruptly shift from (mainly) face-to-face to fully online distance education (Emergency Remote Teaching (ERT); [1]). Within this spectrum, blended education (see *theoretical background* for detailed definitions) can provide opportunities to make education more flexible and enrich the curriculum in an engaging manner [2]. Simulations, for instance, can visualize "invisible" phenomena such as electricity, or the use of virtual reality can mimic real-life situations. At first glance, this opens up numerous possibilities for interactive and activating learning. On the other hand, due to its inherent nature, ERT was often not based on a deliberate didactical design. Also, it negatively affected students' psychosocial well-being as it increased feelings of isolation and anxiety [3], and consequently underlined the need to strive for a well-thought balance in blended higher education design. It is therefore important to consider how blended education should be effectively designed, not solely in terms of combining face-to-face (FTF) and online learning activities, but equally in promoting both student achievement and psychosocial well-being.

Current research that systematically examined and compared blended education with FTF formats has revealed slightly positive effects of various blended formats on outcomes in students (e.g., [4]). Most studies, however, focus almost exclusively on the effect on academic achievement (i.e., knowledge and skills), while psychosocial outcomes (e.g., well-being, metacognition, and personal growth) are rather understudied, and limited to specific blended teaching formats (e.g., [5]). Moreover, often the effect of specific digital tools or learning environments is examined (tool-oriented), with limited attention to didactical design, that is, how those tools are used to promote effective learning (goal-oriented). Given that blended education is now likely to become a permanent and increasingly important facet of higher education, it is essential to understand how teachers can design blended education that effectively promotes both student achievement and psychosocial well-being. In order to fill this gap in the literature, this chapter describes evidence-informed didactical design principles for effective blended higher education, with a focus on students' broad development, by combining the insights of two independently conducted literature reviews.

2. Theoretical background

2.1 Online and blended education

Firstly, we delineate the terms "online education" and "blended education," and describe where specific blended teaching formats such as the flipped classroom are situated within this continuum.

Figure 1 illustrates the extent to which technology, including the use of digital tools, can be applied in education, and where various teaching formats can be positioned on this continuum [6, 7]. At the far left of the figure, face-to-face education is found, in which no technology is used. The next three teaching formats can be positioned under the umbrella term "online education," as it entails the use of technology to replace or supplement face-to-face education [7], namely (1) face-to-face education supported by technology; (2) blended education; and (3) fully online distance education. In this chapter, we are primarily concerned with the use of technology in education, and we will therefore subsequently discuss the three latter types in more detail below the figure.

Figure 1.
Online education and the level of technology.

1. *ICT in support of face-to-face education*: face-to-face education with (minimal) technological support in order to enrich or support lessons. For instance, the use of digital presentations to present course materials, digital interactive quizzes to assess (prior) knowledge, or even the use of simulations to teach students about electricity [6]. There are no elements of distance education, and all activities take place in face-to-face settings.

2. *Blended education: face-to-face and online combined*: blended education is often described as a deliberate and integrated combination of face-to-face and distance education [8]. Within this definition, it is important to underline the terms "deliberate" and "integrated," as blended education goes beyond simply merging face-to-face and distance education, and equally implies more than simply adding distance components to traditional face-to-face education. It involves a thoughtful combination, or blend, of both approaches [9].

One of the most extensively studied blended teaching formats is the flipped classroom (e.g., [10–12]), in which students independently review the (often theoretical) learning materials before the lessons, for example, by completing a learning path in the digital learning environment or studying knowledge clips. **Figure 2** illustrates how during the lessons, ample time can then be dedicated to actively processing the studied learning materials, for instance, through relevant case studies, assignments, group work, discussions, or quizzes. While actively processing and practicing the course materials in class, students can rely on instruction and support from the teacher and equally have sufficient time and space for interaction among peers. After class, there is once again time and space for independent practice and application of the covered course content.

3. *Fully online distance education*: The most extensive form of online education is fully online distance education, in which teachers offer the learning materials entirely remotely, and primarily with the use of the internet [13]. The so-called massive open online courses (MOOCs) are a well-known example [14, 15]. This type of education does not involve any face-to-face components that are organized at a specific educational location. Although distance education can also be organized without the use of technology (e.g., sending textbooks and courses by regular mail), it is increasingly becoming technology-supported.

In what follows, this chapter focuses on blended education, as it encompasses widely used and versatile teaching formats that thoughtfully and deliberately combine face-to-face and online learning, which can be organized both synchronously and/or asynchronously.
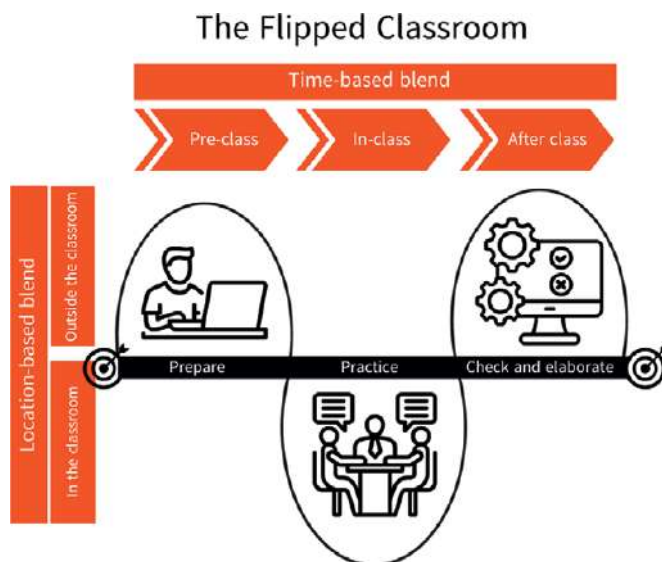
Figure 2.
Schematic overview of the flipped classroom.

2.2 Blended education and (a)synchronicity

Synchronous interactions involve live contact with students and can occur during face-to-face moments in the classroom, but also online (e.g., a live online lecture). During synchronous interactions, (prior studied) theoretical content can be further explained, deepened, and practiced. Synchronous interactions can also facilitate community-building among students, which could lead to increased involvement [16].

Asynchronous interactions, on the other hand, do not occur chronologically and are particularly important to facilitate instances in the learning process when live interaction between teachers and students, or among students themselves, is not required [16]. Asynchronous interactions can be used by students to process course materials independently and within established boundaries, at their own pace. In this manner, instructional videos, digital simulations, or digital learning paths can ideally be studied more than once to optimize retention [17]. Moreover, on discussion boards, asynchronous interactions can provide students with more time to formulate a suitable response, which could encourage students to deeply engage with the course content before answering [16].

Blended education allows to deliberately combine both types of interaction. When students have already independently studied the course content beforehand (asynchronously), teachers can subsequently use synchronous interactions to work on aspects that students may struggle with, discuss specific assignments, or apply acquired knowledge in practical scenarios. In this manner, teachers can decide to use synchronous interactions less for pure knowledge transfer but reserve them primarily for learning activities that focus more on the application of the acquired knowledge.

2.3 Blended education and broad development

The broad development of students encompasses both the enhancement of learning outcomes (i.e., knowledge and skills) and psychosocial outcomes (i.e., well-being,

metacognition, and personal growth). The Taxonomy of Significant Learning [18], as shown in **Figures 3** and **4** illustrate how both aspects are of great importance for student development. It delineates six dimensions that contribute to meaningful learning.

With regard to *learning outcomes* (see **Figure 3**), we focus on three dimensions of the taxonomy, namely (1) the acquisition of foundational knowledge, (2) its application, and (3) its integration [18]. It is crucial for students to first build a solid knowledge base, and to be able to retain and comprehend it, which then serves as an essential foundation to thoughtfully perform practical tasks [19, 20]. In addition to acquiring the necessary knowledge about the course content, its subsequent application in skills is also an important learning goal. The objective is for students to become proficient in specific tasks, such as conducting lab experiments, removing stitches, administering physiotherapeutic treatments, or improving communication skills.
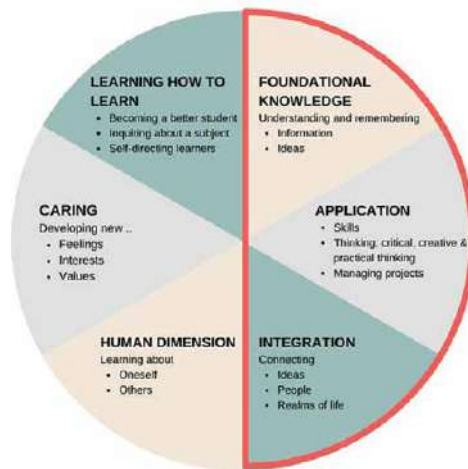
Figure 3.
Learning outcomes in Fink [18].
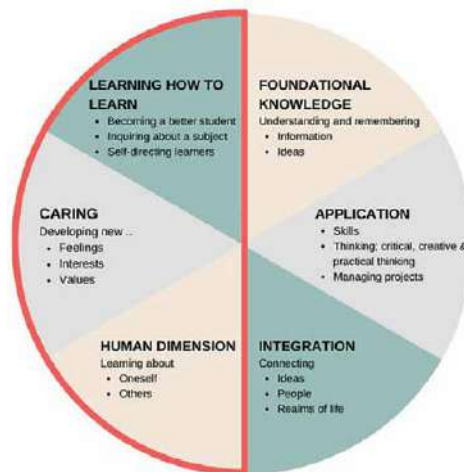
Figure 4.
Psychosocial outcomes in Fink [18].

However, it is not always possible nor desirable to distinguish between knowledge and skills thereby strictly. In-depth domain knowledge serves as the indispensable foundation for skill development and application [21]. Besides learning outcomes, Fink [18] also addresses (4) the human dimension (intra- and interpersonal perspectives), (5) caring (feelings, interests, and values), and (6) learning to learn (metacognition), thus advocating a holistic approach to education (see **Figure 4**). These aspects are referred to as psychosocial outcomes in this chapter.

To gain a better understanding of how blended education can be optimally designed from a didactical perspective with a view to enhance students' broad development (i.e., both in terms of achievement and psychosocial well-being), this chapter describes the results of two literature reviews that were carried out independently, yet with similar and compatible inquiries. In the following section, the research methods of both studies will be elaborated. Although both literature reviews were performed in a different context and used their own approaches, similar results and recommendations emerged from both studies. Combining the results of both review studies in this chapter underlines the scientific support and power, but also the generalizability of the results found.

Review study A was conducted by authors HT and DVB based on the following research question:

- What is known about didactic and pedagogical strategies, methods, and techniques concerning online education in the field of empirical research on higher education?

Review study B was carried out by authors CV, MDS, LE, KA, and DVG to answer the following research questions:

- What are the effects of different blended teaching formats, compared to face-to-face teaching, on learning outcomes and/or psychosocial outcomes in higher education students?

- What didactic preconditions do effective blended teaching formats (i.e., with positive effects on student learning outcomes and/or psychosocial outcomes) adhere to?

We first outline the distinct methodologies employed in both review studies. Subsequently, we provide an overview of the evidence-informed recommendations for an effective blended design distilled from these reviews in the results section, followed by general suggestions for the design process in the discussion and conclusion section.

3. Methodology

3.1 Search process

3.1.1 Study A

To address the research question, we conducted a thorough examination of existing literature through a systematic literature review. We utilized databases Scopus, PsychINFO, and Education Resources Information Center (ERIC) to identify studies meeting specific inclusion criteria: (1) articles written in English, (2) peer-reviewed

Keywords	Synonyms
e-learning	"Online education", "distance education", "online learning", "online program", "online course", "online schooling", "online training", "blended learning", "hybrid learning", "hybrid education", "online teaching"
Didactic[*] / pedagog[*]	"Method", "instruc[*]", "inform[*]", "activit[*]", "model[*]", explain[*]", "strateg[*]", "tactic[*]", "approach[*]", "design[*]", "program[*]", "course[*]", "technique[*]", "tool[*]", "intervention[*]", "technolog[*]", "teach[*]", "school[*]", "train[*]", "prepar[*]", "coach[*]", "tutor[*]", "educat[*]"
Higher education	"Universit[*]", "academic"

[*]*Variations of the keyword, such as plurals, were also included as search terms.*

Table 1.
Search query of study A.

articles, (3) studies employing qualitative, quantitative, or mixed-method approaches, (4) articles focusing on online education, didactics or pedagogy, and higher education or related terms. The keywords as described in **Table 1** were derived from relevant literature related to the didactics and pedagogy of online education, also denominated "e-learning," within higher education.

3.1.2 Study B

To gain more insight into the effectiveness of blended teaching formats on both learning and psychosocial outcomes in higher education, a rapid evidence assessment (REA) of existing systematic review studies (SR) and meta-analyses (MA) was conducted according to PRISMA guidelines [22]. The initial search was conducted in the Education Resources Information Center (ERIC) and Web of Science (WoS) databases, with the following inclusion criteria developed according to the PICOS framework: (1) higher education students (Population); (2) implementations of a blended teaching format at course level (Intervention); (3) compared to a face-to-face teaching format (Comparison group); (4) learning outcomes and psychosocial outcomes in students (Outcomes of Interest); (5) peer-reviewed systematic reviews and/or meta-analyses written in English (Study design). The keywords used in the search query are described in **Table 2**.

Keywords	Synonyms
Blend[*] learning	"Flipped blend", "hybrid learning", "supplemental blend", "flipped learning", "replacement blend", "online learning", "technology mediated learning", "blend[*] course", "technology enhanced learning", "hybrid course[*]", "technology transmitted learning", "flipped course[*]", "digital learning", "online course[*]", "e-learning", "flipped classroom", "multimedia learning", "inverted classroom"
Higher education	"University", "college[*]", "undergraduate[*]", "bachelor degree", "polytechnic"
Achievement	"Learning", "skill[*]", "development", "knowledge", "attitude[*]", "well-being", "personal[*]", "social[*]"
Meta-anal[*]	"Review"

[*]*Variations of the keyword, such as plurals, were also included as search terms.*

Table 2.
Search query of study B.

Both review studies focused on the period from 2010 to 2021, as the surge of the Internet in the 1990s to 2000s significantly impacted the integration of online technologies in educational settings [23, 24]. Between 2000 and 2010, there was a notable rise in initiatives related to online education, resulting in a substantial increase in student participation. By approximately 2007–2010, online education had become an integral part of educational practice [2, 13].

3.2 Selecting articles

3.2.1 Study A

The process of selecting articles for this systematic literature review is outlined in **Figure 5**. A total of 1040 studies were identified in Scopus, 837 in ERIC, and 356 in PsychINFO. Among these, 376 studies were duplicates. The two authors (HT and DVB) jointly reviewed 100 abstracts to ensure consistent application of the inclusion criteria. The remaining abstracts were divided between the two authors. Following this initial screening, 1739 studies were deemed unrelated to the topic. Approximately 1340 studies did not address the pedagogy or didactics of online education. Many studies primarily focused on student experiences and learning outcomes in (partially) online learning environments or were centered on the procedural aspects of design rather than on the design itself.

An additional 193 studies were excluded as they did not pertain to online education, while 115 studies did not pertain to higher education. Furthermore, 91 studies were excluded for various other reasons, such as discussing the management, organization, or financial aspects of a (partially) online course, detailing the technical design of a tool rather than the pedagogical use of it, or addressing a (blended) combination of institute-based education and internships. For the remaining 118 articles, both authors jointly reviewed the full texts to definitively determine which articles met the criteria for inclusion in the literature review. After a thorough discussion, 42 articles were identified as suitable for inclusion.
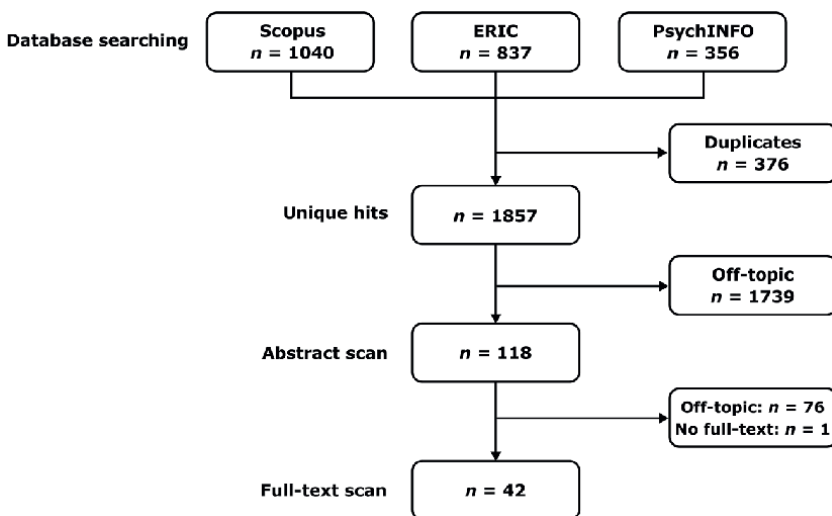
Figure 5.
Selection process of study A.
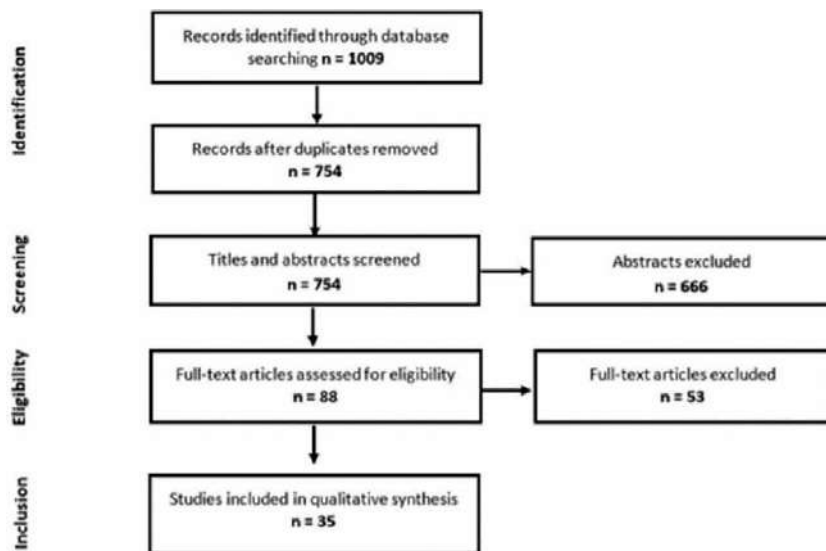
Figure 6.
Selection process of study B.

3.2.2 Study B

The screening procedure as shown in **Figure 6**, the subsequent critical appraisal of the review studies, as well as the data extraction and processing were carried out by five independent expert reviewers (authors CV, MDS, LE, KA, DVG). In total, 1009 systematic reviews and meta-analyses were identified in Web of Science and ERIC, of which 255 studies were duplicates. The 754 titles and abstracts of the resulting studies were independently reviewed to ensure consistent application of the inclusion criteria. Following this initial screening, 666 SR and MA were deemed unrelated to the topic. The remaining 88 review studies were read in full, resulting in 42 studies that met the inclusion criteria. These 42 SR and MA were then subjected to a thorough and independent critical appraisal (CA) by a minimum of two authors in order to determine the methodological quality. The studies were scored on four domains, namely (1) study eligibility criteria; (2) identification and selection of studies; (3) data collection and study appraisal; (4) synthesis and findings and based on the total score labeled as (a) high-quality; (b) average-quality; and (c) low-quality. The detailed CA-instrument is available upon request. Discrepancies were discussed and resolved by consensus. Seven additional SR and MA of low methodological quality were subsequently excluded. Therefore, in total, 53 full-text studies were excluded in the eligibility phase, resulting in 35 high-quality meta-analyses and systematic reviews for further analysis.

3.3 Analysis.

3.3.1 Study A

First, the 42 included studies underwent categorization using the following coding scheme:

1. General information: this included details like authors, title, publication year, database source, journal, abstract, country, and field.

2. Research design: this encompassed the research type (quantitative, qualitative, or mixed-method), data collection methods, and participant count.

3. Type of e-learning: this identified whether it was blended or distance learning, including the authors' provided definitions and components.

4. Design principles: this covered learning theories, didactic principles, pedagogy, and recommended practices.

These categories helped uncover both similarities and differences among the studies. Notably, this review specifically focused on online education. Next, labels were derived through open coding of the design principles, involving a continuous comparison of similarities in the data. Two key continua emerged as pivotal for e-learning: the active learning continuum and the authentic learning continuum. Finally, axial coding established connections between the labels from the open coding. To ensure inter-rater reliability, both authors collaborated closely throughout the analysis process until consensus was achieved.

3.3.2 Study B

The 35 retained meta-analyses and systematic reviews were first independently analyzed by at least two members of the research team by means of a review matrix with the following elements:

1. General information: APA reference, domain, research question(s), SR and/or MA; critical appraisal score;

2. Included source studies: range of source studies; n studies on BL compared to FTF/total N included studies;

3. Type of blended education: provided definitions and components, and position on the MIX-taxonomy [25];

4. Outcome variables: learning outcomes and/or psychosocial outcomes (including terms, provided definitions, and measurement instruments);

5. Effects: positive and/or negative effects on learning and/or psychosocial outcomes in students, including effect sizes if provided;

6. Didactic preconditions: how, when, and why do positive and/or negative effects occur (including moderator analyses in MA if provided); link with learning theories, and instructional design;

7. Overall conclusions: is blended education effective as compared to FTF teaching formats, and if so where, when, and how?

Discrepancies were discussed by the complete research team and resolved by consensus. Subsequently, two sub-teams of reviewers further analyzed the effects on learning outcomes (authors CV, MDS, and LE), and psychosocial outcomes (authors KA and DVG) respectively. The findings were then presented and discussed between both sub-teams and finally combined into a qualitative synthesis.

4. Results: recommendations for an effective blended design

Based on both literature reviews, it was found that blended education formats potentially enhance students' learning outcomes and their psychosocial outcomes. However, not all studies showed positive effects. Some studies did not show any difference between blended and face-to-face education, and a minority even showed negative effects of blended education compared to face-to-face education. Blended teaching formats therefore do not always or automatically lead to enhanced outcomes. We consequently delved deeper into the characteristics of moderators in meta-analyses, and the characteristics of individual source studies to understand the underlying didactic preconditions; what works, when and why? This analysis revealed that the instructional approach plays a crucial role. Hence, instructional recommendations were distilled, which are presented below.

The combined results of both literature reviews have led to a series of evidence-informed recommendations for the effective design of blended education with a view to promoting student achievement and psychosocial well-being. **Figure 7** provides an overview of the recommendations discussed in this chapter, which can be categorized into prerequisites, and four didactical themes: (1) authentic learning, (2) content and process scaffolding, (3) peer-to-peer learning, and (4) formative strategies. All these
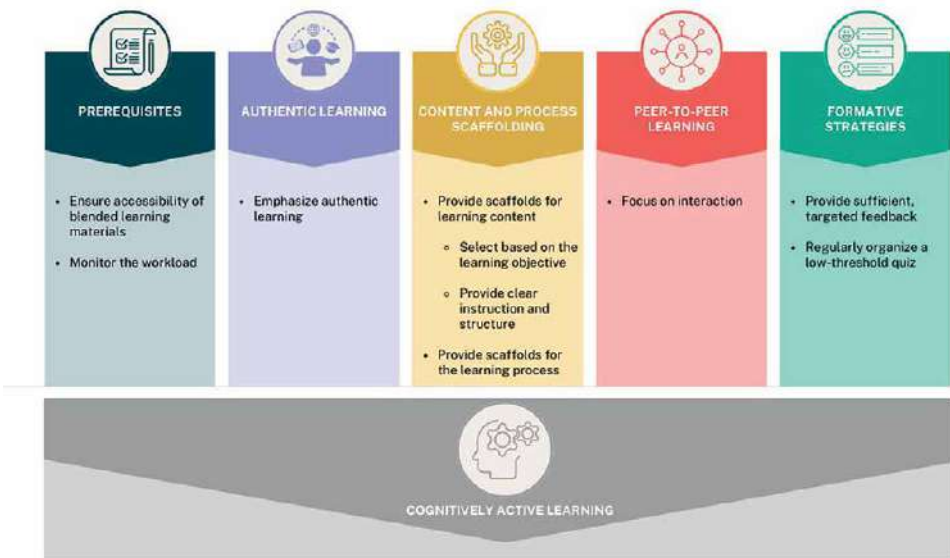
Figure 7.
Overview of recommendations for an effective blended design.

recommendations contribute to the cognitive activation of students, which was found to be a crucial overarching element for an effective blended design. In the following sections, we will discuss each component of **Figure 7** in detail.

4.1 Cognitively active learning

Active learning plays a significant role in all effective teaching formats, but particularly in a blended design. This implies that in an effective blend, students should be encouraged to actively engage with course content on a cognitive level. Cognitively active students do not only appear to be actively engaged in various activities at first glance but are sufficiently challenged to deeply reflect on the course content, thereby gaining lasting learning experiences [26]. This can be achieved by integrating the four didactical recommendations which we will discuss below. However, several prerequisites of an organizational nature should be met before teachers can start to design an effective blend based on the didactical recommendations.

4.2 Prerequisites

Two concrete examples of organizational prerequisites emerged from the review studies, namely accessibility and workload.

4.2.1 Ensure accessibility of blended learning materials

First, teachers should verify whether their course is sufficiently accessible for all students. This implies, for instance, a stable internet connection at home, the required hardware and software, and the appropriate knowledge and skills (such as ICT skills) to effectively engage with the technological aspects of a blended course. If not, teachers ought to direct students to the appropriate facilities where they can receive assistance in acquiring the necessary hardware and software. Moreover, they could assist them in developing the necessary knowledge and skills to use digital learning materials for a blended course.

4.2.2 Monitor the workload

Additionally, when designing blended education, it is important to closely monitor students' overall workload. Ensure that teachers (design teams) design, integrate, and replace components thoughtfully, rather than simply adding digital or blended components to the existing course design. This prevents the total workload of the course from being exceeded quickly.

4.3 Emphasize authentic learning

The use of technology provides opportunities for teachers to create (more) authentic learning experiences. The learning process encompasses materials and situations that range from non-authentic to highly authentic [27]. On one end of the spectrum, there are learning materials that offer little to no context, such as simple arithmetic problems or multiplication tables, which are of course important as a solid basis for subsequently acquiring more advanced content. On the other end, learning materials are closely tied to practical applications, such as the use of simulated learning environments or real-life scenarios. Simulated learning environments give teachers the opportunity to replicate

workplace scenarios in a lifelike or authentic manner, resulting in rich learning experiences [28]. Consider, for instance, midwifery students practicing episiotomies in a virtual reality environment, or facility management students conducting building visits and inspections through a 360-degree photo tour. Once they have acquired a solid basis of foundational knowledge, students can then experience situations that closely resemble what they will encounter in their future workplaces. If these real-life situations present complex problems that students must solve, they can be used to enhance their understanding and the relevance of the subject matter. Additionally, they can help bridge the gap between theoretical knowledge and practical application as students witness how the concepts, they learned in the classroom are actually applied in professional environments. If used purposefully and thoughtfully, technology can play a significant role in this process.

4.4 Content and process scaffolding

Effective blended education places a strong emphasis on scaffolding. In education, scaffolding refers to the supportive structure and guidance provided by a teacher to assist students in understanding and mastering new concepts or skills [29]. This support is tailored to the needs of students and is gradually phased out as students gain more independence [30]. This serves to prevent cognitive overload [31, 32] in students (for instance, due to excessive information, stress, or overly high complexity), and supports the gradual development of self-regulatory skills [33]. The goal of scaffolding is to assist students in achieving a higher level of understanding and performance [34], and it is crucial in two domains: delivering the course content and supporting the learning process.

4.4.1 Content scaffolding

Teachers should ensure that the course content follows a clear learning trajectory and is presented to students in manageable segments. By providing sufficient structure and support, teachers can assist their students in achieving the learning objectives. In this regard, two important recommendations can be outlined: selection of an appropriate blend based on the learning objectives and the provision of clear instruction and structure.

4.4.1.1 Select based on the learning objectives

It is crucial to first determine the specific learning objectives, and then decide which course content and teaching methods align with it. What do students need to know and/or be able to do? In that regard, blended education should not be considered a goal in itself, but merely a means to achieve the learning objectives. It is important to ensure that the blended design is purpose-driven rather than tool-driven. For instance, for teachers who primarily aim to enhance specific applied skills of students, a flipped classroom can be a highly effective blended teaching format (e.g., [11, 12]). Students can independently and asynchronously study theoretical contents at their own pace, and subsequently apply and integrate the underlying theory to practice domain-specific skills in the synchronous component (face-to-face or online).

4.4.1.2 Provide clear instruction and structure

Clear communication about the content and format of a course is essential. Students need a clear and well-defined overview of the learning objectives to be

achieved, what the lesson structure and course layout entail, and how the objectives and content are interconnected. This can be achieved, for example, through the use of an advanced organizer [35] or a schedule that structures the course of the lessons and clarifies the relationship between different lessons, content, and activities.

4.4.2 Process scaffolding

Besides scaffolds in terms of course content, teachers can also offer students support in organizing the learning process. In many blended teaching formats, a high degree of self-regulation [33] is expected of students, particularly in the asynchronous components. However, most students often have insufficient mastery of the required self-regulatory competencies. It is therefore essential for teachers to guide and support students in developing self-regulatory study skills, such as planning, applying effective learning strategies, and monitoring their study progress. Students need to learn to consciously reflect on their learning objectives, the most effective and efficient learning strategies, and how to assess and adjust their own learning process to effectively utilize the available time for preparatory activities. This leads to improved preparation and satisfaction among students [36].

An effective way to support this process as a teacher is through (metacognitive) scaffolding [30, 37]. Initially, a high level of support can be provided by the teacher, tailored to the students' level. This can be achieved, for example, by explicitly discussing effective learning strategies, initially modeling these strategies, collaboratively working on exercises, providing feedback, providing instruction, etc. In that manner, students have the opportunity to adjust their learning process and gradually develop self-regulatory study skills. As students become more proficient, teachers should gradually reduce the support so that students can ultimately employ self-regulating (effective study) strategies independently.

4.5 Peer-to-peer learning

An interactive and collaborative component in blended education has a positive effect on both learning outcomes and psychosocial outcomes. By emphasizing collaborative learning [38], students can learn from and with each other without constant involvement from the teacher. In a blended learning environment, teachers can organize these interactions synchronously, both face-to-face in the classroom and online through for instance, webinars, chat sessions, or live peer discussions. These synchronous forms of interaction can make students feel more connected [16]. Furthermore, through discussions in synchronous interaction, greater depth can be achieved. This, in turn, can contribute to higher engagement and a more active attitude, thereby increasing student motivation and satisfaction. In addition, teachers could also employ asynchronous interactions by means of wikis or forum discussions. These forms of interaction provide students with ample time to formulate responses or answers, and with sufficient guidance, can facilitate the development of self-regulatory (study) skills.

4.6 Formative strategies

A final recommendation outlined in this chapter is the regular use of formative strategies [39]. These are actions that provide teachers with ongoing insight into the performance and progress of students. This helps teachers (and their students) to

make decisions about the next steps in the learning process. Two effective formative actions that surged from the review studies are (1) providing sufficient, targeted feedback, and (2) regularly organizing low-threshold quizzes.

4.6.1 Provide sufficient, targeted feedback

Ensure the provision of sufficient, process-oriented feedback that prompts students to think and act [40]. It is important to offer students' knowledge-developing feedback: clear quality requirements so that students know what is expected of them (feed up), followed by feedback on where the students are situated in the learning process (feedback), and concrete tools they can use independently to improve their performance (feed forward). It is crucial to provide targeted feedback early on in the learning process, as this guides students in their learning and allows them the opportunity to adjust their learning process. This, once again, leads to the enhancement of self-regulatory skills [33]. The use of digital learning environments can enable instructors to monitor individual activities and study the progress of students easily and comprehensively, allowing the provision of timely and targeted feedback.

4.6.2 Regularly organize a low-threshold quiz

By using a short and low-threshold quiz, teachers can review or test the contents that students have already studied. When organized at the beginning of a lesson, important prior knowledge is activated in students, which they need to connect new information from the lesson [20]. Additionally, the answers and scores of students on such quizzes provide teachers with the opportunity to assess whether their students have understood and retained the material and identify any gaps or misunderstandings. This allows them to adjust their lessons accordingly.

Regularly using quizzes and similar activities at the start of the lesson positively influences students' learning outcomes and is considered an effective learning strategy. When students practice actively retrieving learning material from their memory (retrieval practice; [41]), they strengthen their memory more compared to so-called passive learning strategies, such as rereading materials [42]. In other words, it helps students to retain information better, and for a longer period of time. It is important however, to alternate with different learning activities that facilitate retrieval practice, for instance, a one-minute paper [43] or think-pair-share, as starting each lesson with a similar quiz type is not very motivating for students in the long run.

5. From recommendations to an effective blended design

Instructional recommendations do not automatically lead to an effective design. So how can the aforementioned recommendations be translated into an actual blended design? There is no fixed format for designing blended education, but it is recommended to design from back to front: backward design [44]. **Figure 8** illustrates how the desired learning objectives are first identified: What needs to be learned and by whom? Then, it is determined what the learning process will look like, and how progress can be made visible and monitored. Finally, a logical structure and sequence are established, and suitable learning tasks are planned, selected, and designed. Only then the specific online or offline learning resources (tools) are selected. In other words, the design starts from the learning objectives, and ends with suitable tools,
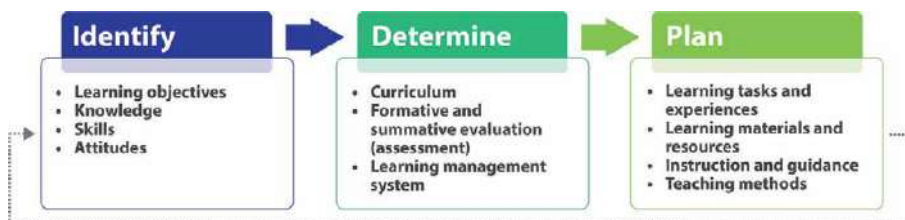
Figure 8.
Backward design.

and not vice versa. The design principles described in this chapter are particularly important for the second and third design phases.

In terms of practical organization, it is recommended to assemble an interdisciplinary design team [45]. In such teams, various roles are represented: teachers, information and communication technologists, educationalists, and policymakers. Another valuable suggestion is to initiate each design phase described above with a brainstorming session. A whiteboard or flipchart can then be used to record and connect essential elements. The aim is to progressively introduce more structure into the process. Students can also be actively engaged in the design process, particularly during the final evaluation and potential redesign, so that their perceptions and experiences can be taken into consideration. A final recommendation is to stick to the essence and to resist the urge to implement every design suggestion. The learning objectives are central to the design, so the next design phases should always consider what is necessary to achieve them.

6. Conclusion

In summary, the exploration of two different literature reviews in this book chapter has shed light on relevant design principles essential to the development of blended education. Despite methodological variations and a slightly different focus in the literature studies discussed, a fundamental similarity emerged. The synthesis of findings highlighted two important prerequisites for effective design: ensuring the accessibility of blended learning materials and monitoring the workload. These prerequisites were complemented by recommendations within four main themes: (1) emphasizing authentic learning, (2) content and process scaffolding, (3) leveraging peer-to-peer learning, and (4) implementing formative strategies. While these recommendations resonate with established principles in traditional face-to-face education, their increased significance in the realm of blended education, particularly within student-centered contexts, underscores their additional relevance. This synthesis of two literature reviews underlines the essence of adapting established didactical principles to blended education and highlights their essential role in shaping effective teaching.

*Included in review study A; **included in review study B

Author details

Hanneke Theelen[1*], Milou De Smet[2], Dave Van Breukelen[3], Laura Eeckhoudt[4], Dinska Van Gucht[4], Karolien Adriaens[4] and Claudio Vanhees[2]

1 Zuyd University of Applied Sciences, The Netherlands

2 Centre of Expertise Education and Learning, Thomas More University of Applied Sciences, Belgium

3 Fontys University of Applied Sciences, The Netherlands

4 Centre of Expertise Care and Well-being, Thomas More University of Applied Sciences, Belgium

*Address all correspondence to: hanneke.theelen@zuyd.nl

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Chapter 4

Increasing Lifelong Learning Using Video Animations: The Case of an Agriculture WhatsApp Group in Kenya

Anne Namatsi Lutomia and Julia Bello-Bravo

Abstract

Developing new ways of providing information and knowledge for lifelong learning to those on the margins of society with low literacy and access is complicated. Using a case study, this chapter generally demonstrates how smallholder farmers in Kenya engage in opportunities for lifelong learning offered by video animation programs in agriculture in their WhatsApp groups. The definitions of lifelong learning, affordances that technology provides for lifelong learning, and its relationship with Sustainable Development Goal 4 (SDG4) are offered. Moreover, African philosophies and practices such as *Palaver, Harambee, Umuganda, Ubuntu, and Omoluabi* and how they relate to and increase lifelong learning are discussed. The successes and challenges of the WhatsApp groups and video animations as sites for lifelong learning are also addressed.

1. Introduction

Lifelong learning has emerged as a critical concept in contemporary society, reflecting a shift from traditional, time-bound educational models to more dynamic and continuous forms of learning. The first major emphasis on lifelong learning was in the 1970s [1] and was visible in development and implementation of policies such as lifelong education (UNESCO, Council of Europe), lifelong learning (UNESCO), recurrent education (OECD), and *education permanente* (Council of Europe). Hager and Halliday [2] comment that this concept was not well-received in education initially; lifelong learning was misunderstood as devaluing traditional education, as it was mistakenly equated with lifelong education. This led to a decline in the interest in lifelong learning in the 1980s, with renewed interest in the 1990s. In that decade, lifelong learning experienced a renaissance to emerge as the dominant idea.

This resulted from numerous modern forces, including the growing importance of knowledge creation, globalization, and neoliberal economic imperatives. In the

modern, knowledge-driven world, people realize more and more how important it is to constantly update and learn new skills throughout their lives. Beyond traditional school environments, lifelong learning encompasses a range of (often specifically adult learning) experiences, including job training, independent study, and interaction with a variety of learning materials. Due to shifts in industry and technology, a demand arose for critical flexibility and staying abreast of cutting-edge knowledge. This has created a situation where lifelong learning can supply the knowledge and skills to remain competitive and relevant in the workplace. According to Jarvis [3], lifelong learning is a comprehensive strategy that views education as a continuous and integrated aspect of existence, stressing the value of social interaction, personal growth, and the accumulation of both explicit and tacit information.

Presently, lifelong learning applies to a vast number of situations. The information economy, globalization, and the speed at which technology is developing all highlight how important it is for people to always be learning new skills and expanding their existing ones. As such, lifelong learning not only promotes career advancement but also advances personal development and the welfare of society. It supports a proactive approach to skill acquisition and encourages adaptation in the face of change. Furthermore, by encouraging tolerance and understanding among people from different backgrounds and cultures, lifelong learning promotes social cohesiveness and inclusion in a society where these qualities are not readily available. The benefits of lifelong learning for society, according to Field and Leicester [4], include the development of an innovative and curious culture, enhanced employability, and more knowledgeable and involved citizens.

The purpose of this chapter is to demonstrate how video animations produced by a university-based program, Scientific Animations Without Borders (SAWBO), contribute to lifelong learning in agriculture through a WhatsApp group in Kenya.

2. Lifelong learning in principle and practice

2.1 Lifelong learning defined

Lifelong learning (LLL) covers the whole range of learning: formal, informal, and non-formal. It also includes the skills, knowledge, attitudes, and behavior that people acquire in their day-to-day experiences. Lifelong learning is closely linked to adult learning because it refers to the continuous, voluntary, and self-motivated pursuit of knowledge throughout one's life. It encompasses formal and informal learning experiences occurring in various settings such as the workplace, community, and personal life. Lifelong learning recognizes that individuals can and should continue to learn and adapt to new challenges and opportunities across their lifespan. The concept aligns with the idea that learning is not confined to specific stages of life but is a continuous and evolving process. Lifelong learning identifies the fact that there is no end to education. It is not just a means to an end but something that should be embraced and pursued for personal and intellectual growth [5]. This then introduces the question: how do we learn to learn? According to Medina et al. [6]:

> *Metacognition is an essential skill in critical thinking and self-regulated, lifelong learning. It is important for learners to have skills in metacognition because they are used to monitor and regulate reasoning, comprehension, and problem-solving, which are fundamental components/outcomes [6].*

Metacognition is an important skill for lifelong learning because the learners are aware of understanding how they learn and therefore can evaluate and adapt honed skills for effective learning. Currently, the increased demand for lifelong learning increases the demand for metacognitive strategies:

> *Metacognitive skills also have a role in critical thinking and problem-solving. If you know what you know and do not know, your metacognitive skills help drive you to obtain the missing information, which we refer to as self-directed or self-regulated learning [6].*

Currently, although lifelong learning is accessible through many channels—including online courses, extension university courses, workplace training, and certification courses, non-formal technical and vocational education and training (TVET), courses by professional organizations and master classes, and self-directed learning, even using ChatGPT [7]—it is most frequently *adult* learning, which can differ significant from formal primary, secondary, and college-level learning.

Specifically, Malcolm Knowles described *andragogy*, which focuses on how adults learn [8]. Knowles critically differentiates andragogy from pedagogy, which seeks to understand how children learn. Knowles [9] emphasized the necessity of considering adults' self-concept, experience, readiness to learn, and orientation to learning tasks in facilitating effective adult learning. Knowles [10] provides the most widely accepted definition of adult learning with eight elements: (a) it is a process (b) that is initiated by the individual, (c) which may or may not involve the help of others, (d) to identify their learning needs, (e) develop learning goals from these needs, (f) find the necessary resources to attain these goals, (g) select and implement the proper learning strategies to meet their goals, and (h) determine how to measure learning outcomes. According to Knowles, adult learning takes place away from the traditional formal education system and is self-directed. It is driven by the individual and leans toward experiences. Adults pursue andragogy to improve their work experience, personal development, and new interests or hobbies. Brookfield [11] examined Knowles's andragogy and critiqued it for not considering cultural differences, centering learning experiences of those in individualistic, not collectivistic societies, where learning takes place in groups and activities are more frequently done together. Hence,

> *This does not mean that self-directed learning is highly individualized [or that] learning is always conducted in isolation. Learners can work in self-directed ways while engaged in group-learning settings, provided that this is a choice they have made believing it to be conducive to their learning efforts [11].*

Others see self-directed learning as influenced by variables like the personality of the learner, the experience in the content areas, availability of resources, and society's attitudes toward self-directed learning and other perceived cultural constraints [12]; importantly, self-directed learning is not simply a matter of a learner's innate capacity [11].

Given that lifelong learning occurs throughout our lives, it is vital to understand how we learn to learn, as this informs meaningful learning strategies to that end. This introduces the concept of *transformational learning*. Lifelong learning is transformational and occurs at all stages of life [3]. It leads to creativity and innovation and provides a basis for changes in knowledge, attitude, and behavior [13, 14]; it changes the *parameters* of learning, not just the content learned. Accordingly, transformational

learning is reflective and involves meaning making and raising consciousness in order to free oneself [14, 15]. It shifts one's worldview, assumptions, expectations, and earlier ways of interpreting, deciding, and evaluating conclusions [14].

Arguably, the educational theorist Paulo Freire contributed to the notion of transformational learning by urging learners to be involved in the societal transformation of their community [16]. For him, education should not produce passive learners who receive knowledge that does not resonate with their reality and therefore prevents them from being engaged in producing knowledge for a better community. Freire asserts that education should encourage dialog, raise consciousness, and aim for the liberation of people [16].

2.2 Lifelong learning and technology

Since the beginning of the twentieth century, forms of media like film, radio, television, computers, the Internet, mobile technologies, social media, and virtual, augmented, mixed, and extended reality have been hailed as having the potential to revolutionize the educational system [17, 18]. These modes of teaching have also been used in the agricultural sector to supplement face-to-face (adult) extension services.

The proliferation of mobile phones has allowed the use of social media platforms for information sharing and learning from each other [19]. WhatsApp groups have utilized this affordance and have enabled farmers in rural areas to share information on planting season, crop management, pest control, storage, and market trends [20–24]. These WhatsApp groups are important to farmers who sometimes cannot access extension service information due to gender, geographic remoteness, or perennial shortages of time and numbers of extension service officers.

This access to information using WhatsApp on mobile phones is supported by decreasing costs of mobile phones and Internet connectivity [20, 21, 25]. In various African countries, the capacity of mobile phones to deliver and provide services has led to *m-services*, including m-agri, m-commerce, m-banking, and m-health. These services are accessed with or without connectivity and are either free or require payment [24]. Their delivery is not without challenges. Disparities exist in terms of class, gender, educational attainment, and geographic (urban versus rural) location. Women farmers who live in rural areas especially face these digital, extension service, and m-service divides [21, 26]. Other barriers include exorbitant prices for data access, airtime, and reliable smartphones, unreliable charging points and electricity infrastructures, and issues around language, print literacy, and familiarity with mobile technology usage [27]. Women also experience particular social risks from men due to owning and using mobile phones [28–30].

Nonetheless, mobile telephony is important to lifelong learning because as people learn how to use the mobile phone, they acquire literacy skills, technology skills, and social skills that they can apply elsewhere. This especially concerns the emergence of large language models like ChatGPT, which is envisioned as providing much greater access to information, interactions, learning, and decision making [18, 31]. A critical feature of this is the learning interface itself. Although always with the risk that an LLM will provide erroneous or false information, the interface allows self-directed and self-paced probing of questions; unclear examples can be tagged as such and alternatives asked for. Examples can be asked for to be solved. Most of all, interpersonal conflicts between teachers and learners are not necessarily marked by problematic cultural dynamics; LLMs are infinitely patient, do not mind repeated questions, and do not have a schedule of curriculum or material they must get through within an

allotted period of time. When this works, it affords access to genuinely relevant information for decision making [32]. It can also translate languages, summarize information, respond to questions, and generate text as probed. Besides the risk of providing false information (which essentially requires the learner to already know the topic in order to spot the error), other learning-context shortcomings include privacy issues, cultural bias around normative assumptions (especially along race), plagiarism, and the ubiquitous risk of all technologies to amplify existing divides [33, 34].

Remaining cognizant of these issues, Artificial Intelligence LLMs like ChatGPT (and other digital forms of learning) enable lifelong learning for agricultural extension services, including adaptation, interactivity, and data analysis of existing content. A key emphasis in adult learning is the requirement to connect any information conveyed to the interests of adult learning; LLMs can directly provide this connection, as its users pose their own questions. As of yet, these interfaces are text-based. In the future, content developers, experts, scientists, and animators could leverage these technologies to build characters, overlay them with human-sounding, locally relevant (indigenous) languages, and afford appealing, visually animated figures and stories that learners can relate to.

Technological challenges would limit the reach of this (due to Internet access rates, data limitations and plans, smartphone availability, and so forth). But a template for such an interface already exists in animated videos by Scientific Animations Without Borders (SAWBO).

Founded in 2011, SAWBO researches, creates, and supports the mass dissemination of educational animations to support Sustainable Development Goal topics, including agricultural food security, personal and community health, improved livelihoods, and reduced poverty. Using visually engaging, locally translated, and culturally appropriate content, SAWBO aims to engage and empower the broadest demographic possible [35, 36]—especially communities spanning diverse languages, educational and literacy levels, socioeconomic status, and cultures. As a systems approach for mass-accessibility to such learning and knowledge content [25], SAWBO's animated video media demonstrate increased learning gains compared to traditional extension teaching, high levels of solution adoption and adaptation, and ready redistribution and sharing, especially through the now most widespread and familiar form of information and communication technology (ICT) access, mobile phones [19, 37–41]. The goal is to provide a maximally accessible and redistributable "menu" of innovations and solutions that people at all scales (from individual change agents to governmental and international global coalitions) can select, adapt, and apply to their local problems [42]. Making this kind of cutting-edge, "just in time" knowledge acquisition possible is critical for twenty-first-century lifelong learning [43–45]. Mobile phone Apps, like WhatsApp, thus become ideal vehicles for enabling lifelong learning [46].

3. Sustainable development goal 4 and lifelong learning

The 2030 Agenda for Sustainable Development describes 17 Sustainable Development Goals (SDGs) adopted by all United Nations member states in 2015. The SDGs provide a shared blueprint for peace and prosperity for people and the planet, now and into the future. Specifically, SDG 4 is "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" [47]. Within the United Nations, UNESCO's Institute for Lifelong Learning (UIL) conducts research,

capacity-building, networking, and publication on lifelong learning with a focus on adult and continuing education, literacy, and non-formal basic education. Lifelong learning has been identified as crucial to the achievement of sustainable development and quality education in the *2030 Agenda for Sustainable Development*. With SDG 4, policymakers have recognized that education must reach beyond the formal institutional arrangements of primary, secondary, and tertiary or higher education to occur continuously throughout life.

While lifelong learning can be a nebulous term [5], when applied or used in policies and practice formulations, it gains clarity. Specifically, SDG 4 must incorporate lifelong learning or risk the SDGs generally:

> While lifelong learning "holds" the high position as SDG 4, adult education is taken off the agenda. Only adult literacy and vocational education are excerpted as clear targets related to adults (and part of the target related to gender equality), which puts at risk the entire SDG agenda, since achieving (in a sustainable way) several other goals does depend on extensive use of adult education [48].

Thus, when lifelong learning and adult education are discussed as foundational issues, they can tend to focus too narrowly on literacy, numeracy, and computer literacy [48]. As such, *Education 2030 for Sustainability*—which would facilitate citizenship education and universal participation in decision making that informs a sustainable world—cannot be attained if adult education and lifelong learning are not robustly understood and pursued [48].

By curating a library of video animations in diverse languages and on diverse topics, SAWBO contributes to the attainment of 16 of 17 SDGs [35], including SDG 4. By providing access to information that empowers solutions to local problems, it preserves indigenous languages and practices, ameliorates recurring, "wicked" problems [42], creates a pathway for partnerships to explore new solutions, and increases forms of access (especially digital ones) to such knowledge for lifelong learning.

3.1 African indigenous knowledge and practices that increase lifelong learning

Education in African traditional societies was already largely a lifelong process that was included in everyday life activities. The purpose of African traditional education was to improve personally persistently, empower individual people to be active members of the community, and form an all-rounded human. Most communities had structures of knowledge and skills that were imparted through lifelong learning, including child-rearing practices, age-grade organizations, initiation ceremonies, apprenticeship systems, and festivals around marriages, births, rituals, and funerals [49].

All over Africa, there exist philosophies, worldviews, and life ways that center on interconnectedness, humanity, and communal harmony while emphasizing individual and community activities and therefore lifelong learning. **Table 1** summarizes some of the most widespread examples.

3.1.1 Palaver

Originating in Portuguese, the word palavra, meaning speech, or word, has evolved to represent intricate discussions, negotiations, or simply engaging in

Practice	Place	Details of philosophy or worldview
Palaver	Akan people of West Africa and other West African people	A communal process of conflict resolution and decision making that involves open dialog and consensus-building
Harambee	East Africa, especially Kenya	Pulling together, making a collective effort, or coming together for a common purpose, often with a focus on community development or social projects
Umuganda	Rwanda	Coming together for a common purpose is to achieve an outcome for the benefit of a person, society, or nation
Ubuntu	Nguni people of Southern Africa	Ubuntu, often translated as "I am because we are," emphasizes interconnectedness, communal identity, and a shared sense of humanity
Omoluabi	Yoruba of Nigeria, West Africa, and the diaspora	Omoluabi is a Yoruba term from Nigeria that conveys the idea of a person of good character or a virtuous individual

Table 1.
Select African life ways.

conversation. In West African cultures, particularly among the Akan people, palaver refers to a communal process of conflict resolution and decision making that involves open dialog and consensus-building. This concept has transcended its linguistic origins to become a symbol of collaborative discourse and community involvement.

As a linguistic anthropological concept, palaver underscores the significance of language in shaping social interactions and reinforcing communal ties. According to Edward Sapir, who emphasized the role of language in mediating social relations [50], through its multifaceted interpretations, palaver encapsulates the essence of communication as a dynamic force in shaping human relationships and societal structures. Most importantly (and like the other terms), palaver does not simply represent a concept or practice but a recognized and shared cultural value that holds force among community members. People who do not act in the spirit of palaver can be guided back to better sociability by invoking the term.

3.1.2 Harambee

Meaning "pulling together," Harambee originates in Swahili and is a term widely recognized across East Africa, especially in Kenya. It signifies a collective effort or coming together for a common purpose, often with a focus on community development or social projects. The concept of Harambee embodies the spirit of unity and collaboration within a community to achieve shared goals.

After Kenyan independence, the first president, Jomo Kenyatta, inspired Kenyans to pull together in the spirit of Harambee. It thus became a rallying cry for collective action and national development. Harambee is still used to invoke the spirit and importance of community engagement and collaboration in addressing social challenges and wicked problems [51].

3.1.3 Umuganda

Umuganda from Kinyarwanda can be translated as "coming together in common purpose to achieve an outcome for the benefit of a person, society, or nation."

In traditional Rwandan culture, members of the community would call upon their family, friends, and neighbors to help them complete tasks, like building a house, a bridge, roads, schools, or churches. Currently, in Rwanda, as part of Umuganda, communal work is often done on the last Saturday of each month, with communities coming together to achieve a variety of public works, including infrastructural development and environmental protection [52].

Umuganda is further informed by the history of Rwanda. It emerged from the effects of the 1994 Genocide, in which thousands were killed and displaced. Umuganda has been used as part of the efforts to reconstruct Rwanda and nurture a shared national identity and togetherness. Umuganda reflects Rwanda's commitment to community development and social cohesion, especially in enhancing national unity. During the Umuganda day, most public activities or services are closed so communities can engage in activities like construction, cleaning, and digging drainage ditches and trenches. These embody a collective bid to make Rwanda better. In this way, Umuganda represents a traditional cultural initiative to transform Rwanda [53].

3.1.4 Ubuntu

The best-known of these terms outside of Africa, thanks to Desmond Tutu's invocation of it in post-Apartheid South Africa [54], Ubuntu, meaning humanism or humanness, is memorialized in the Nguni community saying, "umuntu ngumuntu ngabantu," frequently translated to "I am because we are" [55], "We are, therefore, I am," and "I am because we are; since we are, therefore I am" [55]. This philosophical and cultural concept, deeply rooted in many African traditions, holds significant potential for enhancing adult learning and lifelong learning experiences. Ubuntu emphasizes interconnectedness, intersubjectivity, communal identity, and a shared sense of humanity. This philosophy aligns with the principles of social constructivism, suggesting that learning is a socially mediated process that occurs through interaction with others [56]. In the context of adult learning, the Ubuntu philosophy promotes a collaborative and communal approach, fostering a supportive environment where individuals collectively engage in the learning process.

Embracing Ubuntu principles can contribute to transformative and emancipatory adult education, emphasizing the role of dialog, inclusivity, and collective knowledge construction [57]. For lifelong learning, Ubuntu encourages a holistic view of education, where individual people are not isolated learners but active participants in a broader social and cultural context. This resonates with the idea of lifelong learning as a continuous, socially embedded process [3]. Incorporating Ubuntu into adult and lifelong learning practices entails recognizing the interconnectedness of learners, valuing diverse perspectives, and creating collaborative learning communities. By embracing Ubuntu principles, educators can cultivate environments that support the ongoing development of individuals within a broader community, aligning with the essence of both adult and lifelong learning.

3.1.5 Omoluabi

Omoluabi is a Yoruban term from Nigeria that conveys the idea of a person of good character or a virtuous individual; it resonates with the Yiddish sense of what it means to be a *mensch* [58]. Hence, this value is deeply rooted in Yoruban philosophy and emphasizes the importance of moral values, integrity, and social responsibility [59].

Among the Yoruba, an Omoluabi is someone who exhibits qualities such as honesty, respect, humility, and compassion. The term extends beyond personal conduct to encompass a broader societal ethic, promoting the idea that individuals contribute to the overall well-being of the community. Omoluabi reflects the cultural values and ethical principles that guide interpersonal relationships and community cohesion in Yoruba society [60].

As with palaver, the point of the term is not simply to acknowledge valorized traits of a person, like the English acknowledgment *he is a good guy.* The word possesses socially corrective force, as does Ubuntu. One can say, "That's not Ubuntu" or "that's not omoluabi" as a corrective to unvalorized social behavior.

3.1.6 Lifelong learning

While each of these philosophical and cultural concepts offer unique insights that resonate with their setting, they also inform adult lifelong learning. Rooted in African communalism, they emphasize the interconnectedness of individuals and community knowledge, as well as the importance of dialog and idea improvement for resolving conflicts, fostering understanding and social ability, and aligning with the cooperative/collaborative nature of adult learning environments generally.

Focusing on collective efforts and community development, Harambee reflects the idea that adult learners can benefit from collaborative initiatives, sharing knowledge and experiences to enhance their learning journeys. Omoluabi's emphasis on virtuous character and ethical values aligns with the personal and ethical development aspects of lifelong learning, promoting continuous growth and reflection. Similarly, Umuganda, with its monthly community service day, underscores the importance of civic engagement and the application of knowledge for the greater good, reinforcing the notion that learning is a lifelong process with ongoing opportunities for individuals to contribute positively to their communities. Together, these concepts underscore the cultural richness and communal perspectives that can inform and enrich adult learning experiences and the broader framework of lifelong learning.

Harambee and Umuganda are relatively similar because they aim to strengthen and build nationhood. They are anchored in the histories and national contests aiming at rallying citizens to embrace nationhood. These practices aim for joint effort, mutual assistance, social responsibility, and community self-reliance [52]. They reflect an assumption, largely absent in "individualistic" societies, that the health of the community and everyone generally requires the participation of its members [61].

Although it must happen (like elsewhere) that politicians, governments, and other public figures can co-opt the public spirit of these social values for self-serving ends, the key difference turns on the acceptance of a community, public, or even national destiny. As Agassi [62] stresses about individualism as a philosophy, it reflects a "basic (nominalist) assumption that only individuals (entities with aims) exist, not social wholes (societies and social institutions) ... *All versions of individualism share the denial that societies have aims or destinies*" ([62], emphasis added). The African life ways described here do not share this individualistic denial of social wholes. Consequently, the practice of lifelong learning involves not only *personal* improvement but also greater knowledge for the sake of others and the social whole in its entirety. Neither is this strictly selfless or self-sacrificing; because "I am because others are," the well-being of individual people is reflected in and through the well-being of others.

4. Case study of WhatsApp groups in Kenya

For the past 3 years, a WhatsApp group in Kenya established as part of a knowledge-dissemination grant for food security and COVID-19 prevention has continued to operate beyond the formal end of the grant. The WhatsApp group has since emerged as a site where group members exchange information, dialog with one another, share and repost animated videos, and participate in the virtual life of the space. Currently, the Kenyan WhatsApp network has expanded to all 47 counties in Kenya, with at least 250 members disseminating curated and self-selected SAWBO animated educational content to their communities, learning from and forming relationships (both actual and virtual) with one another, asking questions, sharing their experiences, and deepening their knowledge and skills.

The WhatsApp group in Kenya can be understood as a virtual community of practice for lifelong learning. Communities of practice (CPs) are groups of people who share a concern, a set of problems, or a passion about a topic and who deepen their knowledge and expertise by interacting on an ongoing basis [63]. Lave and Wenger have emphasized the social aspects of learning, arguing that learning is inherently situated within social contexts and is a process of engagement in a community of practice [63, 64]. Communities of practice are essential for facilitating learning and knowledge sharing within organizations [64, 65]. They provide a space for individual people to exchange ideas, collaborate on projects, and develop shared understanding and expertise. By participating in communities of practice, WhatsApp group members not only learn from one another and contribute to the collective knowledge of the group but experience transformative learning as well.

Communities of practice are more structured, intentional groups that bring together individuals with a shared interest or profession. In agriculture, CPs may consist of farmers, researchers, agricultural experts, and policymakers who collaborate to enhance their collective knowledge and expertise. These communities promote a deeper understanding of agricultural practices through sustained interaction, shared resources, and collaborative problem-solving. Communities of Practice in agriculture may extend beyond virtual platforms to include face-to-face meetings, workshops, and field visits. The collaborative nature of CPs fosters a sense of belonging and shared identity among participants, leading to the development of a collective intelligence that benefits the entire community.

WhatsApp groups are suitable as virtual communities of practice because they afford the crucial elements for fostering collaborative learning, knowledge sharing, and community engagement within the agricultural sector, germane to lifelong learning in Kenya. These platforms serve as innovative tools to connect farmers, agricultural extension workers, researchers, and other stakeholders, promoting effective communication and the dissemination of valuable information.

The WhatsApp group's knowledge manager—a native Kenyan—moderates and facilitates the group. In this role, he ensures that discussions are focused, respectful, and inclusive. He guides the group and ensures that they focus on the learning objective [66]. He also shares resources for learning such as videos, blogs, and still photos of video animations to enhance the learning experiences. He also responds to questions and looks for other videos to provide supplementary information where needed.

The knowledge manager's significant role is to encourage the farmers to solve problems. Members seek advice for the problem they face on their farms, and they receive feedback from members of the group or the knowledge manager provides solutions where the collective does not respond [67]. He does this by providing other

videos to be watched from the library of videos and sharing solutions from his vast experience.

The knowledge manager continuously welcomes participants, adds them to the group, trains them on how to use the videos, and shares them. He shares the group guidelines and checks on them to ensure that they fit into the group. In some cases, he removes members who do not adhere to the group guidelines. There are instances where he deletes some information that is shared on the platform, especially if it is political or not related to the goal of the group.

4.1 Successes and challenges of WhatsApp groups for lifelong learning

As discussed above, one can glean that WhatsApp groups, when functioning as communities of practice, are a viable tool for providing proxy extension services to farmers, fostering a lifelong learning culture, and contributing to the resilience and sustainability of agricultural practices in a group. This is consistent with research examining the role of WhatsApp groups in supporting lifelong learning initiatives [46, 68, 69]. WhatsApp groups are germane to informal and community-based learning because they enable individual people to access knowledge instantly, connect with others, and be involved in problem-solving. Social media like WhatsApp are playing a vital role in democratizing learning and attaining lifelong learning [70].

WhatsApp groups in agriculture have gained prominence as dynamic spaces for real-time communication and collaboration. Farmers join these groups to find information, share their experiences, seek advice, and market their products. This encourages peer-to-peer learning and acts as an extension service where there is otherwise none. Agricultural extension service officers leverage WhatsApp groups to provide expert advice, conduct training, and visit farmers virtually. Such customized and instant communication enables farmers to get the feedback they need for decision making [70].

WhatsApp groups have become instrumental in facilitating adult learning in the agricultural sector in Kenya [70]. In the context of lifelong learning—specifically informal and community-based learning—these groups serve as dynamic platforms for knowledge exchange, skill development, and collaborative problem-solving. WhatsApp groups can enable agents to share valuable insights, exchange best practices, and collectively address challenges faced in the field [70]. Research identifies the primary characteristics of social media, which include ease of use, usefulness, credibility, flexibility and Internet availability [70]. Additionally, when using mobile applications for disseminating agricultural information, usability attributes increase solution adoption [70, 71]. This collaborative approach to learning through WhatsApp groups operates in tandem with the principles of adult education, metacognition, experiential learning, and peer interaction.

4.1.1 Successes

WhatsApp has affordances for lifelong learning such as information, knowledge sharing, resources, and collaboration while allowing the growth of a virtual community. The WhatsApp group has provided a platform for informal learning communities consistent with a (virtual) community of practice. These communities can increase learning from each other, mentorship, collaboration among members, and creation of friendships. These groups also are an available tool for lifelong learning because the farmer can access video animations on an as-need, just-in-time basis and engage in discussions with farmers from all over the country, doing away with the need to physically meet.

While WhatsApp may not be a traditional learning platform, its versatility and widespread adoption make it a valuable tool for lifelong learning, particularly in informal or community-based learning contexts. By leveraging its strengths and addressing its limitations, educators and learners can harness its potential to enhance learning experiences and foster continuous personal growth. The Kenya WhatsApp group continues to be a space for farmers to learn from each other and share information that they would not access.

In particular, farmers have grappled with "understanding whether the information shared via YouTube videos is retained and/or knowledge transferred, and/or acted upon appropriately by recipients more precisely, that the knowledge is absorbed and that the videos contribute to knowledge and human progress" [72]. WhatsApp groups have become a virtual space where farmers who use SAWBO animations can provide evidence in the form of photos and narratives about how they are using their videos and implementing what they learn. Admittedly, empirical studies have not been carried out to provide robust data about the narratives. From evidence from the Kenya WhatsApp shared video animations, some SDGs are being addressed. **Table 2** summarizes the videos and their related SDGs.

4.1.2 Challenges

The challenges of WhatsApp for learning involve the technical and social limitations of its affordance. Technically, this involves its menu of features, i.e., text-based

Video animation topic	Description of the video animation	Related Sustainable Development Goals
The jerrycan technique	This animation explains how to avoid insect damage when storing beans and other legumes after harvest for a long period using the jerrycan method.	Goal 1: Reduce poverty Goal 2: Zero hunger Goal 3: Good health and well-being
The Purdue Improve Crops Storage Bag (PICS Bag) video	Purdue Improved Crop Storage bags provide a simple, low-cost method of reducing post-harvest legume losses due to bruchid infestations	Goal 4: Quality education Goal 5 Gender Goal 10: Reduced inequality
Sweet Potato Roots for Timely Planting Material: The Triple S Method on How to Prepare and Store Roots	This animation explains the steps in preparing and storing root vegetables.	Goal 12: Ensure responsible consumption and production
How to Identify and Scout for Fall Armyworm	The Fall Armyworm is an insect that can damage your maize plants or even cause you to lose your whole maize crop. The best way to protect your maize crop is to scout early and treat early. In this animation, we will explain how to scout for the fall armyworm, so you can take action to protect your crop and yourself and family.	Goal 17: Partnerships for the goals
The Newcastle disease video	This video points to the spread of Newcastle disease in chicken, how it spreads, the signs and symptoms in chicken, and how to keep them healthy for nutritious food.	

Table 2.
Video animation topics and SDG.

conversations, downloading of videos, video calls (non-text-based communication), posting and forwarding of messages and photos, videos, and PowerPoint slides. It does not provide any assessment tools or nuanced ways of tracking learning. Unless a group is intentional in using WhatsApp as a tool for learning and therefore provides housekeeping rules that maintain an ambiance of learning, there are high chances of not benefiting as robustly from the shared group as an information sharing or other type of learning space. The same can be said about leveraging indigenous philosophy; indeed, it remains unclear whether the relatively anonymous WhatsApp environment supports or inhibits the kinds of sociability that Ubuntu and other lifeways can foster in offline, face-to-face interactions.

Additionally, tension exists around moderating content to remain focused on the group's goal and members utilizing the platform for other purposes. This can also lead to silence or non-participation by some members and a general lack of deep conversations. In this WhatsApp group, the knowledge manager is also the administrator and ensures that the group does not post information that is not related to the group's purpose. Still, there are times when the information shared is about accessing markets for farm products and not focusing on the video animations shared or agriculture-related discussion.

Timing plays a role as well. WhatsApp group accounts can be bombarded with messages and content at certain hours of the day or sporadically, allowing little or no control or management and information overload on the part of the group participants. This can prevent learners from maintaining a threaded discussion and reviewing relevant videos or messages. Also, as already noted generally, the use of WhatsApp on smartphones involves data bundles or credits, reliable electricity infrastructures, and access to the Internet. Women can (wisely) resist disclosing information, with some not participating as robustly in anticipation of harassment from males. Consistent with other research, these factors can exacerbate digital divides.

Similar to face-to-face social interactions, where some people dominate the group, certain members of the groups dominate conversations or post messages more often than others. In the Kenya WhatsApp group, men tend to dominate the conversation and post information more than women. This could be cultural, given that men are afforded more voice than women and have more availability of time, social status, and access to funds for buying credit. There are cases where farmers who are outgoing and confident share their thoughts and opinions about their experiences in agriculture freely, thus contributing more frequently. The group administrator counteracts this by attempting to diversify the voices of the members, introducing new videos or information about agriculture, and referring members back to the goals and guidelines of communication of the group.

5. Conclusion

This chapter explores how video animations shared via WhatsApp groups can enhance lifelong learning among smallholder farmers in Kenya. It highlights the shift toward dynamic and continuous learning in modern society, driven by the demands of a knowledge-based economy and technological advancements. Lifelong learning is presented as essential for personal development, career advancement, and societal welfare, emphasizing the importance of adapting to new challenges and opportunities throughout one's life.

The case study focuses on the use of video animations produced by Scientific Animations Without Borders (SAWBO) to facilitate learning in agricultural practices. These animations, shared in WhatsApp groups, serve as an innovative tool for knowledge dissemination, particularly beneficial for communities with low literacy and limited access to traditional educational resources. Such efforts are enhanced by the presence and integration of African philosophies like Palaver, Harambee, Umuganda, Ubuntu, and Omoluabi, which value communal harmony and collective effort as part of lifelong learning practices. These philosophies underscore the importance of community and collective learning in African contexts.

Going forward, the challenges and successes of WhatsApp groups for lifelong learning include the creation of just-in-time virtual communities of practice that foster knowledge sharing, collaboration, and real-time communication. Challenges involve technical limitations of the interface, moderation issues, and the reproduction of existing digital divides along gendered and socioeconomic axes.

In general, the expanding knowledge economy demands leveraging technology, like mobile applications like WhatsApp, and in the future, artificial intelligence in conjunction with indigenous knowledge and practices to keep pace with that expansion and ensure lifelong learning and the attainment of Sustainable Development Goals in agricultural communities are achieved.

Conflict of interest

The authors declare no conflict of interest.

Author details

Anne Namatsi Lutomia[1,2]* and Julia Bello-Bravo[2]

1 Department of Entomology, Purdue University, West Lafayette, IN, United States

2 Department of Agricultural Science Education and Communication, Purdue University, West Lafayette, IN, United States

*Address all correspondence to: alutomia@purdue.edu

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Section 3

Ethical and Socioemotional Skills in Future Education

Chapter 5

Perspective Chapter: Inclusive Ethics as a Key Competence for Teachers in the Embodied Cognition Perspective

Paola Damiani, Davide Brancato and Filippo Gomez Paloma

Abstract

The chapter explores a central theme for future world education: ethics as the essence and necessity of teacher education in the perspective of long-life learning. Particularly, the assumption of the idea of ethics as a scientific, natural, and humanistic dimension, as well as a valuable and political one, is consistent with the embodied cognition approach and the "embodied-based" training models aimed at the development of life—soft skills. In this sense, it is possible to identify the construct of ethical competence as an essential competence underpinning inclusive professionals and teachers in primes. A priority objective is, therefore, to provide a scientific definition of ethical competence and to operationalize it through the implementation of embodied cognition-based approaches and strategies. In addition to the definition of the theoretical framework, the chapter will also present the findings of a preliminary survey examining various dimensions of ethical competence among teachers in training at specialization courses for support activities in four Italian universities, aimed at designing training courses for their development and implementation.

Keywords: ethic, ethical competence, inclusive education, teachers' training, embodied cognition, intersubjectivity, sense of justice

1. Introduction

The challenges of globalization are inherently ethical and political in nature. Equity is a moral principle, but it is also a principle of strategic rationality for the "good functioning" of professionals and contexts [1].

The issues of ethics, morality, equity, and inclusion have been variously investigated and universally recognized as a priority for the sustainable development of current and future society [2]; however, at both conceptual and application levels, significant gaps and critical issues are present.

From a formal point of view, the "necessity of ethics" is interpreted and declined from different angles and all of them highlight the close interconnection of ethics with the abovementioned concepts. In the educational and care professions, the ethical issue, when addressed, is predominantly associated with the topic of professional profile and code of ethics; however, even for professions for which ethical competence has long been codified as an essential aspect of the profile, as in the case of nurses, and a *condictio sine non*e of nursing practice, there is no consensus in the literature on its definition [3].

As far as teachers are concerned, the need for a specific code of ethics becomes evident in an era of great social and technological change [4] and of new and increasingly complex educational challenges [5, 6]. Unfortunately, this awareness does not seem to be present in a systematic and operational way in all countries. "Despite efforts to recruit and retain enough skilled VET (Vocational Education and Training) teachers, challenges persist. Many OECD (Organization of Economic Cooperation and Development) countries have significant VET teacher shortages, partially due to the limited attractiveness of the profession (...). Digitalization, automation, and the transition to greener economies affect the skills needed in the labor market, and therefore also the skills required from VET (Vocational Education and Training) teachers and trainers. In this context, VET teachers need to keep abreast of changes to be able to teach and train their students effectively [7]. The in-service training of teachers needs to be adjusted to those new requirements by including the necessary technical and pedagogical competencies" [6]. Particularly, the global challenge concerns the need to improve the quality of schools starting from the quality of their teachers, through co-development (people and contexts) in the inclusive direction [2].

A unique situation is the Italian one, for which, in the face of a recognized tradition of avant-garde in the field of integration and school inclusion; unlike many other European and world realities, no real code of ethics for teachers has ever been issued by the Ministry of Education. This is an anomaly that contrasts with the high degree of professionalism and competence required of an indispensable function, such as that of the teacher [4]. In fact, despite the absence of an institutional document, there are numerous bodies (local, public, and private entities, teachers', and managers' associations), studies, and experiences that affirm the centrality of ethics as a value and as a compass to guarantee the quality of schools, teachers, and inclusive education.

As highlighted by UNESCO's IIEP (International Institute for Educational Planning),[1] codes are being developed in an increasing number of countries either by an autonomous body, as in Hong Kong, or by teacher organizations themselves, as in the province of Ontario in Canada. Research has shown that teacher codes can be an effective instrument for promoting ethics in education [8].

This is a process initiated in the last two decades that testifies to the growing attention to the more complex and deeper dimensions, often of an implicit nature, that contribute to the development of global competencies—technical and personal—[9], which are closely related to the ethical, empathic, and inclusive behavior and attitudes of teachers [10–14]. Indeed, "plans for improving the quality of education often focus on quantitative data such as learning time, class size, physical infrastructure and facilities, teaching and learning materials and qualification of teachers, rather than

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[1] IIEP Unesco - Etico | Platform on ethics and corruption in education.

on "intangible inputs", such as the commitment of teachers and other staff to their profession, their capacity to help every pupil reach his or her potential, and their ethical and professional behavior and responsible judgment. Such factors are nevertheless critical in providing quality education for all, as well as fostering universal values such as honesty, integrity, and citizenship. To increase the professionalization of teachers and other staff, countries have developed professional codes of conduct in the education sector, in addition to the general statutory rules in force for all members of the public service [2]. These codes are considered as a cornerstone of quality teaching and work toward excellence in education in several ways: "by building better teaching and learning environments, they can improve the quality of classroom teaching-learning interaction, while helping curb misconduct; by promoting ethics, they can make sure that common values are shared by all citizens. In most countries, such codes exist in one form or another; as a clearly formulated code, a set of regulatory texts, laws, regulations, statutes, directives, implicit rules, and so on. In some others, they still need to be introduced at the national level (or at regional or provincial levels, in the case of federal systems)" [2] (Ib.).

However, their implementation sometimes proves difficult due to—among other variables—limited access, unclear content, and inadequate teacher training, as shown in IIEP's research in Canada and South Asia [8]. Research shows that even in countries where there is a code of ethics for teachers, their impact is sometimes questionable due to a variety of factors such as limited access to the code or lack of awareness of its existence, difficulties in understanding it, inadequate education for teachers, lack of capacity for its enforcement, a lack of knowledge about procedures for lodging complaints, etc. [15]. In 2009, the IIEP developed guidelines describing all stages of code development. Specifically, the guidelines have been prepared to guide countries on how to successfully design a code (or review an existing code); make it into a functional tool that will contribute effectively to the regulation of staff (and more specifically, teachers' conduct at school level); and help countries put in place the appropriate mechanisms to ensure the proper dissemination, application, and monitoring of the code at all levels of the system (including its integration into teachers' education and professional development).[2]

What emerges is a general difficulty, a gap between what is stated in the documents and the behavior and attitudes implemented by professionals, in terms of ethical, empathic, and inclusive capacities and their impact on the context. In this scenario, albeit dynamic and varied, the recognition of the "necessity of ethics" for teachers is reaffirmed, which must reckon with the realization of a difficulty in its concretization and the inadequacy of codes and policies to regulate and codify ethical standards and conduct, albeit necessary.

In the sector's literature, in ethical codes and codes of conduct, and in international institutional documents, some common principles-values recur that, translated into behavior and attitudes, must characterize teachers: dignity (as respect for humanity and human rights);, truthfulness (one of the core values in teachers' basic task, which involves steering learners in navigating life and their environment), honesty (with oneself and others and mutual respect in all communication is a basic aspect of teachers' work), fairness (involves, in particular, promoting equality and nondiscrimination and avoiding favoritism), equity (necessary for inclusive

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[2] Muriel Poisson 'Ethics and Corruption in Education'. International Institute for Educational Planning".

teaching), responsibility and caring, helpfulness and cooperation, and understanding.[3] In general, the aim of teachers' ethical principles is to draw attention to the ethics involved in teaching [15] (Ib.).

The reference to the teaching process and didactics highlights the strong intertwining between personal ethics and the profession, between the cultural and value dimension, and the political and technical-practical dimension, which in the case of teachers are almost inseparable.

The core of teaching consists of four basic values: dignity, truthfulness, fairness, and responsibility and freedom. All teaching is founded on ethics, whether it be the teacher-student relationship, pluralism, or a teacher's relationship with their work teacher's values and ethical principles [16].

In this sense, the use of the construct of "ethical competence" seems capable of understanding and describing such complexity. Reference is often made to soft skills in documents and scientific articles on teacher ethics, although the boundaries between the different constructs are complex and blurred. "Soft skills, especially ethics, moral, and professional skill, play an important role in sharpening individual's excellent personality by complementing his/her hard skills to the teacher communities" [17].

We are aware that, upstream, the very definitions of ethics and competence are critical (as with all broad concepts); however, even if we are faced with definitional problems due to the intrinsic complexity of our object of investigation, what we can clearly affirm is the need to treat ethics as an element characterizing the profile of teachers, as an essential competence of their profession and as a priority theme for targeted and effective training.

The complicated nature of teaching, in both practice and preparation, encourages teacher educators to explore the complexity of the novice teachers' experiences and identify the concerns they face in their induction year [17] (Ib.).

In the literature, there are studies and attempts to define the complex construct of ethical competence. In the Italo-speaking area, for example, a distinction is made between ethical capacity and ethical competence, highlighting the existential nature of the first as the foundation of the political-professional dimension of the second. Ethical capacity concerns a teacher's action that involves the person in a unitary manner, linking his being to his should-be knowledge to knowhow, individual and relational behavior, emotional attitudes, and finally value choices [18]. The close relationship between ethics, morality, and deontology re-emerges. "The choice that will take shape in the decision must be governed by ethical modalities and oriented by deontology so that the decision itself is rationally oriented to the good for the other" [19]. One speaks in this case of moral decision [20] that tends toward a paradigmatic and operational synthesis distinct in content and field of application on the problematic plane of reality [20] (ib.).

The reference to problematic concerns first and foremost the dilemmas, choices, and uncertainties associated with the relational dimension that characterizes the teaching profession, which requires constant confrontation with one's values, beliefs, and attitudes. "This conflict concerns the totality of the relationships that see pupils and colleagues in the foreground and extend toward families and school institutions [21–23]. Ultimately, a teacher's ethical capacity is precisely the capacity for ethical and deontological decision-making. To decide in the deontological sphere is to

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[3] Teacher's values and ethical principles (oaj.fi).

assume a professional duty, that is to recognize the moral case and set up a rational framework through ethical deliberation in both the content and implementation of his decision" [18].

Ethical competence must, therefore, be understood as an integral part of the teacher's competences since the aspects that characterize the teacher's teaching in relation to other professions are first and foremost the vulnerability and dependence of the subjects in front of them [24]. As Bourdoncle [25] also states, the profession-alization of teachers has a focus on the moral perspective as a distinctive dimension of the teaching profession [26]. Moreover, Fenstermacher [27] highlights among the aspects in which teaching differs from other professions, the function of power that the teacher exercises over the pupil to realize that helping relationship that underlies pedagogical principles.

This aspect concerns the reciprocity of the relationships underlying the expected results. These are not insignificant differences if one considers the double task of teachers as moral agents, that is to behave morally and to train pupils morally. This is indeed a critical key point as it indicates the level of complexity/difficulty for the professional, but also the potential in terms of the teachers' role as a formative and transformative resource. We refer here to the possibility of a reinterpretation of these aspects characterizing ethical competence in the light of embodied cognition; an embodied-based research and training approach can in fact provide a valuable lever to understand and support the deep and complex personal and relational dimensions of teachers that are mirrored in students see, for example, the construct of *Mirror Competences*, [28, 29] and that underpin the possibility of concretizing the "need for ethics" in the everyday reality of schooling.

The track to be taken to support the development of teachers' ethical competences and ethical school contexts requires an investment in teachers' profound formative and transformative processes, which must necessarily accompany the enactment of ethical codes. In short, it is also necessary to invest in another direction of the need for ethics, a direction that explores and enhances the origin and foundational dimensions of ethics in its existential scope.

2. Beyond deontological codes: an approach consistent with the pedagogical perspective and the embodied cognition (EC) approach

As *Vito* Mancuso states in a recent work dedicated to "ethics for difficult days," ethics does not and cannot have a strong and absolute foundation to safeguard its freedom as an unavoidable condition (for its "intrinsic ethicality.") In the absence of freedom, in fact, one remains in the sphere of law and its imposing cogency; ethics based on freedom (hence value and not hetero-imposed regulation) is in turn lack-ing an absolute foundation. At the same time, it is important to note what the author emphasizes: the fact that ethics cannot have an absolute foundation does not mean that it is totally at the mercy of arbitrariness, because a foundation, albeit in the form of a modest floor and not an indestructible rocky foundation, can neverthe-less be found. And the result is a foundation so peculiar that theoretical weakness is matched by considerable existential strength' [30]. In Mancuso's perspective, ethics cannot attain the security that comes from the heteronomous ethics of faith, nor can it aspire to the absolute foundation that comes from incontrovertible reasoning; but, at the same time, it is not left at the mercy of the waves of perplexity and arbitrari-ness. Ethics as freedom can obtain a threefold foundation on the basis of three solid

arguments: the phenomenology of human civilization (which defines the universality of ethics: there is no humanity or civilization that does not know it and does not have its precepts in this regard), the logic of physical reality (the concept of ethics, even before having to be, indicates being), and the peculiar esthetic dimension that coincides with personal sensitivity.

The practice of ethics is the condition for each of us to be truly and authentically human. The highlighting of the "existential robustness" of ethics [30] (ib.), outlines a kind of ontology of ethics, which defines and substantiates the ontological necessity of ethics that we have affirmed so far.

This is a very interesting perspective for reflection about ethics in relation to teachers and teaching since it is functional and consistent with the current inclusive pedagogical perspective assumed by training and education systems at the transnational level, which, as we have seen, recognize ethics as a secular and universal value placed at the center of professional profiles and codes. Ethics represents an "alternative way to the way of power and oppression" [30] (ib.); a conceptualization that is useful in overcoming the logic of the strong and ableism in school, training, and work contexts. In this sense, it is possible to identify ethical competence as a necessary and essential competence for inclusive professionals and inclusive education [31].

Moreover, the idea of ethics as a scientific, natural, and humanistic dimension, as well as a value and political one, is consistent with the embodied cognition (EC) approach and the "embodied-based" training approaches aimed at the development of life—soft skills [28, 29]. Going back to Mancuso's model, the three foundations outlined can be harmonized with each other, although, according to the author, the third of these, the esthetic way, is the most congenial because of its connection to the essential dimension of life, to being, to the soul.

Taking our point of view, we share the relevance of the existential esthetic dimension of the argumentation about the human condition as the foundation of ethics (the ethical question is nourished by love, bonding, and beauty that is relational care, intersubjectivity); however, we would also like to highlight the poignancy and closeness of the embodied cognition perspective (and in particular our studies and research on inclusive skills and teacher training) in the second foundation identified by Mancuso, the physical-natural one, which is closely connected to the third (esthetics). "Ethics expresses at the interpersonal level the same logic of bodily health at the individual level. This logic of health is called homeostasis, which indicates a dynamic equilibrium from which we can see that living means carrying out a series of operations and exchanges (...); the logic of biology also presides over ethics and consists in a question of respect and the application of rules (...); the logic at the basis of our formation following the encounter of the germ cells of our parents is the same logic that, as adults, must guide our free conscience in orienting ourselves and acting consciously in the world" [30] (ib.).

Within this perspective also lies the idea of the need for in-depth teacher training in embodied relational ethics, in the intersection of phenomenological aspects, the body, social interaction, and esthetics. A training that should not replace, but rather accompany, the production and knowledge of ethical codes on a macro-institutional level, but which is on another formative level—transformative, global personal, acting on the profound change of attitudes and behavior in professionals.

The embodied cognition approach, due to its characteristics, focuses on the second way and stresses the relationship between the body and social interaction as a founding dimension of ethics. As Caruana and Borghi [32] point out, despite the flourishing

of multiple versions and interpretations of embodied cognition, two cornerstones are shared by all the "new mind scientists;" the rejection of the "mental sandwich" metaphor (for overcoming the idea of a clear cut between perception and action and cognitive processes) and the rejection of the computer metaphor (for overcoming the idea of a clear cut between mind-body-environment).

Any explanation of our cognitive processes must necessarily also consider the body and the environment, including the social environment, that surrounds us [30]. The idea of any mental representation, even the moral and ethical representation underlying the understanding of everyday ethical dilemmas and the responsibility of choice, must be rethought in its embodied and relational dimension.

3. Research training with "inclusion specialists" teachers

As we have seen, the practice of ethics is the condition for each one of us to be truly and authentically human [30] (ib.) and is the basis of the expected behaviors in teachers' profiles; in this sense, in view of the shortcomings and criticalities noted in the first paragraph, we intend to think and design actions and paths to support the development of an authentic and effective practice, which is consistent with the idea of ethics shared above.

Assuming the model of ethics as an ontological necessity, we can identify its essential-existential foundational dimensions as priority tracks for the development of an ethical essence/skill, as a constitutive aspect of ethical competence.

Our summit focuses on certain tracks and dimensions of ethics that are consistent with the embodied cognition perspective and, for this reason, does not claim to be exhaustive. We will focus on the second and third foundational dimensions: the logic of physical reality and the esthetic dimension. The former is based on the body's natural logic of creating bonds and places the interpersonal dimension at the center. In the perspective of embodied cognition, the construct of intersubjectivity, declined as a "natural but also biological and social" element, can be understood as a kind of embodied root (nature, environment, body) of a characteristic aspect of ethics. The second foundational dimension recalls the embodied dimensions of the sense of beauty, taste, and justice.

We have already pointed out how ethical competence, understood in this way, is at the basis of the better known and broader "inclusive competence" and, in this sense, constitutes a fundamental and necessary element of professionalism for all teachers since all teachers are and must be "inclusive teachers."

In order to start exploring the dimensions characterizing ethical competence, the object of our work, we chose a "privileged/priority" target represented by teachers specializing and/or specializing in support activities for pupils with disabilities, as "inclusion specialist teachers."

Specifically, we administered the initial questionnaire (Annex A) to the trainees of the one-year specialization course provided by the Italian Ministry of Education, who, despite the variety of their legal positions (some are already specialized teachers, others are teachers working on support activities but without a specialization qualification, others are curricular teachers, others have only occasional teaching experience), share a basic cultural motivation and a highly qualified training course on inclusion issues.

This preliminary investigation will be followed by the construction of a research-training design, broad and general, addressed to all in-service teachers, aimed at developing and enhancing the dimensions explored.

3.1 The constructs: intersubjectivity and sense of justice in the light of EC

In recent years, the literature has produced studies and research on the theme of intersubjectivity, according to a broadened perspective that, starting with the approaches of infant psychoanalysis and neuroscience, has gradually involved various scientific and disciplinary fields. Intersubjectivity has taken neuroscience, more than any other topic, out of the laboratories of neuroscientists and into those of philosophers, psychiatrists, sociologists, and linguists, as well as into theaters and novels [32] and into schools. A work dated 2018 [33] proposes a review of the literature on the dynamics of intersubjectivity in primary and secondary schools, in which it is stated that the concept is considered relevant in education, to enhance different types of collaborative learning situations and to improve instructional design.

The discovery of mirror neurons gives us a new empirically based notion of inter-subjectivity, mainly characterized as inter-corporeity. As Gallese [34] states, neuro-science has begun to investigate domains such as intersubjectivity, the self, empathy, decision-making, ethics, esthetics, economics, etc., opening a series of questions about the permissibility and/or capacity of cognitive neuroscience to shed new light on characteristic aspects of human subjectivity such as art, creativity and esthet-ics, and politics (p. 9). This interest has made a "phenomelogization" of neuroscience and the redefinition of the meaning of intersubjectivity desirable to avoid spurious and reductionist views and has led to the new scientific approach to the study of the human condition that starts from the study of the bodily dimension of cognition (the Embodied Cognition approach). In this field, the problem of the subject now sees the convergence of phenomenological and neuroscientific perspectives [34]. "Starting from an analysis of experience and the role that the living body plays in the constitu-tion of our experience of things and of others can allow an empirical study of the genetic aspects of subjectivity and intersubjectivity on a new basis compared to those adopted so far by classical cognitivism, that is, without eliminating the first-person aspects of experience. Francisco Varela had sensed a similar possibility and started a course of analysis in this direction [34, 35]. In redefining the dialectic between subjectivity and intersubjectivity, a new explanation of the origin and foundational nature of the latter (being as being with) emerges.

The discovery of mirror neurons made it possible to derive—at the level of sub-personal description—subjectivity from intersubjectivity (man is the result of being with and not the other way around) and delivered an empirically grounded notion of intersubjectivity, connoted first and foremost as inter-corporeity—the mutual resonance of intentionally meaningful sensorimotor behavior.

"The ability to understand others as intentional agents, far from depending exclu-sively on mentalistic-linguistic skills, is highly dependent on the relational nature of action (…). Inter-corporeity, thus, becomes the main source of our knowledge of others. Action does not exhaust the rich store of experience involved in interpersonal relation-ships" [34] (ib.). Inter-corporeality is the basic level of intersubjectivity; the body is the priority and the non-further reducible of experience. We reuse our mental states or processes represented in corporeal format to functionally attribute them to others [36].

According to neuroscientists, mirror activity is modulated by the personal experi-ence of the observer, and the mechanism reflects something deeper than simple muscular movement. This explains the congruence between personal ability and observed action. Furthermore, recent studies suggest that in addition to being at

the basis of forms of motor resonance, the mirror mechanism is activated when we observe complementary actions, allowing us to anticipate the possible actions of others and to prepare ourselves to respond appropriately [37, 38]. Jannerod [39] asserted that without the involvement of the motor system, visual perception, as well as auditory perception [40], would only provide a description of the sensory aspects of movement and would not give any information on the components of the action that are instead essential to understand the purpose and to be able to reproduce it [32]. Embodied simulation plays an essential role in social interaction [24, 41].

We have already highlighted how the embodiment perspective changes the conception of thought and mental representations. Understanding becomes something broader than a mere exercise in abstraction; the contents of our mental representations are inconceivable apart from our corporeality. "We can undoubtedly use forms of representation that utilize a non-corporeal format. But it is difficult to imagine how the human propositional representational format could have developed apart from our corporeity. We can transcend it with language, but I suspect that the link with the body is always there" [34].

The esthetic dimension can also be interpreted and enhanced in the light of embodied cognition; the esthetic foundation of ethics, identified by Mancuso as the third way, is constituted by the "originally motivating" experience that derives from a kind of attraction for the beautiful and the just and for the "beauty of justice" [30]. Like intersubjectivity, the "sense of the just/beautiful of justice" is also a concept that has been investigated regarding schools and teachers' competences as central to the quality of teaching. It too, such as intersubjectivity, has a relational neurobiological foundation and is expressed in the interaction between body mind environment, it is a product of evolution and is rooted in the ability to develop long-term cooperation [42]. The human response to injustice, which is fundamental for sustaining the relationship and cooperation between people, is based on the ability to imagine and understand from the activation of sensorimotor systems, and through these can be nurtured and enhanced.

3.2 The research design

In the light of the framework outlined above, we propose to begin collecting and evaluating certain aspects of teachers' ethical competence, more specifically the foundational dimensions of ethics, starting with intersubjectivity and the sense of the just, to design training courses aimed at improving and implementing the "practice of ethics." In this article, we will present the results of the first phase of the research dedicated to the construction of the survey instruments and their administration for the collection of information on teachers' ethical competence. The second phase, on the other hand, will be devoted to the implementation of the training course, in relation to the results obtained and the training needs that emerged. More specifically, this phase will be aimed at developing and improving the foundational dimensions of ethical competence, starting from those explored during the first phase of the research and illustrated here (interpersonal skills/intelligence and sense of justice). Also, envisaged is the implementation of the esthetic sense, as a further aspect of competence closely related to the sense of justice and the perception of the good, through a comprehensive and innovative training approach, based on the principles of embodiment, which emphasizes inter-corporeity as a privileged mediator. Methods and devices that have already been tried and tested will be used (see, for example, [28, 43, 44]).

3.2.1 Theory/research hypothesis

Working on the foundational dimensions of ethics, according to a coherent embodied cognition-based methodological approach, allows attitudes and behavior (being and knowing how to be) to be improved as essential parts of ethical competence and ethical practice in professional contexts. Our hypothesis centers on the effectiveness of a two-part training model in enhancing teachers' ethical competence, particularly in intersubjectivity and justice. Through initial questionnaire data collection and subsequent training implementation, we anticipate significant improvements in teachers' abilities to navigate ethical complexities. Thus, our belief is that structured training will lead to measurable enhancements in ethical competencies, contributing to educators' effectiveness in inclusive practices.

3.2.2 Method

The overall work is characterized as a research training, articulated in two phases: the first investigation, theoretical and empirical, on the dimensions inherent in the framework constructs and the second training to be carried out a posteriori. To conduct our investigation on the intersubjectivity, with a specific focus on the relationship teachers-students, we have adopted a methodological approach that combines qualitative and quantitative elements to obtain a thorough and complete understanding of the phenomena under examination. This integrated qualitative-quantitative methodology, endorsed by Creswell and Plano Clark [45], offers a comprehensive approach to research and evaluation. By combining qualitative and quantitative methods, we can gain richer insights and enhance the validity of our findings. The heart of our methodology is represented by the self-report questionnaire built ad hoc, described later in detail. This tool was administered in a qualitative-quantitative manner, allowing participants to express their perceptions through structured responses, while this provided us with the opportunity to analyze quantitative data in depth.

The use of an integrated methodology has allowed us to grasp the complexity of inter-objective relationships while providing significant quantitative data that enrich our understanding of the dynamics involved. This mixed approach, with the questionnaire as the focus, provided us with a robust platform to explore and interpret the nuances of intersubjectivity in the educational context.

3.2.3 Instruments

Our study used a specially developed self-report questionnaire, divided into two distinct sections to investigate the constructs of intersubjectivity and sense of justice. The questions within the questionnaire are all custom-made and are all based around various papers regarding ethics within the school environment, such as Biancato [4] and Pianta [12]. This is the first major use of this questionnaire and, given the difficulty of the subject studied, some bias must be taken into consideration, such as the desirability bias. This detailed tool is divided into eight sections, each focused on specific aspects such as general perception, emotional connection, communication and understanding, collaboration and support, cultural sensitivity, technology and communication, general satisfaction, and sense of justice. In total, we have 42 multiple-choice items, aimed at exploring in detail the perceptions and evaluations of participants. This articulated structure of the questionnaire aims to comprehensively capture the complex facets of subjective experience in intersubjective contexts and in

the perception of justice (Annex A: The Self-Report Questionnaire: "Intersubjectivity Questionnaire and Teacher-Student Relationship").

3.2.4 The sample

The first phase of the research is aimed at the investigation of perceptions on one's own competences related to intersubjectivity and sense of justice, addressed to over 500 teachers (with a 4:1 ratio between females and males, in eight different age ranges, from 21–25 to 56–60 years old) specialized and specializing in educational support activities for students with disabilities at four Italian universities. This included specialized teachers, those working in support roles without formal specialization, regular subject teachers, and individuals with sporadic teaching experience. These teachers were selected because they are "inclusion experts," for whom the professional profile includes strong relational skills, which concern responsibility, fairness, justice, collaborative skills, and all the other characteristics recognized as the basis for ethical behavior, and which are codified in international codes of ethics.

3.2.5 Results

The data analysis of the "Intersubjectivity Questionnaire and teacher-student relationship" reveals interesting demographic trends and challenges in the collection of specific information. The majority of participants are concentrated in the 26–55 age group, with a predominantly 1–10-year teaching period. The primary schools come from secondary schools. However, there has been a difficulty in collecting data on degrees, subjects of instruction, universities of adherence, and the province due to open responses, which would require further additional work to obtain numerical results. In general, the answers to the questionnaire on intersubjectivity and teacher-student relationship show a clear trend that is evident in all its sections; the answers oscillate mainly between "agree" and "strongly agree," with a prevalence of the first option, preferred by the majority of subjects; answers with a majority of "strongly agree" refer mainly to the importance of positive emotions and empathy in the relationship with students (see for es. Annex B: the Figures n. 4, 7, 12).

The item analysis reveals interesting details.

In the first item of Section 1, "I believe that positive teacher-student relationships contribute to a better learning environment," the remarkable 75.5% of responses "strongly agree" suggests a broad consensus on the importance of positive relationships. In Section 4, relating to "collaboration and support", the item "I involve students in decision-making when appropriate "highlights a 15% of "neutral" responses, suggesting a variety of opinions on engaging decision-making. The second statement in Section 4, "I believe students should have a voice in defining the learning environment," shows a 17.2% of "neutral" responses and a 4.5% of "disagreement," indicating a divergence of views on student participation in defining the learning environment (Annex C). As regards the three questions of Section 6, "technology and communication," "neutral" answers between 21.9% and 22.7% indicate moderate indecision or ambivalence regarding these aspects, stressing the importance of further investigation to better understand the dynamics of technology and communication in the teacher-student relationship (see for es. Annex D: the Figures: 31, 33).

As for the section dedicated to the construct "sense of justice,", of particular interest is the predominant answer to the last question, where it is stressed that the

application of justice in school mainly concerns "the observance of the rules by all subjects" (Annex E).

The analysis of the answers obtained from the questionnaire revealed a correlation, albeit small, in a range of Spearman between weak and moderate among the items considered. In addition, significant differences emerged between men and women for some specific items, including 6 (I believe that fostering a sense of community in the classroom is essential for effective teaching), 13 (I actively listen to students during class discussions), 14 (I seek feedback from students on my teaching methods), 16 (I am open to constructive criticism from students and use them to improve my teaching), and 27 (Respect and value cultural differences between my students)highlighting variations in gender responses. On the contrary, as regards the schools of origin, no significant differences were found for any of the items, suggesting consistency in the answers regardless of the school origin. These results provide an important perspective in the analysis of questionnaire responses, highlighting gender dynamics and suggesting a uniformity of perceptions between the different schools involved in the study.

4. Discussion, conclusions, and perspectives

We started by reflecting on the theme of the "need for ethics" as an essential aspect of the teachers' professional profile (ethical competence), recognized and affirmed by international documents, and by noting the gap between what is stated in the teachers' ethical codes—where they exist—and the concrete processes and actions at school (particularly with regard to ethical practices directly related to guaranteeing equitable and inclusive schools). We have, therefore, attempted to understand the nature of ethics as an existential practice, before being professional, through the assumption of a model consistent with the embodied cognition perspective, to highlight its foundational dimensions from a different perspective. At the same time, we have designed a research-training course that has seen the initial involvement of over 500 teachers in training at four Italian universities, to begin investigating two dimensions that constitute essential elements of ethical competence and, from the second part of the academic year, to devise a path for the empowerment of these dimensions, through an "embodied-based" training approach.

In summary, this contribution intends to offer an original and integrative key to the theme/problem of the ethical competence of teachers, beyond that proposed by the institutional documents, and to the still open question of research and training on complex personal dimensions, connected to the "soft skills" of professionals, such as those relating to ethics.

Through the administration of the questionnaire, we were able to collect data on teachers' perceptions of the dimensions of ethical competence, which constitute an initial corpus from which to draw information in need of further investigation. In fact, in addition to the methodological limitations inherent in the research design (lack of a control sample, questionnaire not yet validated, exclusive use of a self-report instrument), the social desirability bias hypothesis must always be considered, which, being difficult to measure, may have influenced the results. However, we feel it is important to have opened a systematic and documented investigation space on such a complex subject, by focusing on aspects that are generally still under the radar (or taken "for granted") in the teaching profession. In general, the information gathered is useful for formulating new research hypotheses and, secondly, for devising ad hoc development and training paths.

As we have seen, the questionnaire reveals a general perception of the importance of the quality of the teacher-pupil relationship, but the answers on teachers' behavior

do not always support this perception. For example, awareness and/or willingness toward practices of co-participation, co-planning, and sharing of choices with pupils, which are instead essential to support self-determination and the ability to make choices, recognition, and empowerment, as indicators of the practice of an ethics of relationships, are less evident. With reference to the connection with equity and inclusion, it is of relevance that these teachers' behaviors and attitudes (educating for choice; building opportunities for recognition and empowerment…) are useful for all learners to foster their education as adults and aware citizens but are indispensable precisely for those learners with fragility and/or at risk of exclusion. The absence of this kind of "stimulation" on the part of teachers and the learning environment, as the biopsychosocial perspective of the International Classification of Functioning [17] and the social model of disability [46–48] well point out, represents a disabling factor, a barrier to the development of learners' life skills and to inclusion.

Regarding the section dedicated to the construct "sense of justice," of particular interest is the predominant response to the last question, where it is stressed that the application of justice at school, for most teachers (86.2%) mainly concerns "the observance of rules by all subjects." This suggests a prevailing idea of "justice" at school related to obedience/observance of the rules, therefore hetero-directed, determined by mainstream culture; a narrow idea of justice disembodied from experiences and esthetic sense and scarcely connected with educational action. However, it is interesting to note that, given the choice of more than one option, the second choice falls on items related to relationships (with pupils, with families, with colleagues) for a total percentage of 64% of responses. Even though an "abstract" idea of right as a rule, as a duty to be, is predominant, the perception of the relationship between a sense of right and relational experience is relevant. On this perception it is possible to open a space for reflection and action in a formative and transformative sense on one's own way of being an "ethical teacher" and on the impact on interpersonal relational practices. Finally, it seems important to note that the questionnaire was administered to a population of teachers who are particularly attentive and trained (and in training) precisely on the issues of relationships and inclusion; therefore, we can assume that the shortcomings noted here are present and—probably amplified—in most teachers.

In the light of these results, the second phase of the research training will be launched, as described in the previous paragraph. Beyond the enhancement of what we consider to be the foundational dimensions of ethics, and thus the improvement of teachers' ethics practice, training according to an "EC-based" approach represents an opportunity to rethink and experiment with innovative and functional ways of developing the complex competences of professionals in the current and future challenging scenario. The elements characterizing our approach can be identified along two lines: the first, based on the embodiment paradigm, contemplates, and valorizes key aspects that are transversal to other training paradigms and models (art, narration, metaphor, emotions, reflexivity) and the second focuses on some "original" elements, pertaining to disciplinary fields in dialog with neurosciences, which are reinterpreted and declined in "EC- based" training settings [43, 49]. During training, the body becomes the protagonist, experiencing itself in such a way as to increase the centrality of the existential, interbody emotional, perceptive, and reflexive dimension, both in the learning process and in human relations, to highlight how the environment influences the expression of one's emotional states and is essential for the structuring of ethical and creative empathic relations [50].

Specifically, the answers to the questions in sections 2–5 provide data in the area of intersubjectivity and those in Section 8 on the sense of justice. At this stage of

our study and on this specific object (exploration of the essential dimensions of the construct of ethical competence), it is not possible to identify the presence/ lack of intersubjectivity and the sense of justice in terms of entity and objectivity (of objectifiable substance), binary (presence yes/absence no) or quantitative (levels of presence or lack) as these are complex dimensions, hardly reducible to singular measurable elements, particularly in the educational field, where they acquire value only if considered from an ecological-relational perspective.

Therefore, it is possible to start up a hermeneutic-phenomenological participatory reflective process according to a research-training approach (within a general Mixed Method design) that also makes use of quantitative data [51]. For this purpose, collective meetings and focus groups have been planned with the teachers involved, to be held by the end of this school year, for the presentation and discussion of the questionnaire results. For the next academic year, embodied-based training workshops are planned. The analysis of the results of the questionnaire and of these courses will contribute to the definition of a broad general research-training design for all in-service teachers. In summary, the information obtained from the questionnaire and discussed with the teachers is useful for two purposes:

1. To encourage debate on ethical competence and the focusing of its essential dimensions, in relation to the teaching profession.

2. To support the reflective and transformative processes of expert teachers on inclusion (and then of all teachers) on the dimensions of ethical competence, through the implementation of coherent training approaches.

These are transformative paths, which foster the acquisition of awareness of one's own ideas, knowledge, and teaching and relational practices, through participation in workshop and experiential paths that support the development of the embodied dimensions of intersubjectivity and sense of justice. We know how, according to the embodied cognition perspective, intersubjectivity is mediated by intercorporeality and the body, as a "pre-reflective and preverbal vehicle, capable of transferring meanings from one person to another" [34].

The embodied cognitive process utilizes bodily representations (motor, sensory, affective) in the execution of a cognitive learning task. Through the mechanism of embodied simulation, empathy is experienced as a transformative relational experience that allows the subject to "move away from his own body to enter that of others" [52], favoring the perception of oneself and one's way of being in relation to others. The embodied decision-making mechanism, acquired through experience and constantly subject to change "guides" [53] the individual in personal behavioral choices "like a kind of wisdom derived from the body" ([32], p. 25). Within this framework, the "EC -based" training strategies that will be used in the paths with teachers are based on the following aspects: social learning, art and corporeity, imagination and dreaming, body relaxation and mindfulness, reflexivity and storytelling, and creativity and foresight. The group and in-presence participation constitute the privileged setting for this type of training, but blended modalities are also being tested, which alternate between collective in-presence moments and collective and individual remote moments.

The ultimate aim of EC-based training is consistent with and functional to the development of relational ethical competence, the foundation of professionals' soft skills.

Conflict of interest

The authors declare no conflict of interest.

Annex: Questionnaire on intersubjectivity and teacher-student relationship for teachers

Welcome to our questionnaire on Intersubjectivity and the Student-Teacher Relationship! Your participation is crucial for a better understanding of these elements in the field of education. We kindly ask you to share your experiences and opinions sincerely. The questionnaire is anonymous, and the data will be treated in an aggregated manner, purely for research purposes. Your responses will contribute to a deeper understanding of the dynamics between students and teachers.

Please complete the questionnaire within ONE WEEK.

Thank you very much for your time and valuable participation!

Section 0: Personal data.

Answecthe appropriate box.

Select your gender:

• Male

• Female

• Other

 Select your years of teaching:

• −1

• 1–5

• 6–10

• 11–15

• 16–20

• 21–25

• 25–30

• 30+

 Select the school level where you teach:

• Preschool

• Primary school

• Lower secondary school

• Upper secondary school

Indicate your teaching subject:
(Open-ended response)
List all types of degrees you hold:

• High school diploma (secondary school, technical, professional...)

• First-cycle university degree (Bachelor's degree)

• Third-cycle university degree (Ph.D.)

• Other degrees (Specialization diploma, First/Second-level Master's, Advanced diploma...)

• High artistic, musical, and dance education degree (First and second-level academic diploma))

• Specialization for teaching support activities for students with disabilities

• Other (Open-ended response)

Indicate your affiliated university:
(Open-ended response)
Indicate your province of residence:
(Open-ended response)
Instructions: Respond to the following statements by indicating the extent to which you agree or disagree. Use the scale below:
Strongly Disagree.
Disagree.
Neutral.
Agree.
Strongly Agree.
Section 1: General perception

• The atmosphere in my class promotes open communication with students.

• I feel comfortable expressing my expectations and concerns to students.

• I actively encourage student participation and interest in my lessons.

• I believe positive teacher-student relationships contribute to a better learning environment.

• I am aware of the impact my interactions with students can have on their overall school experience.

• I believe fostering a sense of community in class is essential for effective teaching.

Section 2: Emotional connection

- I make an effort to understand the emotions and concerns of my students.

- I address the emotional needs of my students in a supportive manner.

- There is a sense of mutual respect between me and my students.

- I am aware of the emotional climate in my class and its influence on the learning process.

- I actively work to create a positive emotional environment for my students.

- I believe expressing empathy is crucial for building strong teacher-student relationships.

Section 3: Communication and understanding

- I actively listen to students during class discussions.

- I seek feedback from students on my teaching methods.

- I strive to understand the perspectives and experiences of my students.

- I am open to constructive criticism from students and use it to improve my teaching.

- I provide clear and consistent communication about expectations and assignments.

- I believe effective communication is fundamental for building strong teacher-student relationships.

Section 4: Collaboration and support

- I involve students in decision-making processes when appropriate.

- I provide support to students in achieving their academic goals.

- Collaborative projects and group activities enhance the relationship between me and my students.

- I encourage a sense of teamwork and collaboration among students in my lessons.

- I believe students should have a voice in shaping the learning environment.

- I am available and accessible to students seeking guidance or support.

Section 5: Cultural sensitivity

- I demonstrate cultural sensitivity and inclusivity in my teaching.

- The curriculum I use includes diverse perspectives and experiences.

- I respect and value cultural differences among my students.

- I actively incorporate cultural awareness into my teaching practices.

- I believe promoting cultural understanding contributes to a positive classroom environment.

- I am committed to creating an inclusive and culturally responsive learning space.

Section 6: Technology and communication

- I effectively use technology to facilitate communication with students.

- Online platforms and tools are integrated into my teaching to enhance communication.

- I actively explore new technologies to improve communication and engagement in my lessons.

Section 7: Overall satisfaction

- Overall, I am satisfied with the level of intersubjectivity in my teaching environment.

- The teacher-student relationship in my school positively contributes to the learning environment.

- I believe continuous professional development can improve teacher-student relationships.

Section 8: Sense of justice

- I consider justice central to my teaching profession.

- I believe it would be useful to discuss justice at school with my colleagues.

- When making decisions involving students, I try to clearly explain the reasons behind the choices made.

- I encourage the fair and objective participation of all students.

- I feel that discussing justice at school is beneficial for both teachers and students.

- The application of justice at school primarily concerns (Max 2 responses):

- Adherence to rules by students

- Adherence to rules by teachers

- Adherence to rules by all parties

- Relationship with students

- Relationship with colleagues and the school principal

- Relationship with families

- Curriculum planning

- Teacher preparation

- Other (Open-ended response)

B. Annex

See **Figure B1**.

4. I believe positive teacher-student relationships contribute to a better learning environment.
517 answers
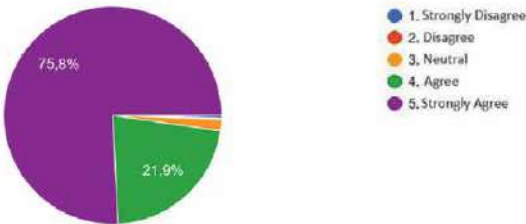
7. I make an effort to understand the emotions and concerns of my students.
517 answers
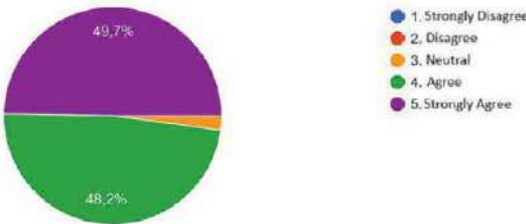
12. I believe expressing empathy is crucial for building strong teacher-student relationships
517 answers
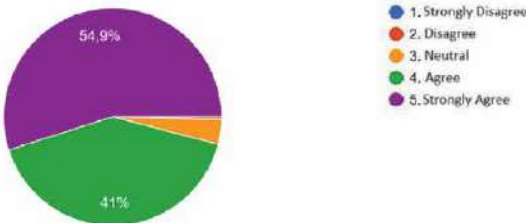
Figure B1.
Pie Charts illustrating teachers' responses to key questions on intersubjectivity and teacher-student relationships. The overwhelming majority of participants indicated 'Strongly Agree' to statements emphasizing the importance of positive teacher-student relationships, empathy, and understanding students' emotions and concerns in fostering a conducive learning environment.

C. Annex

See **Figure C1**.

19. I involve students in decision-making processes when appropriate.
517 answers
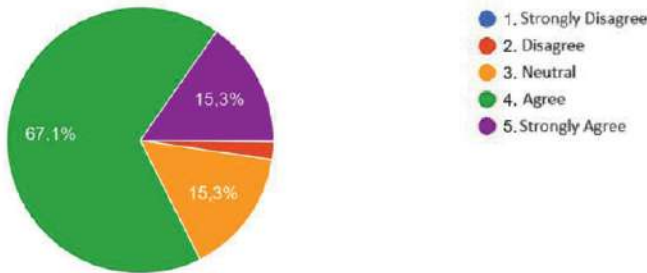
23. I believe students should have a voice in shaping the learning environment.
517 answers
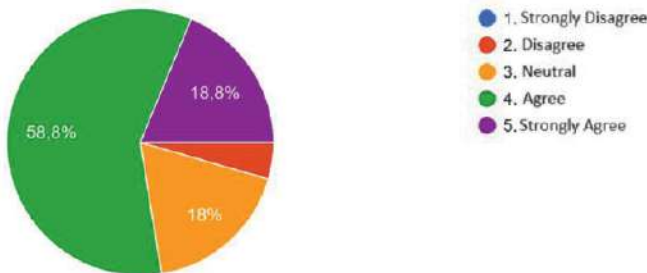
Figure C1.
Pie charts depicting the distribution of responses from teachers participating in the "Collaboration and Support" section. While a significant portion of subjects indicated 'Agree' to statements regarding student involvement in decision-making processes and shaping the learning environment, notable proportions also expressed 'Neutral' and 'Strongly Agree.' This suggests a spectrum of perspectives among educators regarding student empowerment and participation in educational decision-making.

D. Annex

See **Figure D1**.

31. I effectively use technology to facilitate communication with students.
517 answers
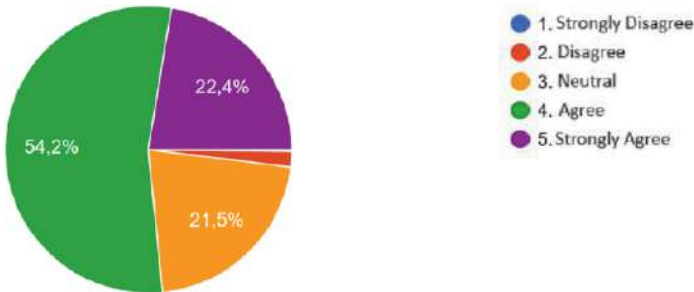
32. Online platforms and tools are integrated into my teaching to enhance communication.
517 answers
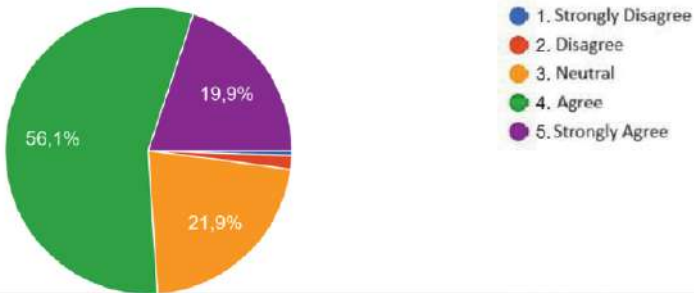
Figure D1.
Distribution of Responses from Teachers on the "Technology and communication" section, depicting the utilization of technology for communication in teaching. While a majority of subjects responded with 'Agree,' notable proportions also indicated 'Neutral' and 'Strongly Agree.' This suggests varying levels of adoption and perception regarding the effective use of technology for facilitating communication with students and integrating online platforms into teaching practices.

E. Annex

See **Figure E1**.

42. The application of justice at school primarily concerns (Max 2 responses):
517 answers
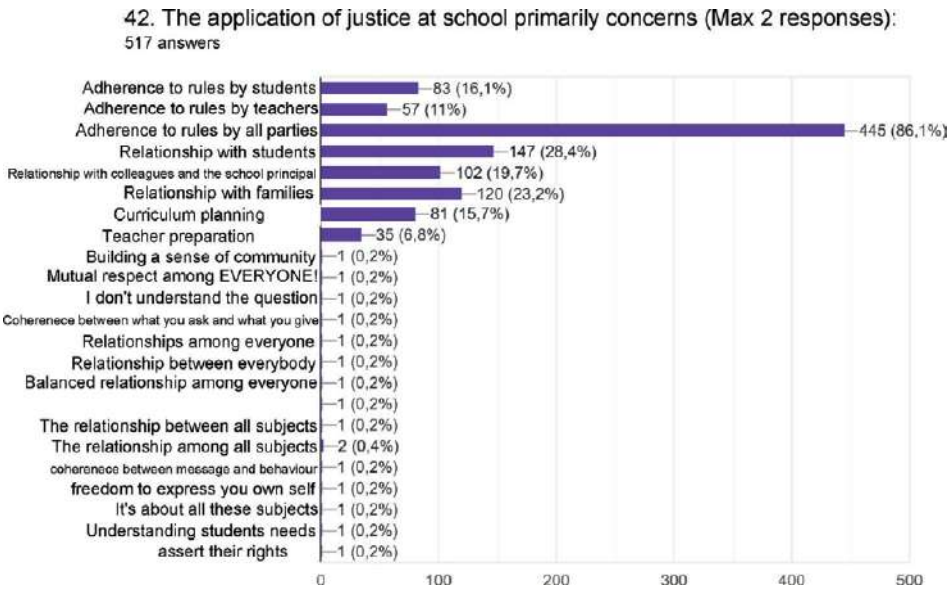
Figure E1.
Bar Graph Depicting Responses to the Open-Ended Question in the 'Sense of Justice' Section: 'The application of justice at school primarily concerns…' The most voted answer, 'Adherence to rules by all parties,' indicates a prevalent perspective among respondents regarding the primary focus of justice application within the school environment.

Author details

Paola Damiani[1*†], Davide Brancato[2†] and Filippo Gomez Paloma[2†]

1 University of Modena and Reggio Emilia, Modena, Italy

2 University of Cassino e Lazio Meridionale, Cassino, Italy

*Address all correspondence to: paola.damiani@unimore.it

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Chapter 6

Learning How to Flow: Paving the Way for Lifelong Learning

Cathérine Conradty and Franz X. Bogner

Abstract

Classrooms set the seeds for lifelong learning. When students resist active participation in the classroom, this important channel is flagging and raising questions: Why do both students and teachers experience high levels of stress at school? How can we cultivate a self-motivated lifestyle and experience the exhilarating immersion of creative flow? Sixty years of extensive research highlighted the significance of motivation, particularly in cognitive performance. However, a systemic challenge persists: conventional teaching often is perceived as a passive destiny without an active learning experience. We therefore introduced our Starwalker initiative in order to shift conventional teaching into reflective and motivating schemes. This chapter delves into the convergence of emotional intelligence (EI) within a teacher's professional development initiative by exploring variables such as flow, emotional intelligence, and self-efficacy. It illuminates the pivotal role of EI in enhancing student motivation and well-being. While addressing the issues of high dropout rates and disruptive behaviour, a transformative teaching style was favoured, grounded in an open-minded coaching mindset. A supportive and conducive learning environment was promoted by fostering personal experiences and recognising skills rooted in emotional intelligence. Besides highlighting the significance of comprehensive teacher training, it was supposed to cultivate a teacher habit that nurtures students' EI, self-efficacy, and overall well-being.

Keywords: emotional intelligence, self-efficacy, flow, school motivation, professional development, in-service teacher, dropout rate

1. Introduction

> *Flow is a state of being in which self-awareness and the outside world vanish, and people act with total abandonment, pouring all their abilities into a task, without thought of success or failure. In some ways, it is the epitome of working with emotional intelligence, because to enter a state of flow, you must possess emotional intelligence: the ability to focus and enter a trance-like state without losing touch with the emotions of those around you. Daniel Goleman [1].*

Education is not just about textbooks and exams; it is a fascinating journey that goes far beyond classroom walls. It is a voyage of discovery, where students not only gain knowledge and skills but also shape their attitudes, values, and beliefs. However, as students enter the tumultuous realm of adolescence, many teachers find themselves

grappling with a disheartening trend: dwindling motivation. This decline breeds dissatisfaction, frustration, and, sadly, even higher dropout rates [2]. It is a challenge that cannot be ignored.

In response to this educational puzzle, an initiative known as the Starwalker project came to life. This endeavour sought to tackle the soaring dropout rates and disruptive behaviour in schools, not through temporary interventions, but by transforming the very fabric of teaching itself [3]. Instead of following the same old patterns, teachers embarked on a profound exploration of their roles, embracing a mindset akin to open-minded coaches [4]. The vision was a safe haven where students could freely immerse themselves in the wonders of learning, nurturing their passions, and developing vital competencies. The best part of the project was that this innovative approach alleviated stress for both students and teachers, opening doors to new possibilities.

At the heart of the Starwalker project lies a captivating concept: emotional intelligence (EI). School dropouts are often loners or outsiders whose emotional and social skills are insufficiently trained [5]. EI as a set of skills enables individuals to navigate the intricate landscape of emotions—not just their own but also those of others. This basic capability allows you to recognise, understand, and regulate your emotions, while gracefully connecting with others on a deeper level [1]. EI empowers students and teachers alike to communicate effectively, build resilient relationships, and confidently face life's challenges. But if we challenge the assumption held by traditional education that EI is an innate ability, the question opens: how can one acquire these extraordinary skills?

The journey towards developing EI is multifaceted. Personal experiences serve as powerful guides, shaping our understanding of emotions and their impact. Targeted training unlocks hidden potential, equipping individuals with practical strategies for emotional mastery. Yet, perhaps most intriguingly, the Starwalker project recognises that EI cannot be a solitary endeavour—it thrives within an educational ecosystem that seamlessly integrates EI into everyday school life [6]. It is a collaborative effort, weaving EI into the very fabric of education.

The Starwalker project paints a future of education, one that surpasses the confines of textbooks and embraces a rich tapestry of knowledge, skills, and emotional resilience. Its mission is to unlock the true potential of education and empower future generations with a newfound strength. For details see [6].

1.1 Exploring the intersection of flow, emotional intelligence, creativity, motivation, and sustainable development in education

In our ever-evolving world, it has become crucial to equip learners with the essential competencies needed to flourish in a dynamic, interconnected, and sustainable environment [7]. This chapter delves into the fascinating realm where key concepts intersect, exploring the transformative potential of the STEAM (Science, Technology, Engineering, Arts, and Mathematics) framework, the power of EI, and the insights of flow theory. Together, these concepts hold the promise of shaping an educational landscape that fosters sustainable development and prepares individuals for a future brimming with possibilities.

1.1.1 The profound impact of emotional intelligence in education

In the realm of education, EI plays a pivotal role, and recent studies have shown the positive effects of targeted training programs in enhancing EI skills [8]. These programs

encompass a blend of theoretical knowledge, self-reflection exercises, and skill-building activities. Notably, even a brief EI training program significantly can improve emotional awareness, regulation, and empathy skills among late adolescents [9]. Drawing on current literature, several key factors have emerged as vital contributors to the development of EI, including self-awareness, self-regulation, empathy, and social skills [10, 11].

Engaging in self-reflection and mindfulness practices can profoundly impact individuals by fostering a heightened awareness of their emotions, thoughts, and reactions [12]. By attentively observing their internal experiences without judgement, individuals can gain a deeper understanding of their emotions and effectively regulate them [13, 14]. Emotional awareness and accurate labelling of emotions serve as fundamental aspects of EI, and interventions aimed at enhancing emotional awareness and recognition skills have demonstrated significant improvements in overall EI [15, 16].

Moving forward, it is essential to develop effective strategies for managing and regulating emotions, as this stands as a critical component of EI. Techniques such as cognitive reappraisal, emotional reappraisal, and relaxation exercises have shown efficacy in enhancing emotional regulation skills [9]. Empathy, which involves understanding and sharing the feelings of others, is another core facet of EI. Training programs that emphasise perspective-taking and encourage empathic responses have successfully enhanced empathy skills [8, 9]. These skills contribute to developing effective interpersonal abilities, which are indispensable in EI.

While social competence and EI thrive through skills such as active listening, assertiveness, conflict resolution, and nonverbal communication [17], the everyday school environment often overlooks crucial aspects like self-reflection, mindfulness, emotional awareness, and empathy. Introducing changes in these areas could yield significant positive outcomes. Students often face limitations in their awareness of emotions and feelings, directly impacting their ability to understand and address unmet needs [4, 6, 18]. The unconscious connection between frustration and unmet needs poses a challenge for students to respond appropriately, even when it comes to basic needs like hunger or the need for a restroom break [19]. Consequently, negative emotions are occasionally misattributed to the wrong trigger: students may mistakenly hold the teacher responsible for their discomfort, neglecting their actual reason [20].

To equip students with effective conflict and tension management skills, it is crucial to introduce emotional vocabulary and foster an understanding of emotions and needs. Training programs incorporating empathic communication, such as Marshal Rosenberg's established and successful Nonviolent Communication approach, foster empathy, and consideration for different perspectives [18]. Additionally, these programs encourage attentive listening and conscious expression, thereby cultivating strong communication skills for cooperation and conflict resolution [18].

1.1.2 Flow and emotional intelligence: a powerful duo for personal growth

In the realm of personal growth, two powerful concepts emerge: flow and EI. Flow, as proposed by Csikszentmihalyi, represents a state of complete absorption in challenging activities that brings joy and deep engagement [21]. EI, on the other hand, refers to the ability to recognise and manage emotions effectively, both in oneself and in others [5]. While these concepts may seem distinct, they share a captivating synergy that fuels personal development.

At the core of both flow and EI lies self-awareness—the gateway to unlocking our true potential [5, 22]. In the pursuit of flow, individuals must be keenly attuned to their thoughts and emotions, immersing themselves in the present moment with unwavering

focus [23]. Similarly, EI calls for recognising and understanding our own emotional states, a skill that lays the foundation for empathy and connection with others [5]. By embracing flow, individuals embark on a journey of heightened self-awareness, expanding their EI and deepening their understanding of themselves and those around them [1].

But the harmonious dance between flow and EI does not end there. As individuals experience the exhilaration of flow, they forge an unbreakable bond with the activity at hand, be it a solo endeavour or a collaborative effort. This bond paves the way for empathy—a profound understanding of others' emotions and needs. The immersive nature of flow cultivates a heightened sense of connection, allowing individuals to empathise and relate to those who share their passion [23]. In this symbiotic relationship, flow acts as a catalyst, fuelling the growth of EI through the nurturing of empathy and fostering meaningful connections [24].

Beyond empathy, flow also strengthens our emotional regulation skills—a vital component of EI [24]. When we find ourselves in a state of flow, a calm and focused concentration washes over us, enabling us to navigate our emotions with grace. By honing our ability to achieve and sustain flow, we develop the capacity to regulate our emotions effectively [1]. This skill proves invaluable in high-pressure situations, where emotional regulation paves the way for confident decision-making and the maintenance of positive relationships. Flow becomes the arena where EI is refined, empowering individuals to navigate the complexities of their lives with resilience and finesse.

In conclusion, the dynamic interplay between flow and EI unravels a world of personal growth and fulfilment. As we delve into the depths of flow, our self-awareness expands, fostering empathy and deepening our EI. The immersive nature of flow nurtures empathy, allowing us to forge meaningful connections and understand the emotions of those around us. Moreover, flow hones our emotional regulation skills, equipping us with the tools to navigate life's challenges with poise. Together, flow and EI create a harmonious synergy that propels us towards self-discovery, growth, and a life rich with purpose and joy.

1.1.3 Unleashing the power of self-efficacy: fuelling flow and emotional intelligence

Another important aspect of flow is its connection to self-efficacy, which refers to an individual's belief in their ability to successfully perform a specific activity [25]. Self-efficacy plays a crucial role in influencing motivation, effort, and persistence in pursuing goals, and it can also impact the likelihood of experiencing flow [26].

In the Starwalker project, a close relationship between motivation, particularly self-efficacy, and creativity has been demonstrated (**Figure 1**). The model confirmed that creativity positively influenced learners' motivation, as evidenced by high values of CFI (Comparative Fit Index = 0.971) and low values of RMSEA (Root Mean Square Error of Approximation = 0.029). Detailed information about the experimental design and the questionnaire tools measuring cognitive aspects of creativity (CPAC) and school motivation (SchMOT) can be found in the study conducted by Conradty and Bogner [27].

Individuals with high levels of self-efficacy are more inclined to engage in challenging activities and persevere through obstacles, which, in turn, fosters a sense of accomplishment and promotes the experience of flow. On the other hand, individuals with low self-efficacy may tend to avoid challenging activities or give up easily, which hinders their ability to enter a state of flow [28].

Furthermore, the experience of the flow itself may enhance self-efficacy by providing a profound sense of mastery, accomplishment, and confidence in one's abilities [29, 30]. Through repeated experiences of flow, individuals can develop a
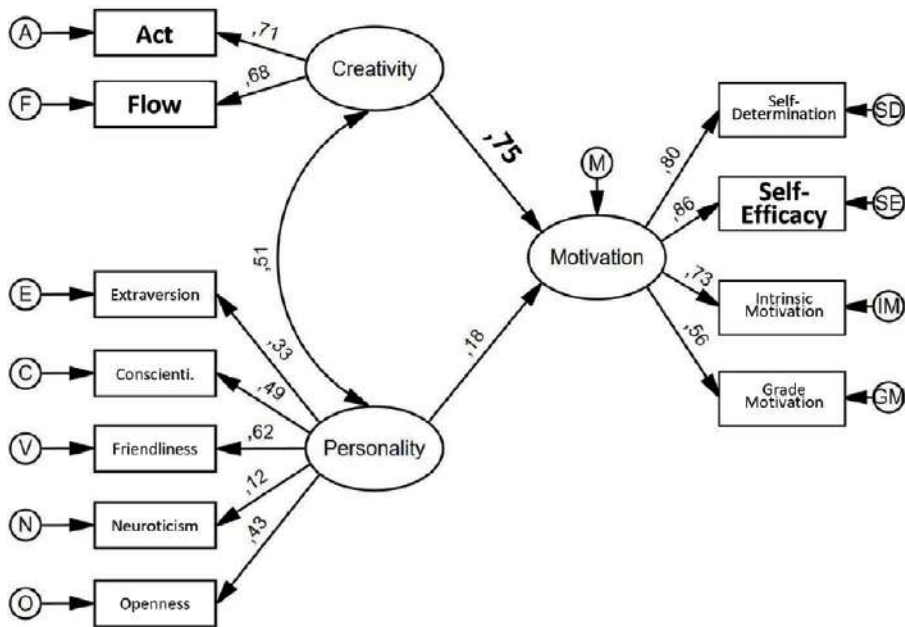
Figure 1.
Model of the effects of creativity and personality on motivation, especially on self-efficacy (edited after Conradty and Bogner [6]).

stronger sense of self-efficacy, leading to increased motivation, persistence, and achievements in various domains of life.

In the intricate tapestry of human emotions, self-efficacy emerges as a formidable force that shapes our ability to navigate the realm of EI. It is the belief in our capacity to understand, manage, and harness our emotions, propelling us towards greater self-awareness and resilience.

2. The Starwalker project

The decline in school motivation among students during adolescence poses a worrisome challenge for teachers [31–33]. This decline is accompanied by dissatisfaction, frustration, aggression, and a decline in academic performance, increasing the risk of school dropout. It is crucial to acknowledge that teachers themselves also face a persistently high dropout rate, as overwhelming work and stress put them at risk of burnout. Addressing this pressing issue, a district in Germany has initiated a call for the development of teaching concepts aimed at combating the rising dropout rates.

2.1 Phase 1: bridging perspectives—cultivating emotional intelligence towards responsible adulthood

For a detailed description of Starwalker, see [6]. In the initial phase of the project, the focus was on providing students with a voice and encouraging their active participation. As part of the weekly class teacher lesson, moderated class discussions were held on current topics relevant to the class. The mindset was communicated

to the teachers as role models through preparatory discussions, and, subsequently, agreed upon with the students as ground rules. This provided a culture of mindful communication, transcending potential hierarchies between students and teachers. To introduce vocabulary related to emotions, light-hearted sessions were conducted, allowing students to begin reflecting on their own feelings [20]. As a result, students started spontaneously asking each other if their observations regarding each other's emotions were accurate. This feedback exchange helped develop their perception, empathy, and external awareness. They also engaged in reflection on their own emotions and gradually developed a curiosity about the underlying needs. The concept of Empathic Communication, based on Marshal Rosenberg's teachings, was introduced preliminarily [18]. The students experienced visible relief upon realising that feelings provide clues to needs, and these needs are normal, valid, and deserve to be addressed. It is worth noting the cultural dependence on knowledge regarding the connection between feelings and needs, often associated with shame. This cultural influence perpetuates an ongoing, unconscious conflict that students lack the tools to navigate.

During this initial phase of Starwalker, a survey was conducted at the beginning and end of the school year, focusing on two questions: how the participants envisioned being a child and being an adult. In comparison to a control group without intervention, the students in the treatment group demonstrated a shift in their values. Cluster analysis indicated that boys tended to feel socially insecure, while girls showed a greater sense of autonomy [4]. However, after the intervention, the treatment group experienced a change in perspective, with a growing emphasis on responsibility as a significant trait. The allure of clinging to childhood diminished, and the negative expectations of teens associated with adulthood was mitigated by recognising positive qualities [4]. Additionally, the treatment group stood out from the control groups through their active participation in democratic activities within the school, taking responsibility for their education.

2.2 Phase 2: learned from STEAM—fostering creativity

Based on these positive initial results, the following development focused on promoting the self-efficacy of the students. Adopting the concept of the Horizon2020 project CREATIONS, the students set themselves goals that they wanted to realise in project weeks. They were to organise the corresponding mentors, learning environment, and tools on their own with the teacher as a tutor. From the organisation to the implementation of the project week, the students learned self-organisation and basic principles of project management. In order to have work groups of a practicable size, the classes are divided into groups, each choosing their own topic [34]. This created a certain competitive situation among the students, which was another motivating factor. As already experienced in CREATIONS, creativity-enhancing projects support the pupils' self-efficacy [35]. In a questionnaire tool developed specifically for this phase, it was confirmed that these resulted in increased school motivation of the pupils [27, 36]. Anecdotal evidence shows that in the participating classes, this also resulted in improved academic cooperation and cognitive performance (measured in school grades).

2.3 Phase 3: ensuring sustainability of Starwalker Competencies—the "Ease the Stress!" Teacher Training Programme

Lack of experience in project work and teamwork was a significant challenge for certain classes, highlighting a notable drawback in their training [7, 37]. These competencies

are widely recognised as essential skills for the twenty-first century as they hold significant importance for students' future professional endeavours [7]. The absence of exposure to project work and teamwork leaves students ill-equipped in developing crucial collaborative and organisational abilities. Such competencies are vital not only for academic success but also for navigating the demands of any professional world. Addressing this shortcoming becomes imperative in ensuring that students are adequately prepared to meet the challenges and expectations of the modern workforce [7].

Furthermore, the students were able to speak critically about the fact that with their new experience in helpful communication, they experienced empathic communication during Starwalker coaching, but not in everyday school life. In contrast to expectations, the lack of empathic communication in everyday school life became even more apparent to the students, which did not strengthen the relationship with the class teachers. The Hattie study highlights the crucial significance of the student-teacher relationship in education [38]. It underscores that a positive and supportive relationship between students and teachers plays a pivotal role in students' academic success, overall well-being, and personal development. The study emphasises that when students feel connected, valued, and understood by their teachers, they are more likely to be engaged, motivated, and open to learning [38, 39]. The quality of the student-teacher relationship affects various aspects of students' lives, including their social-emotional development, self-esteem, and resilience. Through fostering a nurturing and caring environment, the student-teacher relationship serves as a foundation for effective teaching and learning experiences, ultimately contributing to students' positive outcomes both inside and outside the classroom.

The next objective of the project was the development of appropriate teacher training to support teachers in adopting a teaching style, which aimed to support students' self-efficacy and reduce teachers' stress levels [6]. Extensive training in empathic communication or systemic attitudes was beyond the scope of the project. Instead, the focus was on training teachers in a style that would empower students to take more responsibility for their learning [35]. In order not to provoke resistance from teachers who felt solely responsible for learning success, the training concept was adapted in a low-threshold way. Instead of a single three-hour session at the beginning and end of the school year, a lunchtime coffee exchange on "Ease the stress!" was organised every five weeks. Teachers were encouraged to design lessons that supported students' personal challenges, such as punctuality, completing homework, practising vocabulary, integrating sports, or improving grades. Through this approach, students learned to better organise themselves, improved their academic mindset, and took an active role in shaping their learning experiences, which ultimately impacted overall school motivation [6].

2.3.1 Students' SMART challenges

To foster students' ability to reflect on their actions, understand the factors that make certain tasks challenging, and effectively shape their lives, the class culture of "challenges" was introduced. In the classroom, a poster serves as a guideline for students to develop their regular challenges (**Figure 2**). The first step involves creating a concise and clear title for the challenge, along with setting a fixed period. In the subsequent step, the challenge outline is assessed for its SMART qualities and adjusted if necessary [40]. Students record their progress on the clearly defined challenge goals in a daily log within their homework notebooks. At the end of the challenge period, they reflect upon and note whether they have succeeded or failed in meeting the
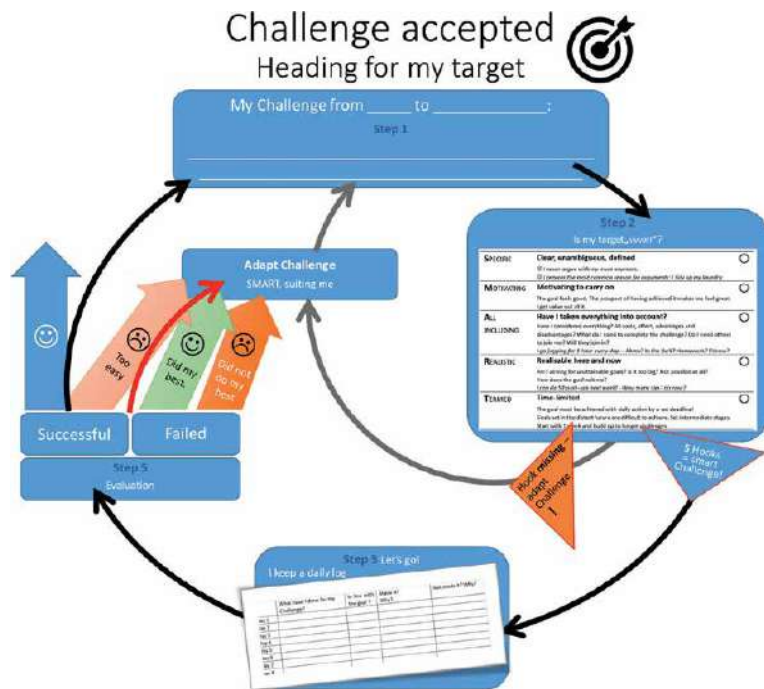
Figure 2.
Poster in class about the challenge-process.

goals. If the challenge was deemed successful due to a lack of difficulty, it is considered a clear failure. On the other hand, if the challenge was not successful, but the student identifies the reasons behind it, adjustments can be made to the challenge or the student's own behaviour for greater success in the next round.

Throughout this process, students engage in friendly competition with themselves, rather than against each other. They can better understand their own abilities and difficulties while practising error management and reflection [1, 8, 41]. As expected, the students developed stable self-efficacy [35]. Surprisingly, this intervention revealed that students reported experiencing more flow in their lives by the end of the school year, despite the absence of explicit flow experiences within the challenges themselves [35]. It appears that those who engage in reflective practices are more likely to experience flow.

The "Ease the Stress!" teacher training program had a profound impact on the students (**Figure 3**). The offer of two different formats of the training highlighted the importance of time in the development of a supportive coach-like attitude of teachers. It became evident that condensing five hours of training into a single day (**Figure 3**, Treatment 1) was insufficient for fostering meaningful development. While such an intensive session could deliver a wealth of content, it did not translate into practical, long-term skill acquisition for the teachers. Treatment 1 only in *Act* produced a difference to the control score. *Act* measures cognitive aspects of creativity, encompassing techniques of imagination and collaborative strategies that are conducive to active application and cognitive training. Increasing these skills necessitates not specialised pedagogical methods but rather a straightforward knowledge transfer from teacher to student. After the one-day training, the students of the participating teachers showed no differences in motivation from the control group (**Figure 3**). Teachers could not transform their attitude to become tutors encouraging a motivating learning environment.
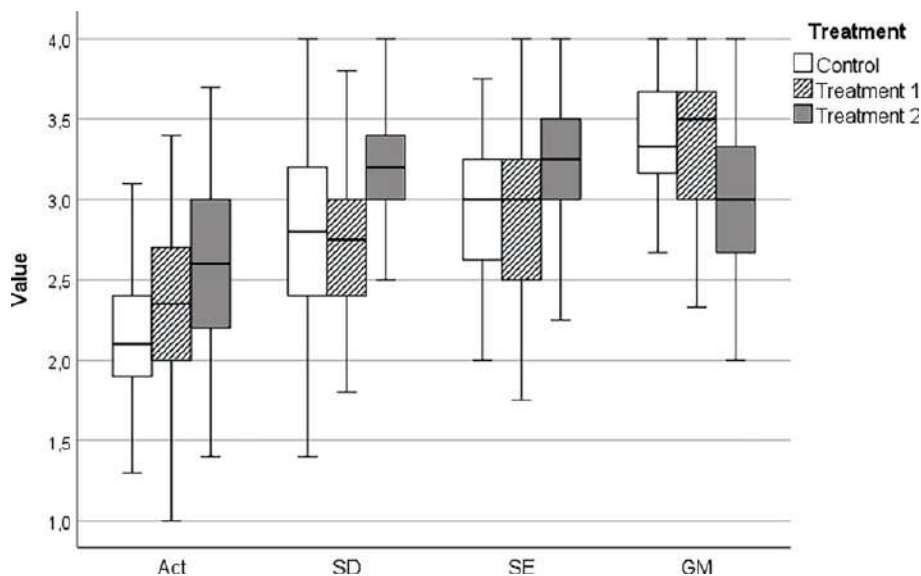
Figure 3.
Effect of teacher trainings on students' motivation and cognitive creativity (edited after Conradty and Bogner [6]). (control = teachers without training; treatment 1 = 1 day training; treatment 2 = regular coffee catch-up training; act = cognitive creativity factor; SD = self-determination; SE = self-efficacy; GM = grade motivation).

In contrast, when these five hours were distributed across a school year in "coffee catch-up" meetings, the results were significantly more positive (**Figure 3**, Treatment 2). This extended timeframe allowed teachers to gradually assimilate and apply the training concepts, effectively transitioning from primarily content-focused lecturers to self-efficacy-enhancing coaches for their students. This transformation not only benefitted the teachers in their professional growth but also had a tangible, positive effect on the students, fostering a more conducive learning environment where pupils could thrive.

Treatment 2 differs from both the control and Treatment 1 significantly with higher scores in motivation factors, Self-Efficacy (SE) and Self-Determination (SD) (*Act*, SD, SE, GM; $p < 0.001$, **Figure 3**). The notable decrease in Grade Motivation among classes taught by teachers involved in Treatment 2 is intriguing. It is worth noting that, anecdotally, the actual academic performance of these classes remained stable or even increased slightly. The key shift was in the students' attitudes towards grades: their significance diminished, indicating a transition from extrinsic to intrinsic motivation. This shift suggests an increased influence of self-efficacy (SE) and self-determination (SD) in driving student motivation.

After 50 years of research into the nature of flow and its promotion with complex initial theories, flow may prove to be easy, but not simple. In addition to the ability to concentrate, we need the ability of self-efficacy, based on self-reflection, which gives us feedback on our successful work during the creative process. This self-experienced feedback is more important than external feedback. External praise can be hugely disruptive and cause flow to fizzle out like a soufflé tested too early. However, self-efficacy is the driving force behind flow, with which "micro-flow" can also occur even in short periods of work. This currently discussed hypothesis was also confirmed in the Starwalker study. The calculation of the correlation between *Flow* and self-efficacy confirmed the close relationship. The correlation of SE with *Flow* creativity is highly significant with a strong correlation coefficient (**Table 1** $p > 0.001$,

		SD	SE	GM
Act	Corr. coeff.	0.240[**]	0.402[**]	0.186[*]
	Sig. (2-tailed)	0.002	0.000	0.018
Flow	Corr. coeff.	0.054	0.307[**]	0.222[**]
	Sig. (2-tailed)	0.498	0.000	0.005

SD = self-determination, SE = self-efficacy, GM = extrinsic grade motivation.[**]Highly significant; Act, Flow: creativity scale factors.

Table 1.
Spearman rho creativity and motivation (N = 160).

rho = 0.307). For the sake of completeness, it should be mentioned how strongly the active imaginative creativity *Act* correlates with SE but also with SD (**Table 1** Act-SE $p > 0.001$, rho = 0.402; Act-SD $p = 0.002$, rho = 0.240).

Unfortunately, the lesson design was not yet suitable for providing students with more flow opportunities. Further development of both teacher training and curriculum is necessary to create a sense of coherence in the classroom, the fundamental of flow. For this, the significance of flow for productivity, well-being, and lifelong learning must be acknowledged. Several initial steps have been taken, and the fundamental concept of such a learning environment has been deemed feasible.

At this juncture, it is important to emphasise our recommendation of incorporating learning development meetings (instead of grades only) to foster students' self-efficacy and strengthen the student-teacher relationship through meaningful interactions [39, 42]. While the significance of these meetings in promoting EI at school cannot be understated, it is important to acknowledge that a detailed discussion of this topic falls outside the scope of this chapter. However, we strongly encourage educators and curriculum developers to consider the value and potential impact of such meetings when designing lesson plans to enhance EI in educational settings.

In summary, the Starwalker approach encompassed a comprehensive strategy to enhance EI and student empowerment within the educational landscape. By strategically cultivating self-efficacy and flow ability within a non-explicitly creative setting, we absolutely need further measurements to explain in detail this improvement. Central to this approach was the integration of vocabulary and reflection techniques aimed at fostering an understanding of emotions and needs, which formed the basis for developing empathy and effective conflict resolution skills, drawing inspiration from the influential work of Rosenberg [18].

Expanding beyond theoretical foundations, implementing the Starwalker approach involved reimagining the daily school routine as an action-oriented framework. This framework provided students with personal challenges carefully designed using the SMART concept. Disciplinary issues ceased as cohorts notably excelled in organizing school activities, collaborating with management, and notably graduating as the top performers in their schools. This shift necessitated additional training for teachers, enabling them to transition from conventional hierarchical knowledge brokers to tutors and facilitators.

By offering a secure framework for exploration and growth, the Starwalker approach cultivated well-developed EI among students and fostered an academic mindset alongside self-reflection skills. This combination empowered students to actively shape their own lives, becoming active participants in their learning journey and embracing a sense of ownership over their educational experiences [43, 44].

Notably, implementing the Starwalker approach did not impose additional courses or assessments on students. Instead, it called for a paradigm shift in the instructional approach, emphasising the pivotal role of teachers as facilitators of student-centred learning. Through this transformative process, teachers experienced the gratification of witnessing their students' engagement and academic success, as the educational process returned to its rightful place at the heart of the classroom.

The Starwalker approach represents a compelling paradigm in education, blending theoretical insights with practical implementation strategies. By nurturing EI, an academic mindset, and self-reflective abilities, it offers a promising pathway to empower students and optimise their educational outcomes.

3. Igniting success: the key role of emotional intelligence in education for paving the way for lifelong learning

In the presented project, teachers underwent specialised training to cultivate a teaching style that fostered empathic communication, facilitated self-reflection, and guided students in setting and assessing goals using the SMART criteria [40]. This innovative approach was seamlessly integrated into everyday instruction. The results obtained from the project revealed a remarkable response from students, as they experienced heightened self-efficacy and entered a state of flow, characterised by deep engagement and performance. These outcomes provide compelling evidence that this particular teaching approach effectively nurtures the development of students' EI.

The cultivation of EI holds immense significance in the realm of education and schooling. It equips individuals with the necessary tools to understand and effectively manage their own emotions, paving the way for enhanced self-regulation and sound decision-making. Students with well-developed EI are better equipped to cope with stress, regulate their impulses, and maintain an unwavering focus on their academic goals [45, 46]. Furthermore, EI empowers students with the ability to comprehend and empathise with the emotions of others, fostering positive relationships and facilitating effective teamwork. Students with EI excel in various areas, including effective communication, conflict resolution, and collaborative efforts with their peers. Moreover, EI serves as a vital catalyst for success in the professional world, where the ability to navigate complex social dynamics and engage in fruitful collaboration is highly prized [46, 47]. By prioritising the nurturing of EI within the educational framework, schools ensure that students are equipped to confront future challenges head-on and have a higher likelihood of achieving success both personally and professionally.

4. Conclusion

In summary, the presented professional development project not only demonstrated the effectiveness of a teaching approach that promotes EI but also highlighted its far-reaching benefits. Through the integration of empathic communication, self-reflection, and goal-setting practices, teachers skillfully nurtured the holistic development of students while effectively alleviating their own stress levels. The acquisition of EI not only enables students to thrive academically but also equips them with invaluable skills that transcend the classroom, empowering them to navigate the complexities of life with resilience, empathy, and a greater likelihood of achieving their aspirations. The skills of self-reflection and the experience of joy in

the classroom for both teachers and students can pave the way for students to cultivate a lifelong love of self-development and learning.

Acknowledgements

Conflict of interest
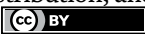
The authors declare no conflict of interest.

Author details

Cathérine Conradty* and Franz X. Bogner
University of Bayreuth, University Campus, Bayreuth, Germany

*Address all correspondence to: catherine.conradty@uni-bayreuth.de

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Chapter 7

Identifying Socioemotional Skills for the Digital Age: Foundations of an Early Childhood Literature-Based Program

Ma. Lovena Veladiez Moneva and Czarecah Tuppil Oropilla

Abstract

Rapid advancements in technology have changed the education landscape. Starting at a young age, individuals are exposed to new and emerging digital tools, requiring them to learn technical skills throughout their lives. The increasing digitalization of society also brought about new ways of expressing oneself and interacting with others. This means that learners should also be equipped with socioemotional skills to effectively navigate their environment. One of the challenges is identifying which skills should be included in learning programs. This chapter presents how we generated a roster of 12 socioemotional skills that we targeted when we designed a 10-week early childhood literature-based program promoting socioemotional development. We reviewed various research and policy documents from different institutions, taking into consideration socioeconomic as well as psycho-educational views.

Keywords: socioemotional skills, early childhood, curriculum, digital age, 21st-century skills

1. Introduction

1.1 Children and the digital age

The digital age has brought about profound changes in the environments in which children grow and develop, influencing their experiences, interactions, and development. While offering new opportunities for learning and socialization, it also presents challenges that require careful consideration and guidance from parents, educators, and policymakers.

Children now have unprecedented access to information through the internet [1]. This has implications for their learning, allowing them to explore a wide range of topics and gain knowledge beyond what is traditionally taught in schools. In line with this, children also now have access to a vast array of digital entertainment, including streaming services, video games, and interactive media [2]. This has changed the way children consume content and engage with entertainment, sometimes leading to

concerns about screen time and its potential impact on physical and mental health [3]. Additionally, social interactions have expanded beyond face-to-face interactions to include online communication through social media, messaging apps, and online gaming. This digital connectivity can not only provide opportunities for socialization but also pose challenges related to cyberbullying, digital etiquette, and online safety [4]. Through the internet, they can connect with peers from different parts of the world, fostering cultural awareness and a global mindset. As such, the digital age has exposed children to global issues and perspectives. However, children's privacy is a growing concern in the digital age. Online activities, social media usage, and interactions with digital devices can result in the collection of personal data. Ensuring children's privacy and teaching them about online security are important aspects of digital parenting, where parents must navigate decisions about screen time limits, online safety, and helping children develop a healthy relationship with technology. Balancing the benefits of technology with potential risks requires thoughtful parenting strategies [5].

The digital age has made digital literacy an essential skill for children. They need to be adept at using technology, navigating online platforms, and critically evaluating information. Digital literacy is crucial for academic success and future career opportunities [6]. Digital technologies have introduced new educational tools and resources, such as educational apps, online courses, and interactive learning platforms. These resources can enhance children's learning experiences and cater to individual learning styles.

Furthermore, the digital age has introduced new ways of learning, such as gamified educational platforms and virtual simulations [7]. These tools can enhance cognitive development by providing interactive and engaging learning experiences. On the other hand, the impact of screen time on children's physical and mental health is a topic of ongoing research and discussion [8–10]. Sedentary behaviors associated with excessive screen time, exposure to inappropriate content, and the potential for digital addiction are areas of concern for parents and educators.

While the digital age has introduced innovative approaches to learning, it is important to balance the use of technology with traditional pedagogical methods and to address concerns related to screen time, digital distractions, and the need for critical thinking in evaluating online information. The digital age promotes a culture of lifelong learning. Children are encouraged to develop a growth mindset and the skills necessary to adapt to a rapidly changing world, fostering a love for learning that extends beyond formal education.

1.2 Socioemotional skills for the digital age

This overwhelming array of digital technologies has substantial effects on children's development. Children's self-expression and social interactions are mediated by technology, living their lives both in the real and the digital world. This will continue throughout their lives, with technology becoming more and more present in learning spaces and years after, in their workspaces, too. For children to thrive in this changing society, they should be equipped with appropriate skills starting at an early age. This includes the appropriate and intelligent use of digital technology focused on conceptual and technical knowledge, which are already being integrated into pedagogical practices worldwide [11]. Often neglected, though, is the curricular integration of intrapersonal and interpersonal skills that children need to handle the effects of technology on their social and emotional well-being. It is therefore important to explicitly include these skills in the educational programs.

The first step for doing so is identifying which of these skills is important for the digital age so these can be considered in designing a curriculum program. These skills can be identified using different equally valuable perspectives: social-economic and psycho-educational views. The socio-economic view looks at the impact of skills development on society, considering the potential economic contributions of healthy and productive individuals. The psycho-educational perspective looks at the acquisition of socioemotional (SE) skills as crucial for human development and personal relationships. These are what we considered in choosing the materials that we reviewed for this chapter.

In this paper, we will describe how we identified the SE skills relevant to the digital age. The results of this analysis informed us on how we designed a literature-based program promoting socioemotional skills for preschool children (socioemotional skills for the digital age (SEDA) program).

2. Background of the research project: developing an early childhood program

Determining the relevant SE skills for the digital age was a crucial first step in the research project, "Reading in Early Childhood Settings: Promoting Socioemotional Development for the Digital Age" by one of the authors, Ma. Lovena Moneva. In this quasi-experimental study, the intervention group composed of 4- to 6-year-old children participated in a literature-based program implemented in Slovak Kindergarten schools. This program, which uses children's picture books, aims to promote socioemotional skills for the digital age (SEDA program). The first step for developing this program is to determine the scope of topics for the reading sessions.

Thus, it was crucial that we identify the SE skills that will be targeted in the program before choosing the learning materials and designing lessons. Considering that there is a plethora of SE skills that can be taught in the classroom, it was our task to choose and limit the skills to what are the most relevant.

The SE skills that we identified through the review described in this paper were used as lesson topics for the SEDA program. Weekly lessons using picture books that demonstrated each socioemotional skill were made and compiled into a manual that the teachers implemented in their classrooms [12]. Socioemotional skills, personality traits, home literacy environment, and story comprehension levels were gathered and compared before and after conducting the SEDA program [13]. The results of this research project will be published soon after.

3. The process of identifying socioemotional skills

We conducted a focused qualitative review of relevant policy documents, position papers, and research studies to identify relevant SE skills for the digital age. We have chosen literature from internationally recognized organizations because of their influence and impact on government policies which could potentially drive educational programs worldwide. We examined publications released by institutions focused on economic issues that explicitly mentioned socioemotional skills anticipated to be useful in the digital age or the twenty-first century. Aside from that, these publications have enumerated, through a framework or description in the text, a consolidated roster of multiple SE skills and not just focused on one skill.

These documents provided macro-level perspectives, looking at possible societal and economic implications of having these skills, and therefore, could be considered in developing educational programs that prepare children for the ever-evolving digital age. The publications we reviewed are from two international economic organizations—the Organization for Economic Cooperation and Development (OECD) and the World Economic Forum (WEF):

- PISA 2012 Results: Ready to Learn (Volume III) [14]

- Skills for Social Progress: The Power of Social and Emotional Skills [15]

- Social and Emotional Skills: Well-being, connectedness, and success [16]

- New Vision for Education: Fostering Social and Emotional Learning through Technology [17]

We also examined a widely used framework in educational contexts from the Collaborative for Academic, Social, and Emotional Learning (CASEL). This was chosen because this framework had been used and cited in numerous research on socioemotional skills in children:

- CASEL Framework that was developed in 1994 [18]

Lastly, we have also included the Big 5 Personality Traits, which have also been mentioned as the main framework in some of the abovementioned literature we reviewed:

- Big 5 Personality Traits [19]

3.1 Review of the selected documents

To provide a better picture of how this review was conducted, we will describe our process, discussing how we analyzed the documents until we generated the roster of SE skills relevant to the digital age:

The OECD identified different sets of useful SE skills in several of their publications. Because of their mandate, they framed socioemotional skills as crucial for economic growth for current and future societies. In OECD's analysis of PISA 2012 results [14, 20], they identified three socioemotional characteristics that promote better academic performance: *high levels of self-belief, motivation, and expectations.* Lastly, they have also identified specific skills that are drivers for lifetime success: *emotional stability, conscientiousness,* and *sociability* [21].

The OECD also developed two separate frameworks which enumerated skills that impact economic and social outcomes. First is the Framework for Cognitive, Social, and Emotional Skills [15]. From this framework, we extracted the social and emotional skills and subskills that they identified to impact economic and social outcomes:

- Managing emotions (Self-esteem, Optimism, Confidence)

- Achieving goals (Perseverance, Self-control, Passion for goals)

- Working with others (Sociability, Respect, Caring)

The second OECD framework is the Social and Emotional Framework [16] which was the foundation for their Survey on Social and Emotional Skills which they conducted at the beginning of 2023 [22]. This was based on an established framework Big 5 Personality Traits Model [19]: *Neuroticism, Conscientiousness, Openness to Experience, Agreeableness, and Extraversion.* In this OECD framework, broad categories and specific subskill were identified:

- Emotional regulation (Stress resistance, Optimism, Emotional Control)

- Task performance (Achievement Orientation, Responsibility, Self-control, Persistence)

- Open-mindedness (Curiosity, Tolerance, Creativity)

- Collaboration (Empathy, Trust, Cooperation)

- Engagement with others (Sociability, Assertiveness, Energy)

Aside from these five main skills, they added another category that involves a combination of the different skills:

- Compound skills (Self-efficacy, Critical thinking/Independence, Self-reflection/Metacognition)

The World Economic Forum or WEF [17], another international economic organization concerned with public-private partnerships, also enumerated SE skills. They have proposed that SE skills are the gaps needed for the twenty-first century and that these can be developed using technology and can determine success in school and eventually in the workplace. These include 16 skills for the 21st Century—6 foundational literacies (literacy, numeracy, scientific literacy, ICT literacy, financial literacy, and cultural and civic literacy); as well as 4 competencies, and 6 character qualities which can be considered socioemotional skills:

- Adaptability

- Initiative

- Persistence and grit

- Collaboration

- Communication

- Leadership

- Social and cultural awareness

The other three are cognitive abilities but are nevertheless related to SE development and are considered to also be important for the digital age:

- Critical thinking/problem-solving

- Creativity

- Curiosity

Aside from looking at SE skills using the lens of global and economic institutions, we also examined frameworks from a psycho-educational perspective. One widely used framework is from the Collaborative for Academic, Social and Emotional Learning (CASEL) [18]. The CASEL framework identified the following SE competencies needed to understand oneself and connect with others as well as to achieve personal goals and extend support to their communities:

- Self-awareness

- Social awareness

- Relationship skills

- Self-management

- Responsible decision-making.

Since its conception in 1994, the use of the CASEL framework expanded its reach when it was adopted by the UNESCO Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP) as a primary reference for its programs [23]. As a consequence of its popularity, several education programs assessed or designed their programs using this framework [24–27]. The original CASEL framework was not explicitly designed especially for the digital age but has since been updated to fit the rise of digital media use triggered by the COVID-19 pandemic when learning and work activities shifted to mostly online formats [28]. They reframed the skills that they identified to make it more applicable to the digital age wherein it considered the risks and opportunities that technology brings [29].

We extracted the socioemotional skills that were identified in each document and analyzed the definition and description of each term used. Based on the similarity and relationship of the constructs with each other, we matched and grouped the different terms used across the literature (See **Table 1**). There were times when the skills could clearly be matched with a concept from another source. However, there were also instances when a skill could be aligned to multiple terms. We described our analysis process in a subsequent section. In this review, we tried to capture as many related skills as we could but also, considering the fact that we must limit these concepts to fit 10 lessons for the literature-based program. Additionally, we have included empirical studies to establish the importance of these socioemotional skills to children in the digital age.

The initial list generated was included in an online survey distributed to kindergarten teachers in Slovakia between March and April 2022 [30]. This was done to seek validation for the relevance of each skill based on the teachers' perspectives. The development process of the online instrument and partial results are discussed in detail in a conference paper by Moneva [30]. This was modified and redistributed in July 2022, accumulating the responses from the first and second rounds. In one section of the survey, the teachers were asked to identify the top three socioemotional skills relevant to the digital age. Based on the results of the survey, "leadership" was initially

CASEL	PISA 2012	OECD framework for cognitive, social, and emotional skills	OECD Review of Longitudinal Studies	WEF Socioemotional Learning through Technology	Big 5 Personality Domains	OECD Renamed Big 5 plus compound skills (	OECD Big 5 plus compound skills
	Self-belief					Compound Skills	Self-efficacy
				Critical thinking			Critical Thinking/ Independence
				Problem solving			
Self-awareness							Self-reflection/ Metacognition
			Emotional Stability		Emotional Stability		Stress resistance
						Emotional Regulation	Optimism
Self- management		Managing emotions					Emotional Control
	Motivation	Achieving goals	Conscientiousness		Conscientiousness	Task Performance	Achievement orientation
							Responsibility
Responsible decision-making				Initiative			
							Self-control
				Persistence and Grit			Persistence
				Curiosity	Openness to experience	Open-mindedness	Curiosity
				Adaptability			Tolerance
				Creativity			Creativity

CASEL	PISA 2012	OECD framework for cognitive, social, and emotional skills	OECD Review of Longitudinal Studies	WEF Socioemotional Learning through Technology	Big 5 Personality Domains	OECD Renamed Big 5 plus compound skills (	OECD Big 5 plus compound skills
Social Awareness		Working with others		Social and cultural awareness	Agreeableness	Collaboration	Empathy
Relationship skills							Trust
				Collaboration			Cooperation
			Sociability	Communication	Extraversion	Engagement with Others	Sociability
				Leadership			Assertiveness
							Energy
	Parental Expectations						

Table 1.
Alignment of socioemotional skills for the digital age.

considered to be part of the roster of skills [30], but was eventually removed from the program because it had the least frequency count (f = 1) in the validation [13].

After the validation process, we were finally able to identify the SEDA skills used in designing the literature-based program:

- Self-awareness

- Managing emotions

- Initiative

- Responsible Decision-making

- Curiosity

- Creativity

- Adaptability

- Persistence

- Collaboration

- Communication

- Critical thinking and Problem solving

- Social and Cultural Awareness

4. Socioemotional skills for the digital age

In this chapter, we will discuss the socioemotional skills that we identified to be relevant to the digital age. Here, we describe how we matched the different concepts from the documents that we reviewed. Aside from that, we provided studies that support the importance of developing each skill in young children. Finally, we discuss why these skills are relevant to the digital age and throughout children's lives.

4.1 Self-awareness

In the CASEL framework, *Self-awareness* is defined by CASEL as *Self-reflection and Metacognition* (considered as a Compound skill) as defined by the OECD [21, 29]. In both definitions, these involve the identification of emotions, feelings, and thoughts. Both also mention an awareness of the self, including the processing of experiences or self-perception and awareness of their strengths and weaknesses.

Young children are capable of being self-aware, in that they recognize the changes in their emotions (e.g. from happiness to sadness) [31]. Improved emotional awareness among preschool children is associated with a decrease in negative behaviors [32]. By 36 months, children may reach the stage of "Norm and Reputation" when they are able to have strategies on how they present themselves to gain positive evaluations from others [33].

Digital technology has been a strong influence in shaping people's thoughts and identities. Social media, for example, shows people infinite possibilities of how they can live their lives. With the rise of "influencers" on the internet, children, who are at an impressionable age, are exposed to different lifestyles that may or may not be beneficial to them, depending on the content. This asks children to come back to themselves and reflect on who they are, how they learn, and what they can do despite external influences around them.

4.2 Managing emotions

Managing emotions is related to multiple concepts across the literature surrounding the regulation, control, and expression of emotions. In one of OECD's papers, they conceptualized this as *Emotional Stability* which is the opposite of the Big 5 Personality Traits *Neuroticism* which involves resistance to stress, emotional control, and optimism [19, 21]. CASEL touched on the same concepts and coined this as *Self-management*, but added concepts related to another skill that we also identified—*Initiative:* self-discipline, self-motivation, goal-setting, and organizational skills [18, 29].

Children express a variety of emotions triggered by different situations they experience. For example, joy, among others, is displayed when doing play activities, while anger is shown when something is taken away from the child [34]. Technology also elicits both positive and negative emotions in children [35]. The content that children consume, or their use of digital devices, may trigger not only anxiety and sadness, but can also elicit happiness and joy. The stimuli that trigger these various emotions change rapidly with the speed of technology, which is evident in the rise of short-form content on social media, for example. It is of course normal to feel a variety of emotions, however, children should be able to manage and regulate emotional arousal and expressions in socially acceptable ways. This skill impacts how children react and interact with others, thus affecting their relationships as well as their personal well-being [36].

4.3 Initiative

Initiative or *Taking Action* is related to other SE skills across the reviewed literature. This is considered a behavioral characteristic of *Self-Management* since it involves doing activities of one's accord [18]. This is also matched with the concept of *Self-efficacy* which involves skills such as engagement with others, emotional regulation, and conscientiousness and is therefore considered a *Compound Skill* [21]. Although this can be categorized in several different ways, in this review, we aligned it with *Task Performance (Conscientiousness)* which we conceptualized to be part of a process of starting an activity, which will eventually be implemented and completed [16, 19].

Preschool children who are classified to have high initiative levels understand the relevance of the activity, know the steps to be taken, have independence and fervor in accomplishing the task, and assess actions taken while doing the task [37]. Even when the activity is initiated by adults, preschool children are still able to assert themselves by asking questions, suggesting something new, challenging the ongoing interaction by putting forward new ideas, refusing ongoing tasks, and inventing new initiatives [38].

The multitude of choices presented in the digital age can be overwhelming. People can easily sit back and just be passive users of technology or consumers of content. However, to actively participate in the developments in society, people should have the initiative to participate and take action. Even at a young age, children can develop

the skill of initiative-taking by providing an environment that encourages them to try out things on their own. If children develop that courage, they can bring that confidence when they grow up when they face bigger and more complicated tasks.

4.4 Responsible decision-making

Responsible decision-making is defined by CASEL as the ability "to make caring and constructive choices about personal behavior and social interactions across diverse situations [18]". We related this with *Responsibility* which is part of *Task Performance (Conscientious),* therefore expanding the definition to being reliable, honoring commitments and being on time [16, 19].

This skill encourages children to reflect on the possible outcomes of actions taken and own the consequences of their actions. These characteristics are predictive of school and work outcomes beyond the preschool years [16]. This is particularly important in the digital age when children are given venues to express themselves and interact with others. Without proper monitoring from responsible adults, children can create multimedia content that may be harmful to themselves or others, for example. Children who are not aware of the possible effects of their actions (e.g. negative online feedback or sharing of private information) may experience its negative impact when it is too late. Therefore, children should be able to learn how to discern between options and choose the best choice considering possible consequences.

4.5 Curiosity

Curiosity is a skill that is categorized under *Open-mindedness (Openness to experience)* and is defined as the "interest in ideas and love of learning, understanding and intellectual exploration [16, 19]". For Dewey, curiosity is manifested in different ways: physical, social, and intellectual [39]. This is evident in the preschool classroom, too. That is—First, *physically* by manipulating objects to discover the objects' properties. Second, *socially* when the child needs more explanation about a phenomenon, by seeking answers from others. Finally, *intellectually*, when the children inertly become interested in understanding their environment. In a study with about 6200 kindergarten children [40], it was found that curiosity is significantly associated with reading and mathematics academic achievement. This is mediated by the children's socioeconomic status, which suggests that curiosity may be enhanced by having access to more enriching environments.

Digital technology gives children access to massive volumes of information available at their fingertips. If taken advantage of properly, available information could feed into children's curiosity, which increases their understanding of the world. This also opens children to different perspectives from those who have different backgrounds and perspectives, facilitating an exchange of ideas that happens in the digital space and the real world. Fostering curiosity through exposing children to new experiences and encouraging children to seek answers contribute to careers chosen in the future [41].

4.6 Creativity

Creativity is mentioned by the WEF and the OECD as an important SE skill. This was classified under *Open-mindedness (Openness to Experience)* and is defined as "generating novel ways to or think about things [17, 19, 21]". Children's creativity is

influenced by their innate characteristics. It was found that courage and confidence are positively related to children's creativity [42, 43]. This can be nurtured by providing a non-intimidating and encouraging environment where children can experiment and discover new ways of doing things. An environment that allows children to participate in play activities, particularly in social play where children talk and interact with each other, is also associated with the development of creativity [44, 45].

Creativity is related to making innovations, which is useful in the digital age when there is constant development of new technology. In an increasingly progress-driven world, creating things outside of what already exists is given much value. Emerging digital tools in multimedia and computer programming, for example, give opportunities to generate and actuate innovative ideas, and this should be taken advantage of. There are even specialized platforms and devices that allow children to use technology to create things. These new developments will continue into the future; therefore, children must be enabled to think outside what already exists, a skill that will be useful in school and at work.

4.7 Adaptability

Adaptability was defined by Thomas and Chess as "the extent to which a child responds to changes in the environment [46]". They classified children according to temperaments, from "easy" to "difficult". One of the characteristics of an "easy" child is being very adaptable. In our review, this skill is demonstrated by children through the ability to practice both flexibility and structure, adjusting to different situations effectively [17]. This can be related to *Open-Mindedness (Openness to Experience)*. Aside from adapting to the environment, this skill also entails the ability to work with different people and is therefore related to the concept of *tolerance* [16, 21]. Higher levels of adaptability in children as early as 6 months old are associated with social outcomes and academic achievement during primary school [47].

Due to the fast-paced developments in technology, new and better digital and non-digital tools shape people's realities. These developments that emerge in shorter gaps in time demand people to possess the skill of *adaptability* so that they can easily adjust to new environments. At an early age, children should learn how to respond to the use of new tools and adjust to unfamiliar situations effectively. It is a skill that will be useful throughout a person's life as the environment will continue to change because of technological advancements.

4.8 Persistence

Persistence, which is defined as the ability to continue doing tasks until they are done, was mentioned by the WEF and the OECD as an important skill to possess in today's society [16, 17]. This is categorized under *Task Performance (Conscientiousness),* and it involves the completion of an endeavor. The effects of having persistence in accomplishing tasks are evident even in kindergarten children. Children with higher levels of persistence have greater language and mathematics skills than children who are less persistent [48]. The effects of persistence at preschool also extend even to adulthood and were found to be a strong predictor of academic achievement at age 21 and of college completion at age 25 [49].

Innovations that the digital age presents, although generally positive, also present new tasks that might not have been dealt with in the past, and therefore, challenges and failure are possibilities. New technology has increased the speed and efficiency of

systems and processes. Though this contributes to general productivity, this pace may also cause frustration when things do not work.

To effectively face the new challenges in the digital age, people must continue until a task is accomplished. Children who are used to the high efficiency and high speed of the digital world may feel frustrated if things do not work as they should, especially since they can easily quit in the middle of the process. Thus, children must develop persistence and determination in completing tasks and be prepared to face the obstacles that will come along the way.

4.9 Collaboration

Collaboration, which is defined as working with someone to achieve something, was matched with *Working with others* and *Cooperation* [15–17]. This was classified under the *Agreeableness* of the Big 5 Personality Traits [19]. In the OECD literature, Collaboration involves other SE skills involved in effectively interacting with others such as *Empathy* and *Trust.*

Collaboration among preschool children has been found to contribute to positive school performance. Children who worked in pairs tended to have higher learning gains compared to children who worked alone [50]. This interaction benefitted both high-achieving and low-achieving children in a dyad. In another study, peer support, which is shown through assisting and encouraging their classmate, is associated with children's math performance [51]. This shows that giving preschool children the opportunity to work together towards a goal is beneficial for their social and cognitive development.

The world is more connected now than ever before, and there are plenty of ways where people can engage in collaborative activities. Digital technology and the internet provide opportunities to work together, closing the distance between people. As systems become more complex and global, there is a demand to collaborate and coordinate efforts to be able to effectively function in society [52]. There are digital tools available that allow people to share digital workspaces where people can work on the same projects. Numerous online platforms give people a venue to build on each other's ideas to solve and create complex products and solutions. At a young age, children, therefore, should be equipped with the skills to work with others both online and in the real world.

4.10 Communication

Communication is a skill that has been related to several concepts in the documents that we reviewed. Based on the WEF Framework of twenty-first century skills, *Communication* involves creating a language-rich environment [17]. In the OECD Framework of Social and Emotional Skills, *Communication* is related to *Sociability* under the bigger umbrella of *Engagement with Others (Extraversion)* [16, 19, 21]. In the CASEL Framework, communication is part of *Relational Skills* [18].

Being able to communicate ideas, needs, and wants reflects social and cognitive abilities. Children's language and communication abilities were negatively associated with behavioral problems and impulsivity [52, 53]. On the other hand, children with higher communication skills were found to be more reflective and tend to think before acting. These may contribute to the social acceptance of adults and peers [54, 55], which aids in building relationships.

The flow of communication has become effortless, instantaneous, and personal because of the availability of Internet mobile devices, such as cell phones, tablets, and

laptops. However, even with this availability of channels, effective communication entails a clear message that will reach the intended audience. This involves not only skills in articulation and expression, but also skills for proper social interaction, all of which should be learned at a young age.

4.11 Social and cultural awareness

Social and Cultural Awareness, as described in WEF's framework and the CASEL Framework (as Social Awareness), is a skill that fosters respect, tolerance, empathy, perspective-taking, and cultural self-awareness [17, 28]. Because of this definition, this was aligned with *Empathy* from OECD's Social and Emotional Skills Framework, which is under the concept of *Collaboration (Agreeableness)* [16, 19].

Exposing children to cultures and languages different from their own increases their openness to diversity [56]. This does not happen overnight, though, because for preschool children to effectively develop positive attitudes towards people outside their group, they should be exposed to other cultures for an extended period [57]. However, teaching children about diversity is not always easy. In many cases, young children might not have the chance to immediately encounter people outside their local communities. Acceptance of other cultures is also highly influenced by the attitudes of the families, teachers, and schools [58]. This means social and cultural awareness begins with the people around children since they transmit their attitudes towards diversity.

There is an increasing need for social and cultural awareness as the world becomes more global, which is apparent in industries and institutions. Because of the global economy, people have become more mobile and have the chance to travel to different places and experience different cultures. Also, as people expand their social circles throughout their lives, they will inevitably meet people with different backgrounds. Having the awareness that people have similarities and differences in appearance, customs, and beliefs is an important skill that will hopefully foster mutual respect.

4.12 Critical thinking and problem solving

Critical thinking is the ability to analyze a situation and to use that knowledge to think of ways to apply another skill, *Problem Solving* [15–17]. These two, although at first glance are more related to thought-processing rather than socioemotional competencies, were included in our list because they interact with other skills we previously discussed. These two skills are crucial to the digital age since they are used not only in dealing with more cognitive processes but also in assessing social situations and interacting with other people.

First*, Critical thinking is* the most important skill that could be learned in school [59] and therefore, many pedagogical techniques are employed to develop this skill. In the preschool classroom, critical thinking is promoted by using questioning techniques, inquiry-based techniques, and story-based approaches during instruction [60]. In the digital age, there is an abundance of sources of information about anything in the world, and these are available at the click of a button. The challenge that children now face is to filter the information to what is truthful and useful. This is where critical thinking comes in as children should be able to evaluate information that they encounter by encouraging them to ask questions themselves.

Next, *Problem Solving* is a skill that continues to be important throughout an individual's life in dealing with challenges encountered every day. Various classroom activities could help foster the problem-solving skills of children. This includes direct

instruction of step-by-step procedures for dealing with problems, reading story books that target problem-solving skills, and embedding opportunities throughout the classroom routine for children to solve problems on their own [61–63]. New and complex challenges will certainly arise considering the fast changes in the environment. Giving children opportunities to figure out problems on their own and allowing them to try out different solutions will give them the confidence that they need to solve bigger challenges in the future.

5. Conclusion: socioemotional skills for the digital age

In this chapter, we have outlined the process of identifying socioemotional skills relevant to the development of learning programs for young children. In doing so, the identified SE skills were also expounded on in light of their importance, impact, and relevance in the digital age.

The rapid pace of technological advancements requires individuals to adapt to changes quickly. The digital age is characterized by information overload and complex challenges. Critical thinking and problem-solving skills are crucial for analyzing vast amounts of information, making informed decisions, and solving complex problems in various domains. Skills like adaptability and flexibility enable individuals to learn and adjust to new technologies and ways of working. Creativity and innovation skills are essential for generating new ideas, solving novel problems, and thinking outside the box in a digital environment.

The previous subsections showcase SE skills as highly applicable and beneficial for lifelong learning. As individuals navigate their educational journey and beyond, these skills contribute to a never-ending loop of personal growth, adaptability, and success in various aspects of life: Lifelong learners—going beyond the youngest through the oldest in the human lifespan—who are self-aware understand their strengths, weaknesses, and areas for improvement. This awareness allows them to make informed decisions about their learning goals and strategies. Lifelong learners who can manage their emotions effectively are better equipped to persist through challenges and setbacks instilling how emotional regulation is crucial in handling the ups and downs of the learning process. Lifelong learners also take the initiative in identifying new areas of interest, setting goals, and pursuing continuous learning opportunities. Initiative is essential for staying curious and engaged throughout one's lifetime. Lifelong learners make responsible decisions about their learning paths, balancing immediate desires with long-term goals. This skill is vital for navigating the myriad of choices available in the modern learning landscape. Making responsible decisions goes hand in hand with being curious, as individuals who maintain a curious mindset seek out new information, explore diverse topics, and remain open to continuous intellectual explorations, making it one of the driving forces behind lifelong learning. Much in the same way, lifelong learners approach problems with creativity and innovation. They see learning as a dynamic, evolving process and find novel ways to connect and apply knowledge across various domains. Furthermore, lifelong learners embrace change and are adaptable to evolving technologies and learning environments. They readily adjust their learning strategies to suit new contexts and demands. The digital age requires lifelong learners to take initiative, be proactive, and make responsible decisions independently. This includes ethical decision-making in the context of technology use and data privacy.

Lifelong learning is a journey that involves overcoming obstacles and persevering through challenges. Facing setbacks and challenges is inevitable in the digital age.

Persistence allows individuals to continue learning, despite difficulties or initial set-backs. Many tasks in the digital age are collaborative, requiring effective teamwork. Skills, such as collaboration, empathy, and conflict resolution, are vital for successful team interactions, whether in physical or virtual environments. The global nature of digital interactions makes social and cultural awareness crucial. Understanding diverse perspectives and cultural nuances is important for effective communication and collaboration in a connected world—contributing to one's profile of being a lifelong learner.

The skills identified in this chapter are what are also known as soft/transferable skills which are given high value by employers [64, 65]. These soft/transferable skills are also said to enhance employability upon graduation, whether a graduate chooses to delve into different industries or businesses or take the academic route [65]. However, in recent years, employers have reported that graduates are more and more lacking in soft/transferable skills upon graduation [66]. While researchers are pointing towards individual self-awareness and personal literacy of the graduates, or what they call "graduateness" [67–69]. Kemp and Seagraves pointed out that educational institutions must also be more intentional and deliberate in developing these skills [70], starting from the youngest learners.

We highlight these SE skills as relevant to developing curricula, teaching programs, and materials for learning and development. Curriculum development across the human lifespan should not only consider the evolving needs, capacities, and contexts of learners at different stages of life, but also consider what society needs at a certain point in history. Integrating SE skills into the curriculum is crucial for fostering holistic development and preparing individuals for lifelong learning. Incorporating activities, games, and teaching strategies that focus on these SE skills in the kindergarten curriculum (and beyond) can contribute significantly to the holistic development of young children, preparing them for future academic and social challenges.

By integrating and honing these SE skills, individuals are better equipped to embark on a lifelong learning journey. These skills not only enhance the learning process itself but also contribute to personal fulfillment, career success, and meaningful engagement in an ever-evolving world. They enable individuals to adapt to new opportunities, stay motivated, and continuously grow throughout their lives. It is important, therefore, to create supportive environments where individuals can have various learning opportunities that help them develop in all domains. A holistic approach to education and personal development, including cognitive, emotional, and social aspects, can help mitigate these potential risks and promote a well-rounded set of skills in individuals. Additionally, providing children guidance on ethical behavior, resilience, and balanced self-perception is essential in addressing these potential challenges.

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Conflict of interest

The authors declare no conflict of interest.

Author details

Ma. Lovena Veladiez Moneva[1*] and Czarecah Tuppil Oropilla[2]

1 University of Trnava, Slovakia and University of Basel, Switzerland

2 Western Norway University of Applied Sciences, Bergen, Norway

*Address all correspondence to: loviemoneva@gmail.com

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Section 4

Vocational and Work Training in Future Education

Chapter 8

Embedding Entrepreneurship Mindset in Lifelong Learning Activities for the Pursuit of Eudaimonia

Styliani Giossi and Achilleas Gkamanis

Abstract

Leaving apart the traditional idea of entrepreneurship of starting a business and enhancing the aspect of recognizing and taking advantage of any chances, this constitutes the starting point of pathways of lifelong learning not only for gaining skills and competences but also for being in touch with eudaimonia (happiness). Entrepreneurship mindset liberates and enhances the emancipation of adult learners and helps them to their transformation of becoming lifelong learners who enjoy any learning activity where their imagination and creativity flourish. Active citizenship, respect to other people's rights, uniqueness and diversity, collaboration and sensitivity to sustainability, digitalization and green transition as well as lifelong happiness could be parts of their orientation towards their participation in learning activities. Thus, unlearning and relearning as well as upskilling and reskilling do not refer only to the workplace but to the whole journey of their life. The recognition and exploitation of opportunities to participate in learning activities as an imprint of the entrepreneurial mindset was not recognizable by the research participants. Adult learner transformation where liberation and emancipation empower the gaining of entrepreneurial skills could be a pathway to eudaimonia.

Keywords: entrepreneurship, lifelong learning, adult education, learner emancipation, eudaimonia

1. Introduction

Scholars over the years have developed many theories for adult education and the adult learner which try to elaborate on the reasons why learning is important for adult's identity, and it is different at various ages, from early adulthood to old age as well as references on its benefits to the quality of whole life. These theories stress the content, dimensions, types, barriers and the evaluation of learning, different pedagogical approaches, the adult learner and the role of the adult educator, lifelong and life-wide learning. Even though more emphasis is given to competencies

and furthermore, on the key competence of entrepreneurship, which constitutes one of the eight key competencies of the European Reference Framework for Key Competences for Lifelong Learning [1, 2], there are no studies to analyze the value of entrepreneurial mindset beyond the expected outcomes of any structured learning activities and particular to learner's happiness.

The transition from adult education to adult learning and then to lifelong learning has been favored by the majority of international entities such as United Nations Educational, Scientific and Cultural Organization (UNESCO), Organization for Economic Co-operation and Development (OECD) and International Labour Organisation (ILO) as well as the political and economic orientation of the European Union towards creating job opportunities and empowering citizens to acquire marketable skills shed light to key competences of lifelong learning. Furthermore, the transfer from adult education to lifelong learning implies, in the light of responsibilities, the shifting from the state to individuals and has accelerated the growth of the framework of competences which is associated with the individuals' empowerment.

The two Recommendations of the European Parliament and the European Council, dated 18 December 2006 and 22 May 2018, on key competences of lifelong learning [1, 2] make apparent that entrepreneurial spirit is remarkable and important. That is why European strategies recommend entrepreneurship education at all levels of formal education, the primary, the secondary and the tertiary.

The comparison of these two recommendations in terms of the key competence of entrepreneurship, which in the first document is mentioned as a sense of initiative and entrepreneurship and in the second as entrepreneurship competence proves the evolution of the meaning of lifelong learning and, thus, in the end, lifelong learning can be characterized as the symbol of growth for the future of Europe [3].

The term competence includes ability and adequacy, and in case of entrepreneurship, competence involves a set of skills such as taking the initiative, critical and creative thinking, problem solving, making decisions, communicating and collaborating with other people, taking risks, working in uncertain conditions, managing time, diversity and emotions and having courage, patience, persistence and self-discipline. The entrepreneurial mindset has a broader meaning as it includes a set of skills that enable people to identify and make the most of opportunities, overcome and learn from setbacks and succeed in a variety of settings [4].

The objectives of this study are to investigate the meaning of learning for adults with a focus on the value of adopting an entrepreneurial mindset and how lifelong learning activities can help on the path to happiness. This study aspires to make evident the value of the entrepreneurial mindset, stress its value to lifelong learning activities and highlight its importance on the eudaimonia of the learner. It also pursues to stimulate discussion about the creation of learning patterns for the interpretation of the path to the learner's eudaimonia.

2. Adult education and adult learner

There are many theorists and philosophers who have researched and analyzed adult education, adult educator, adult learner, adult learning, learning and its process, lifelong learning and other types of learning, but this study selected only some of them that are considered more appropriate to the analysis of the issues involved to it, without underestimating the value and contribution of the rest.

The analysis of the purpose of education, the role of adult educators, and the way learning takes place seeks to outline the characteristics of the adult learner and the type of learning that can foster the development of an entrepreneurial mindset.

The response to the question of what is the purpose of education was given by many theorists. One of them claimed that the purpose of education is to foster self-actualization and democracy unit [5]. Learning can be facilitated through environments characterized by reciprocal empathy, conditionality, authenticity and flexibility to cover the demands of every learner and the correspondent educational system. Another response puts stress on education, which fosters the development of a higher level of thinking in individuals in a socio-cultural context [6], where they have the opportunity to learn their culture's ways of thinking and doing. Learning can be facilitated primarily through social interaction with more competent adults or peers who participate in the learner's experiences.

In an attempt to compare the two perspectives [7], both of them, Rogers and Vygotsky emphasized the learner's potential, especially in relationship with respect to the unique idiosyncrasy and interests of each learner. Teaching, in their view, should be flexible and adaptive to any new circumstances. One difference in the two views is that Rogers believes in society as a collection of individuals by highlighting individualism, whereas Vygotsky emphasizes the way individual emerges from and within the context of collective life. Both believe that relationships help individuals shape themselves and become more self-regulating.

Rogers' theory sees the teacher as the key role in the process of learning, not as a walking textbook transmitting its contents but as the facilitator of learning. In order to serve this role, he has to be himself, able to communicate and understand the student's feelings and their attitudes towards learning instead of judging and evaluating them. However, the facilitation of significant learning rests upon the attitudes and mindset that appear in the relationship between the facilitator and the learner [8]. Significant learning involves the whole person; it combines cognitive and affective-experiential elements; it includes self-initiated learning, independence, creativity, self-responsibility and self-reliance [9].

When the process of teaching-learning is based on the relationship between the facilitator and the students, students should participate by understanding the uniqueness, authenticity and empathy of the teacher, by responding to situations perceived as a problem and by following their natural motivation to learn [9].

Indeed, learning is not limited to the classroom and the relationship between the teacher and the students, but it has a significant role in everyday life even though it is not easily recognizable [10]. Thus, learning is both experiential and existential [11]. As our world is not a constant and unchanging place, there are always many chances to learn new things, find new explanations, acquire new knowledge and skills as well as to form and reform attitudes and behaviour. This makes apparent the need for lifelong and life-wide learning.

The holistic approach towards learning is captured by the following definition [12]: the combination of processes throughout a lifetime whereby the whole person – body (genetic, physical and biological) and mind (knowledge, skills, attitudes, values, emotions, beliefs and senses) – experiences social situations, the perceived content of which is then transformed cognitively, emotively or practically (or through any combination) and integrated into the individual person's biography resulting in a continually changing (or more experienced) person [12].

Congruent with this perception of learning is the transformative learning extensively developed by Jack Mezirow. Kitchenham [13] elaborated a review of Mezirow's

Transformative Learning Theory through which he explained the stages of transformative learning, the influences on the theory, transitions into the criticisms as well as the evolution and development of the theory. He concluded that transformative learning theory has been developed and will continue to influence adult learning praxis across different disciplines [13].

The two main influences on Mezirow's theory dealing with free thought, critical reflection, liberation and emancipation were Freire's [14] theory on conscientization and Habermas [15, 16] theory on the domains of learning.

Freire defined conscientization as 'learning to perceive social, political, and economic contradictions – developing a critical awareness – so that individuals can take action against the oppressive elements of reality' [14]. He argued that it is of great importance for teachers to form a transformative relationship between themselves and the students, students and their learning, and students and society. To Freire [14], education does not stop in the classroom but continues in all aspects of a learner's life, and this reveals his view towards lifelong learning.

At the 30th anniversary edition about the pedagogy of the oppressed, Freire [17] refused the idea of banking education where education is an act of depositing, the students are the depositories, and the teacher is the depositor. This kind of education makes students passive collectors and derives them from inquiry and praxis. According to his philosophy, knowledge emerges only through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry human beings pursue in the world, with the world and with each other [17]. Education that supports liberation leaves space for authentic thinking (thinking that is concerned about reality) and takes place through communication that gives meaning to human life.

The proposal of Habermas [15] in concern with the three domains of learning and the importance of people communicating with each other in an effort to come to a common understanding [16] has strongly influenced Mezirow. According to Habermas [15], the three domains of learning are the technical, the practical and the emancipatory. Technical learning is the learning that is rote, specific to a task, and clearly governed by rules; practical learning involves social norms, and emancipatory learning is introspective as the learner is self-reflective and experiences self-knowledge [13].

Mezirow [18] has changed the three domains of learning to instrumental, dialogic and self-reflective learning after expanding the view of perspective transformation by relating the emancipatory process to self-directed learning [13]. More precisely, when learners ask how they could best learn the information is instrumental learning; when and where this learning could take place is dialogic learning; and why they are learning the information is self-reflective learning.

It is evident that transformative learning is congruent with the learner's liberation, emancipation and critical and authentic thinking while it deals with the acceptance and the management of uncertainty. As uncertainty constitutes a critical issue of an entrepreneurial mindset, it is evident that transformative learning can lead learners to develop an entrepreneurial mindset.

3. Entrepreneurial mindset in lifelong learning activities

Even though there are many theories of entrepreneurship, there is not a single unified, widely accepted definition [19]. These theories describe entrepreneurship

differently in terms of change, risk, uncertainty, innovation, exploitation of opportunities, profit and other economic issues or concerning the traits, skills and personality of the entrepreneur.

The concern of this study is not to write down and describe the different approaches of the theories of entrepreneurship but to describe and shape the entrepreneurial mindset. For this reason, there will be no reference to the theories that have mainly economic content but to those that describe the act of entrepreneurship and the traits, skills and characteristics required to qualify someone as an entrepreneur. In this way, an attempt will be made to outline the entrepreneurial mindset.

Entrepreneurship competence refers to the capacity to act upon opportunities and ideas and to transform them into values for others. It is founded upon creativity, critical thinking and problem-solving, taking the initiative and perseverance and the ability to work collaboratively in order to plan and manage projects that are of cultural, social or commercial value.

Entrepreneurial mindset caters for the creation of a philosophy instead of combining different skills in a set. According to the Network for Teaching Entrepreneurship (NFTE) [14], a global educational nonprofit organization, the entrepreneurial mindset pairs traditional non-cognitive skills with the quintessentially entrepreneurial skills demanded by today's innovation economy [14]. After a lot of experience and research in teaching entrepreneurship, they have ended up with eight core domains as critical to developing an entrepreneurial mindset, which: future orientation, comfort with risk, opportunity recognition, initiative and self-reliance, communication and collaboration, creativity and innovation, critical thinking and problem-solving, flexibility and adaptability.

Some indicative examples of the theories of entrepreneurship that seem to have relevance to the acquirement of an entrepreneurial mindset, by leaving aside the creation of a new business and orientation to the exploitation of opportunities as the main characteristic of an entrepreneur, are the following:

- McClelland [20] (*he involves in risk taking and energetic activities, has responsibility, organizational skills, anticipation of future and his main motives are mainly the need for achievement and the need of power*)

- Kirzner [21] (*he is a decision-maker whose entire role arises out of his alertness to hitherto unnoticed opportunities*)

- Drucker [22] (*he searches for change, respond s to it, and exploit s it as an opportunity*)

- Stevenson and Jarillo [23] (*he pursues opportunities without regard to resources he currently controls*)

- Casson [24] (*he specializes in taking judgmental decisions about the coordination of scarce resources*) [19].

The perspective of the recognition and exploitation of opportunities consists of the main domain of instilling an entrepreneurial spirit in different lifelong learning activities.

Participation in any lifelong learning activities to develop some skills or even one of the skills included in the entrepreneurial mindset can become a strong stimulus for further participation. It can provide learners with the satisfaction of achievement, the first step to reaching happiness.

4. The concept and value of eudaimonia (happiness)

As change is the central reality in the current life, learning must be continuous [9]. The new era with technological changes and various social, economic and political changes creates an imperative to acquire new knowledge, new skills and attitudes compatible with the new circumstances. The acquisition of digital skills, green skills, and sustainability development skills is considered necessary. Skilling and reskilling, learning, relearning and unlearning are the only ways of survival in every aspect of life. Learning covers the lifespan and the three categories of lifelong learning, such as formal, non-formal and informal learning.

But the real meaning of learning has to exceed the gaining of knowledge, skills and attitudes and concern the learner as a whole person who is interested in having pleasure, satisfaction and happiness through every lifelong learning activity he decides to participate.

In Ancient Greece, the word eudaimonia was very popular and was translated in different ways. It is happiness that signifies a certain way of being and not of feeling, and is also another word for well-being. The philosopher Socrates (469–399 BCE) presented two equivalent principles of eudaimonia through which it is rationally required from each person to make his own happiness mirror his actions and pursue happiness in order to give fundamental consideration to his actions. Due to the emphasis given to virtue by Socrates, eudaimonia is closely connected to happiness, and thus, it could be identical to happiness as a part of happiness or instrumental for happiness [25]. Another Greek philosopher, Aristotle, stated that eudaimonia can be achieved when a person is excellent. Also, it can be considered a sort of happiness or blessedness that constitutes the best kind of human life. The Greek philosopher Epicurus believed that the main goal and the best good of human life is happiness and that it can be achieved from the absence of mental disturbances and physical pain and by the pursuit of pleasure and the elimination of anxiety.

Undoubtedly, the concept of eudaimonia (happiness) has timeless value, and it is still the basic pursuit of human beings over the years, but in the present with the perspective of the future, it is presented with the concept of well-being. It encompasses all aspects of life and all dimensions of lifelong learning. Indeed, it is a multidimensional concept, and this is reflected by the indicative conceptual clarifications in **Table 1**, which is based on various conceptualizations from the different editions of the International Encyclopedia of the Social and Behavioral Sciences.

Contemporary approaches to well-being are represented by the Agenda 2030 well-being and UNESCO's Sustainable Development Goals (SDGs).

The Organization for Economic Co-operation and Development (OECD) is an international organization having as its main goal to shape policies that foster prosperity, equality, opportunity and well-being for all (https://www.oecd.org). The OECD, through its project, the Future of Education and Skills 2030, with the aim to help education systems and students to their future, suggested the Learning Compass 2030. This compass defines the knowledge, skills, attitudes and values that learners

Concept and types of well-being	Authors	International Encyclopedia of Social and Behavioral Sciences
Well-being in Place It is a fluid concept that is place and time-dependent and defies specific definitions. It can be conceptualized through different theoretical foundations, including utilitarianism, the human needs perspective and the capabilities approach. It is connected to the rationale for societal and national well-being as well as global well-being	E.O. Onyango & J. Kangmennaarg	Second edition 2020
Well-being in the workplace It is connected to burnout as poor well-being leads to burnout due to personal and other factors	S. Sonnentag	Second edition 2015
Well-being at its simplest It is identified as a state of happiness, health and comfort understood and rooted in and achieved through an awareness of the self and the maintenance of balance and success	S.C. MacKian	Edition 2009
Social well-being It can be classified into three main lines where the core element is enjoyment or happiness • it is a specific emotional quality of feeling well • it is supra-term for positive emotions like enjoyment, pride, satisfaction, etc. • it is a multidimensional concept combining cognitive and emotional factors	T. Hascher	Third edition 2010
Well-being in the Self-Determination Theory (SDT) This theory is a motivational theory of personality, development and social processes that examines how social contexts and individual differences facilitate autonomous motivation and controlled motivation and in turn predict learning, performance, experience and psychological health. SDT proposes that all human beings have three basic psychological needs – the needs for competence, autonomy and relatedness – the satisfaction of which leads to effective functioning and wellness	E.L. Deci & R. M. Ryan	Second edition 2015

Source: https://www.sciencedirect.com/topics/social-sciences/wellbeing

Table 1.
Different conceptualizations of well-being.

need to fulfill their potential and contribute to the well-being of their communities and the planet. Accordingly, it pays attention to the teacher profiles/competencies (knowledge, skills, attitudes and values) needed to help students learn and improve their well-being and to the teaching curriculum [26].

The main focus of the curriculum is on embedding values and attitudes for shaping a better future by cultivating positive attitudes and values in a learning ecosystem.

The OECD, through the Learning Compass 2030, aspires to orient and prepare students for their future and well-being by suggesting they become change agents, where agency means to be responsible for having a positive impact on their surroundings and on their own well-being. This sense of responsibility covers their understanding

and interpretation of their and others' actions and feelings, the acceptance of diversity and individuality as well as the ability to shape the framework for achieving goals. The Learning Compass 2030 [26] stresses the development of transformative competencies, which include the knowledge, skills, attitudes and values students need to transform society and shape the future for better lives by creating new values, reconciling tensions and dilemmas, and taking responsibility.

In the same vein, the 2030 Agenda for Sustainable Development is based on UNESCO's Sustainable Development Goals (SDGs) adopted in 2015 to cover any aspect of human life, and these are (1) no poverty; (2) zero hunger; (3) good health and well-being; (4) quality education; (5) gender equality; (6) clear water and sanitation; (7) affordable and clean energy; (8) decent work and economic growth; (9) industry, innovation and infrastructure; (10) reduced inequalities; (11) sustainable cities and communities; (12) responsible consumption and production; (13) climate action; (14) life below water; (15) life on land; (16) peace, justice and strong institutions; (17) partnerships for the goals [27]. It is evident that the high value of well-being is included in the seventeenth sustainable goal.

As Education for Sustainable Development (ESD) is characterized as a key driver for achieving all the SDGs, a complimentary resource bank has been designed for educators, education planners and practitioners in order to offer them hundreds of pedagogical ideas for classroom activities and multimedia resources detailing how best to integrate ESD into teaching and learning [28]. From the two recent tendencies for fostering a better future and sustainability for all, well-being plays a crucial role in the better life of individuals, communities and the whole world.

5. Research methodology: design, data collection and findings

5.1 Research approach and design

The methodology of the present research study combines a literature review with a qualitative approach with an emphasis on observations and discussions with adult learners. The combination of the two qualitative methods was selected in order of perceptions, attitudes and skills of participants in lifelong learning activities, mainly with regard to their entrepreneurial mindset, to be investigated, studied and determined. Biographical interviewing was chosen as it constitutes a considerable source of information about the way people view their life history with the narrative to be regarded as fundamental to the creation of meaning [29]. The main question which addressed the narrative of the participants was 'Can you describe one of your learning activity to which you have chosen to participate by estimating that it would give you any kind of benefit?' The participants' responses to this question were expected to clarify the recognition of an opportunity and the exploitation of it to have a benefit of it.

The content and language analysis were used for the data analysis with the aim of a holistic understanding of the entrepreneurial mindset. The limited in number sample constituted candidate adult educators who are in their preparation for their entry into the labour market and study a subject relevant to electronic and new type of entrepreneurship.

In the present research study, the qualitative approach was selected as it is considered to be a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem or the complexity of a situation, where

data is collected mainly in the participants' settings and gives the opportunity to the researcher to makes interpretations of the meaning of the data quite often with a focus on individual meaning [30].

In addition, qualitative research can include comments by the researchers about their role and their self-reflection, and the specific type of qualitative strategy being used not easily used in other designs [31].

This research was conducted mainly by the following research questions:

1. When and how does learning take place in adult education?

2. What is the role of adult educator and adult learner?

3. What type of learning is appropriate for cultivating an entrepreneurial mindset in lifelong learning activities?

4. What are the concepts and the value of eudaimonia?

The appropriate literature review, the observations and discussions of participants in lifelong learning activities provide answers to the above-mentioned research questions.

5.2 Data collection

Data collection was based on a comprehensive literature review and the role of the researchers, the one as adult educator and the other as adult learner correspondingly. Therefore, on the one hand, it includes introspection on the path of self-awareness (knowledge of thyself) for one as an adult educator from teaching adults in praxis, and for the other as an adult learner and as an observer, whereas on the other hand, it includes observations and discussions with adult learners in a multiplicity of acts, actual moments and situations where the rich resource of learners' personal histories often emerges. Concerning the biographical approach of the present study, it is mostly aligned with the themes highlighted by Bornat [32], which are interactivity, subjectivity and structuring. In more detail, interactivity is represented by the collection of data through some kind of direct social interaction such as an interview or at least a face-to-face conversation. Subjectivity refers to the expression of the self, with an emphasis on feelings and emotions and the individual perceptions and understandings of situations and experiences. The structuring, either obvious or implicit, is connected to the means of direct questioning or the nature of individuals' own responses [32]. As this study is limited to specific issues, it is certainly necessary to do a great deal more research than it is currently receiving in order to understand the process of adopting an entrepreneurship mindset in all kinds of learning activities in both lifelong and life-wide contexts and how eudaimonia (happiness) can be achieved in lifelong learning activities.

A concise literature review, narratives about the learning activities of the 14 participants, some episodes of the teaching-learning process of the biography of the researcher acting as an adult educator and conversations with adult learners constituted the main resources for this research study. The sample consisted of 14 candidate adult educators who are prepared to join the labour market.

5.3 Research findings

The main purpose of adult education is to develop a relationship between the adult educator acting as facilitator of learning and the learners being aware of the significance of the role of educator and of their responsibility for their learning concerning their openness to new experiences and their problem-solving skills.

Based on this perspective, some learning episodes were designed in order for the identification of entrepreneurial skills to become possible. The core issues in the first episode for participants were to work in teams and analyze case studies of the real world in order to find solutions to the presented problem. The second episode was to undertake a project of their choice, which they will design and implement from the beginning to the end. The third episode includes conversations and discussions about their experience in the two episodes.

From the first learning episode, it was evident that all the participants found the correct solution to the problem they were assigned to solve. From the cooperative observation of the adult educator, the participants demonstrated skills such as communication and collaboration skills, critical and analytical thinking, exploratory and organization skills, and at the end, after the evaluation of their solutions, they felt satisfied with their achievement.

The second learning episode made apparent the difficulties faced by the participants. Ten out of 14 had very good ideas for the theme of their project; they took the initiative to start but delayed in finding the right team to carry out their plan. The majority of them collaborated in a good way almost throughout the whole process; they had appointed the team leader and shared responsibilities while developing a good relationship with each other. They completed their work in the scheduled time, and the team leader presented it to the plenary.

The set of skills presented were creative thinking and innovation, communication and collaboration, opportunity recognition, initiative and self-reliance, time management, self-efficacy and comfort with the risk.

The other two participants showed the ability to create new ideas and recognized the opportunity to have new experiences; they did not take the initiative to form a team and preferred to operate individually. They had difficulty completing the project, and they did not seem happy with the whole process.

The set of skills presented were creativity, opportunity recognition, risk-taking, self-regulation, self-esteem and autonomy.

The last two participants had quite good ideas about the project and the way of its implementation, but they always asked for help and specific guidelines; they did not succeed in completing their project on time and feel disappointed for the whole process.

The set of skills presented were creativity, organizational skills, difficulty with uncertainty, low self-appreciation and discomfort from the risk.

In the third episode, fruitful conversations and discussions liberate the participants to express their feelings, and their obstacles to risk-taking and uncertainty management.

There were not simple talks that took place because a simple talk is not a way of communicating with others. The real communication takes place when someone asks a question, and this is a chance to hear him, to be in touch with him, to reveal what is hidden in our interpersonal relationships, to enrich our lives and to be in touch with what is universally true [33]. The experience of conversations can reveal

many things concerning the people present at the time it takes place, parts of their inner self, hidden and expressed emotions, their way of thinking and their culture and the way they choose to communicate. Furthermore, conversation is a meeting of minds with different memories and habits where participants not only exchange facts but also transform and reshape them and may create different implications and thoughts [34].

The conversations made clear that the main reason for the difficulty in risk-taking, uncertainty management and self-reliance was the lack of learning experiences based on self-regulated learning, the teacher-centred learning activities and the absence of entrepreneurship spirit.

The narratives of the participants made evident that the main motives for participating in various learning activities often were the acquirement of knowledge and skills, and they did not have in mind neither the perspective of the recognition and exploitation of opportunities nor the aspect of well-being.

The type of learning and the conceptualization and value of eudaimonia emerged from the literature review. Transformative learning seems to be appropriate for building an entrepreneurial mindset as it considers change and uncertainty precursors of learner transformation. Except this, any other type of learning which is learner-centred and offers openness to new experiences, opportunities for risk-taking, creativity and innovation, initiative and self-reliance, freedom to act and express emotions, and fosters liberation and emancipation could be a good choice.

6. Conclusions

Lifelong learning experiences constitute the main part of our real life whether they are intentional or accidental. Instilling the entrepreneurial spirit in them concerning the recognition of opportunities and the exploitation of them in action can help the learner's emancipation. In this vein, the purpose of education could be the facilitation of change and learning, as only the process of seeking knowledge gives a basis for security in an insecure world [8].

As the Learning Compass 2030 aims to help students orient themselves and navigate through uncertainty towards well-being for themselves, their community and the planet, the development of the entrepreneurial attitude is of great importance. The entrepreneurial mindset includes the development of vital skills such as self-management, familiarity with uncertainty, risk-taking, decision making and respecting failure as a prominent step to success. Apart from this, the orientation towards well-being in both an individualistic and a collective manner can enhance what Howard Gardener claims about the adoption of a collective well-being [35].

More precisely, he emphasizes the idea of converting our own sense of agency to a commitment to work with others for the common good under the provision of powerful educational supports that are available for the full spectrum of human beings and being able to help them achieve their full potential. He also highlights the consideration of circumstances and challenges of the present times where computational literacy is exposed, and relevant new techniques and technologies can be deployed [35].

Compatible to the Learning Compass 2030 is the Sustainable Development Goals framework, which is characterized as a rescue plan for people and the planet. It is

crucial for all to take responsibility for their and other's well-being and contribute the most to the sustainability of the whole world.

Taking into account that transformative competencies can be taught and learned in schools, in the family and in the community, during interactions with others, conversations, narrative and storytelling could be fruitful approaches to teaching and learning in accordance with the adoption of entrepreneurial mindset where the tendency of creating new value is apparent. It is also worth mentioning that one can teach what one does not know if the student is emancipated, that is to say if he is obliged to use his own intelligence [36].

Communication plays a vital role in active and transforming learning compatible with gaining an entrepreneurial mindset and other transformative competences and indeed, real conversations can enhance its outcomes. Considering conversation as a meeting of minds, the sparking of the minds can bring excitement [34] and maybe satisfaction and well-being.

In addition, the development of collective well-being could be the vehicle for the existence of eudaimonia based on ethical values where respect for the rights, needs and uniqueness of human beings encompass the whole lifelong and life-wide learning activities.

7. Research limitations, implications and suggestions for further research

There are limitations in this study, among which are the selection of some theories to support the assumptions, the opinions, the research questions, the arguments and the documentation of the research results. In addition, the limited number of learning episodes and discussions with learners as well as the selection of the particular sample, make difficult to cover all the issues concerning lifelong learning, the identification of entrepreneurial mindset and the eudaimonia.

This research study could be the trigger for many interested parties to design detailed curricula in programmes aiming at developing skills related to the entrepreneurial mindset.

The combination of lifelong learning with entrepreneurial mindset could stimulate the interest in a deeper and more detailed analysis with an interdisciplinary orientation and in the identification of a set of skills in congruence with the demand of green, digital and sustainability skills in current reality.

Finally, the development of other in-depth analyses as well as other qualitative and quantitative research studies would guide further research where comparisons and synthesis of multiple approaches would offer valuable and useful findings.

Author details

Styliani Giossi[1]* and Achilleas Gkamanis[2]

1 School of Social Sciences, Humanities and Arts, Department of Educational and Social Policy, University of Macedonia, Thessaloniki, Greece

2 School of Engineering, Department of Electrical and Computer Engineering, University of Patras, Patra, Greece

*Address all correspondence to: sgiosi@uom.edu.gr

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Lifelong Learning through Teacher Design Teams for Interdisciplinary Teaching in Secondary Vocational Education: The Perspective of Different Stakeholders

Tina Gryson, Katrien Strubbe, Tony Valcke and Ruben Vanderlinde

Abstract

Motivating students in general subjects within secondary vocational education poses a challenge for teachers. Flanders introduced Project Integrated General Subjects (PGS), an interdisciplinary course designed to tackle this issue. However, despite its establishment, the dynamic nature of both society and the vocational student population has made it challenging for PGS teachers to meet learning objectives and to motivate their students. Teacher Design Teams (TDTs) can be a valuable tool for promoting lifelong learning amongst PGS teachers through collaborative creation of curriculum materials. To examine how TDTs can be organised for this specific interdisciplinary course, five focus groups were conducted with PGS stakeholders. The results show the need for a long-term TDT programme with regular meetings in school-based TDTs, complemented by meetings in a networked TDT. The school-based TDTs design curriculum materials and the networked TDT provides teachers support through knowledge exchange and feedback. In the school-based TDTs, an internal coach takes a prominent role, whilst an external coach is present in the networked TDT. Teachers' autonomy and voluntary commitment, as well as the school management's support and trust, are essential. Finally, meticulous documentation of the TDT's progress and an online platform to share designed curriculum materials are recommended.

Keywords: teacher design teams, teacher as curriculum maker, vocational secondary education, interdisciplinary teaching, qualitative research

1. Introduction

This study endeavours to elucidate the desirable conditions of TDTs within the context of vocational education, with a particular focus on the interdisciplinary course Project Integrated General Subjects (PGS). In Flemish vocational secondary

education, the general subjects (languages, mathematics, sciences and social education) are clustered in the course PGS. Upon the establishment of compulsory education until the age of 18 in the 1980s, PGS became an integral component of vocational students' curriculum, aiming to furnish a meaningful framework for the general subjects [1]. PGS holds the potential to provide a relevant interpretation of the general subject matter by offering an integrated education through interdisciplinary teaching [2]. PGS's emphasis on twenty-first-century skills through interdisciplinary and project-based learning can also encourage lifelong learning amongst vocational students [2, 3]. Consequently, providing general subjects in a functional and interdisciplinary manner can enhance student motivation, thereby positively influencing learning outcomes [1, 4].

Nonetheless, Creten et al. [5], Van Praag et al. [6] and Placklé [7] indicate that PGS insufficiently succeeds in motivating vocational students for general subjects. Creten et al. [5] show that vocational students perceive the subject matter of PGS as little useful for their future life, which results in a lack of student motivation. Additionally, Van Praag et al. [6] point out that heterogeneity of classes in the vocational track is also detrimental to students' motivation. The student population is heterogeneous in terms of prior knowledge, level, interests and age [8]. Especially the differences in prior knowledge of general subjects are a challenge. Students with more prior knowledge, most of whom ended up in the vocational track after exclusion from other tracks, feel bored in PGS classes [6]. For these students, the content is too easy and often repetitive, which causes them to misbehave and disrupt classroom practices. Consequently, other students encounter difficulties in paying attention, which also reduces their motivation. Therefore, differentiated instruction is necessary for this track but frequently missing in practice [7].

PGS exhibits deficiencies not only in terms of student motivation but also regarding learning outcomes. In 2013 and 2022, the Flemish Government conducted a region-wide assessment research to examine if vocational students in the second year of the third grade met the attainment targets for the course PGS [9, 10]. The results of these assessment research studies indicate that PGS fails to achieve its objectives, as over half of the students do not meet the basic level for numeracy, reading and listening skills.[1] A follow-up investigation on the 2013 assessment research reveals that the PGS course struggles with a multitude of challenges intricately interconnected across various levels: the student level, the class and teacher level, the school level and the level of the Flemish education [8]. Consequently, numerous recommendations were formulated for the government, teacher training programmes, educational guidance services, school principals and PGS teachers. These recommendations consistently emphasise the need to prioritise the professional development of and collaboration amongst PGS teachers.

In conclusion, the advantage of the developed PGS is not yet reflected in the motivation and/or students' learning outcomes [5–10]. PGS teachers are key actors in providing a curriculum that motivates students and stimulates learning gains as they are expected to design teaching materials specifically for their student group [8]. Despite their good intentions, PGS teachers frequently fail to teach the course effectively [8, 11, 12]. Generally, this can be explained by the frequent lack of specific teacher training for the course as any teacher is allowed to teach PGS [12]. PGS teachers frequently acquire qualifications in specific subjects, inadvertently lacking

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[1] The four attainment target clusters were functional reading literacy (38% passed), functional listening literacy (39% passed), functional numeracy (39% passed) and functional information acquisition and processing (62% passed).

the comprehensive knowledge necessary for PGS and experience in teaching diverse and heterogeneous vocational student groups. Because of the complexity of PGS, the course is challenging not only for beginning teachers but also for more experienced teachers, making long-term professionalisation initiatives necessary.

According to the study conducted by Sierens et al. [8], Teacher Design Teams (TDTs), described as groups of teachers collaborating to design new curriculum materials, can foster cooperative efforts amongst PGS teachers and can converge a variety of expertise to design curriculum materials tailored to students. This suggests that integrating TDTs within the context of PGS fosters a culture of lifelong learning amongst teachers, enhancing their adaptability to the dynamic landscape of vocational education and its student population. Simultaneously, leveraging this acquired expertise, teachers actively engage in designing new curriculum materials for PGS, potentially boosting student motivation and elevating learning outcomes.

2. Theoretical framework

2.1 The purpose of the interdisciplinary course project integrated general subjects

The course Project Integrated General Subjects (PGS) integrates general subjects. Through interdisciplinary teaching, PGS tries to reflect the complex and all-encompassing reality [11]. Therefore, striving for real-life and problem-based learning is crucial as it not only motivates students but also fosters equal educational opportunities [12]. Fostering this is crucial, as noted by Van Houtte [13], given that students with a lower socio-economic status or immigration background are more likely to be tracked into vocational education. This underscores the disparities present in Flemish education. Therefore, PGS' main objective is empowering these often vulnerable vocational students to become self-reliant and resilient in society and (professional) life [1, 4, 11].

To meet this objective, project-based learning is used by teachers in PGS classrooms [11]. Project-based learning is an active and student-centred instructional approach which encourages autonomy and constructive collaboration towards a determined goal within real-world settings [14]. Additionally, PGS connects subject matter thematically to students' daily life and interests to make subject matter functional [4].

Research by Placklé et al. [15] focuses on the course PGS to investigate if vocational students' preferences on learning environments correspond with the beneficial conditions in the literature. Placklé et al. [15] synthesise the favourable conditions from the literature into the Model for Powerful Learning Environments in Vocational Education (PoLEVE). According to this model, the learning environment should align with the vocational students' needs. Learning tasks should be both authentic and challenging, with coaching, assessment for learning and differentiation serving as the foundational elements for adaptive learning support. Additionally, Placklé et al. [15] argue that there is an emphasis on cultivating twenty-first-century skills, including self-regulation, problem-solving and collaboration. These prerequisites should be integrated into a positive and safe environment, where students can confidently engage in their learning process.

The learning objectives for vocational students are determined by the attainment targets. These attainment targets are established by the Flemish government. The PGS attainment targets and curricula are intentionally designed to remain quite open and

flexible to realise lifelike learning, tailor-made to the students [4]. Whilst this flexibility grants teachers autonomy, it also results in vagueness and ambiguity, stemming from the multitude of potential directions they can explore whilst developing curriculum materials. Furthermore, customising curriculum materials for PGS to meet the unique needs and interests of specific student groups is essential. Consequently, modifications are often necessary to make these materials applicable to different student groups [11]. Therefore, a lot of engagement is expected from PGS teachers [4] and due to the complexity of the course and the student group, there is a high need for expertise in the course amongst PGS teachers [12]. Nevertheless, as evidenced by the 2013 assessment research [9], there exists a deficiency in the required didactic and multidisciplinary expertise amongst these teachers.

2.2 The basic principles of teacher design teams

A Teacher Design Team (TDT) can be described as 'a group of at least two teachers, from the same or related subjects, working together regularly, with the goal to (re)design and enact (a part of) their common curriculum' ([16], p. 215). Consequently, a TDT is a Professional Learning Community with a focus on (re) designing a curriculum [17]. This (re)designing can include various curriculum components: its scope can vary from single lessons to entire training programmes [18]. Working with TDTs is a long-term and intensive way of professionalising teachers, making it more likely to be effective [19].

According to Binkhorst et al. [17], a TDT has two main objectives: (1) The first objective is the design of new curriculum materials that are useful in classroom practice [17]. Teacher-designed curriculum materials provide a sense of ownership to the teachers and increase the effective use of these materials in class [20]; (2) The second objective is the professional development of the participating teachers [21]. By developing a new curriculum, teachers share their knowledge and skills, learn from each other and improve their classroom practice. A TDT can be organised as a school-based TDT with teachers from the same school or as a networked TDT with teachers from different schools [22]. In Handelzalts' [16] research, school-based TDTs were used to facilitate school-wide reform, with teachers actively engaged in shaping and designing these innovations. Networked TDTs have the advantage of enhancing the quality of professional development since teachers from different schools collaborate and knowledge is shared [22]. Both objectives of a TDT contribute to the ultimate goal of TDTs: the improvement of student learning outcomes [23].

The quality of both curriculum materials and professional development is influenced by various conditions. Binkhorst et al. [17] created a conceptual framework depicting important conditions of a TDT. These conditions are divided into three stages: (1) outcome, (2) input and (3) process. The (1) outcome stage encompasses the two objectives and results of a TDT. The conceptual framework's (2) input stage encompasses two distinct categories: individual conditions, which relate to the participating teachers, and contextual conditions, which relate to the participating school. The importance of teachers' autonomous motivation, their positive attitude towards reform and their design and teaching experience are pointed out as individual conditions. Amongst contextual conditions, the school's ambitions regarding the reform, teachers' commitment to this reform and the emotional and practical support for the TDT are considered important [17]. The (3) process stage relates to elements that characterise and impact the functioning of the TDT during its active phase. Important processes are constructive team interactions, determination of a common

goal and activities both inside and outside the TDT meetings. Binkhorst et al. [17] emphasise the central role of a team coach. The coach is the person who manages the processes within a TDT, without focusing on the content of the curriculum materials. Additionally, Binkhorst et al. [17] also note the practical organisation of a TDT as an important process factor. The choice for school-based or networked TDTs, the term of the programme, the group size and location, frequency and duration of the meetings all influence the quality of the professional development and the designed curriculum materials.

The successful implementation of a newly designed curriculum is more likely when it gains support, acceptance and legitimacy from the wider school team [18]. Emphasising this, Jonker et al. [18] highlight the crucial role of the TDT in actively cultivating support amongst colleagues teaching the same subjects within the department. Handelzalts [16] emphasises the crucial role of school principals as their involvement is important for the success of a TDT. The school principal must enable the organisation of a TDT and must provide support interacting with the TDT and aligning reforms within the TDT with reforms within the school.

2.3 Teacher design teams in vocational and interdisciplinary contexts

The use of TDTs in the specific context of the course PGS has not yet been investigated. Nevertheless, several studies have been conducted in similar contexts [24–26]. Research on TDTs in interdisciplinary and vocational education contexts provides interesting insights.

The PhD research of De Meester [24] examines how TDTs can be used to design new curriculum materials for integrated STEM (iSTEM) education. iSTEM stands for the integrated instruction of science, technology, engineering and mathematics. Its purpose is to demonstrate the interdisciplinarity of the subjects and to increase students' interest and understanding of STEM. PGS and iSTEM exhibit parallels as they both prioritise an interdisciplinary approach that encompasses various subjects. The iSTEM research mainly explored important stages and pitfalls during the design process and focused on strategies and learning gains of teachers who participated in a multidisciplinary TDT. In the research of De Meester [24], each iSTEM TDT involved teachers from different disciplines and an external coach. Each TDT engaged in cross-disciplinary discussions, formulated activating challenges for students and made meaningful connections across STEM disciplines. The research highlighted the value of TDTs for teacher education and in-service training. More specifically, the teachers engaged in these TDTs expressed their appreciation for the interdisciplinary collaboration and acknowledged learning gains. Amongst the participating teachers, there was an improvement in metacognitive thinking and a positive shift in their attitude towards problem-solving [24]. However, the study also illuminated certain pitfalls reported by teachers. These were related to reverting to a discipline-specific approach and creating practical activities with limited learning opportunities.

Albashiry's [25] doctoral research is situated in the context of Technical Vocational Education and Training (TVET) in Yemen. In many developing countries, exemplified by Yemen, there is a notable disparity between the scope of TVET programs and the demands of the labour market. As the purpose of TVET is to cultivate skilled workers to drive economic growth, this discrepancy is inherently paradoxical. This discrepancy is attributed to teachers' inadequacies in curriculum development and a deficiency in curriculum leadership amongst academic managers like heads of departments. In this regard, the context shows similarities with PGS—the context of

this study—as PGS aims to prepare students for their professional life [9]. According to Albashiry [25], teacher collaboration within design teams improves both the internal and external consistencies of the curriculum. Internal consistency relates to the coherence between different parts of the curriculum, whilst external consistency relates to the alignment of the curriculum with the labour market demands. External consistency is also stimulated by involving external stakeholders as co-designers [25]. Furthermore, Albashiry [25] shows that the professional development of department heads in systematic and collaborative learning approaches strongly supports collaborative curriculum design. This cultivates a deeper appreciation amongst department heads for a collaborative approach to curriculum design.

A case study of Placklé et al. [26] with pre-service teachers in their final year of PGS teacher education indicates the opportunities of TDTs for the course PGS. During their training, the pre-service teachers had to design curriculum materials according to the conditions of a PoLEVE and with the integration of vocational subjects in PGS [15]. To achieve this, research teams were formed with these pre-service teachers, a teacher educator, vocational subject teachers and PGS teachers [26]. The project illustrated the benefits arising from collaboration amongst diverse stakeholders in designing a curriculum. This joint effort not only entailed the collective responsibility of shaping Powerful Learning Environments in Vocational Education (PoLEVE) but also enhanced vocational students' learning via collaboration with various stakeholders. Through dialogue, stakeholders reached a collective understanding of PoLEVE, establishing a unified perspective and terminology [2]. A shared understanding of PoLEVE is crucial for enabling its design. Moreover, the collaboration in research teams generated continuous learning for pre-service teachers, in-service teachers and teacher educators.

3. Method

3.1 Research goal and research questions

As the existing literature (e.g. [17, 23]) on TDTs shows, several conditions influence the functioning and outcomes of TDTs in education. Research (e.g. [18, 27]) shows the promising conditions for Teacher Design Teams but is often conducted within the context of higher education or ICT implementation. The research reported in this article explores promising conditions of successful TDT approaches in the context of vocational education by examining the perspectives of multiple PGS stakeholders. Consequently, the research question tackled in this article is: 'Which conditions are desirable for the implementation of TDTs within the context of the vocational education course PGS?'

3.2 Research context

This study is conducted in Flemish vocational secondary education in the context of the course Project Integrated General Subjects (PGS). Flemish secondary education is divided into three grades, each lasting two years. In the second and third grades, students choose a field of study in one of the four tracks. Ranked according to the decreasing importance of theory and the increasing importance of practice, these four tracks are 'general education', 'art education', 'technical education' and 'vocational education'. Flemish education is often referred to as a 'cascade system' [6].

This means that many students usually start their educational career in the general track, which has the highest social status due to the high degree of theory [28]. Over time, some students drop out and move to less theoretical and thus less valued tracks. Consequently, attending the vocational track is rarely a positive choice and often feels like a failure to the students [6]. This presented context is also reflected in the course PGS, where heterogeneous class groups differ in terms of motivation and prior knowledge.

3.3 Data collection

Five focus groups were organised with diverse PGS stakeholders: six pedagogical counsellors (focus group 1), six teacher educators (focus group 2), three education inspectors (focus group 3) and four and five teachers (focus groups 4 and 5, respectively). These stakeholders were chosen because they encounter the vocational track and PGS in daily practice. Therefore, they can advise on the conditions of TDTs for PGS. Audiovisual focus groups were organised online[2], offering similar data as physical focus groups [29]. The focus groups were conducted in May and June 2020 and lasted between 70 and 88 minutes. All participants agreed with the informed consent obtained in advance.

Based on the literature, four overarching components are deemed adjustable factors to consider when organising TDTs. These components are (1) organisational structure (school-based or networked TDT), (2) composition of the TDT, (3) term, frequency and duration and finally (4) guidance and support. (1) Organisational structure pertains to the formation of TDTs with teachers from the same school (school-based TDT) or teachers from different schools (networked TDT). For example, Handelzalts [16] focuses on school-based TDTs, whilst Binkhorst [17] concentrates on networked TDTs. (2) Composition of the TDT addresses which teachers or participants should be involved in a TDT. Binkhorst et al. [17] demonstrate in the integrated conceptual framework that the members of a TDT and their characteristics are crucial for the TDT outcomes. Therefore, the selection of who participates in a TDT is significant. For (3) term, frequency and duration, it was again established in the integrated conceptual framework of Binkhorst et al. [17] that the way the TDT is organised is an important consideration. Finally, (4) guidance and support were derived as the last overarching component from the literature for various reasons. Firstly, it is evident in the integrated conceptual framework of Binkhorst et al. [17] that the coach plays a crucial role in supporting the TDT. However, a broader component 'guidance and support' is chosen, as Handelzalts [16] also emphasises the significant role of the school principal in supporting the TDT. Additionally, Jonker et al. [18] demonstrate that support from colleagues teaching the same subjects within the department is also necessary for the functioning of the TDT.

During the focus groups, a brainstorming exercise was used as an active technique to collect data [30]. During the brainstorming exercise, a basic setup of a TDT was presented which contained the four components: '*Two PGS teachers (composition of the TDT) from the same school (organisational structure) and a coach (guidance and support), who guides and supports, meet monthly for a full school year in a TDT (Term, frequency and duration)*'. The participants received individual time to think about the desirable adjustments to enable TDTs in the context of an interdisciplinary course, exemplified by the course PGS. Afterwards, the participants shared and discussed

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[2] Following the COVID-19 measures, the focus groups were conducted online.

about how they would organise TDTs within the context of the course PGS. In this process, consensus was always sought between the participants of each focus group. To ensure clarity of ideas, the focus group moderator documented each idea per component on a shared document. Before this brainstorming exercise, the participants were asked how they would define TDTs. Afterwards, schematic representations of TDTs were presented so the concept was unambiguous.

3.4 Data analysis

A qualitative research approach was adopted in this study [30]. Firstly, the recordings were transcribed verbatim to enable coding and interpretation of the data. Subsequently, an iterative coding process unfolded across three rounds. In the first round of coding, in vivo codes, in the language of the participants, for TDTs and the course PGS were drawn up. In the second round, the codes were related to each other and merged into categories. This second round led to a summary report of each focus group with a focus on the developed categories and was sent by email to the participants to obtain their feedback and agreement with the summary. Asking the participants for feedback leads to member checking and has the purpose of ascertaining whether the participants agree and whether adjustments need to be made to the summary [31]. Apart from a few additions, nobody disagreed. Finally, during the last round, patterns were searched and the focus was put on the matching and complementary elements that were raised by the different stakeholders. The perceptions of the different focus groups and consequently stakeholder groups were linked in this way. During the analysis, the four important categories derived from the literature (1. organisational structure, 2. composition, 3. term, frequency and duration, 4. guidance and support) functioned as sensitising concepts [32]. Based on the results, a TDT programme for the interdisciplinary course PGS was suggested.

4. Results

The results are presented according to the four components considered in this research. The corresponding and complementary ideas of the stakeholder groups are presented per factor: 1. organisational structure, 2. composition, 3. term, frequency and duration, 4. guidance and support. These insights lead to a recommendation for TDTs within the context of the course PGS.

4.1 Organisational structure

Teachers and teacher educators mainly emphasise the benefits of school-based TDTs. Both see advantages in organisational feasibility and stress the possibility of close cooperation. Teacher educators also emphasise the possibility of designing curriculum materials for one's students. Pedagogical counsellors stress the usefulness of networked TDTs in which expertise is merged and schools can reinforce each other. Education inspectors have no preference and state that TDTs must meet the needs of the school and teachers (e.g. experienced or not).

Despite their initially stated preferences, the stakeholders acknowledge and appreciate the inherent value of more alternative organisational structures. Teachers recognise that networked TDTs facilitate the convergence of teachers from diverse backgrounds, enabling the sharing of varied knowledge and experiences.

Concurrently, teacher educators admit that teachers from different schools can serve as critical friends. The concept of critical friends pertains to peers engaging in the provision of feedback, guidance and constructive critique to enhance one another's curriculum materials. External teachers possess a distinct advantage in critically evaluating developed materials, thereby offering new perspectives. Pedagogical counsellors attribute value to school-based TDTs due to a more facile organisation, eliminating the necessity for substitute arrangements.

Each stakeholder group acknowledges the possibility of combining both TDTs to unite the best elements in a TDT programme. Education inspectors indicate the usefulness of complementing a networked TDT with school-based TDTs, so the information of the networked TDT would reach the schools. The teachers and teacher educators elaborate on this as the design of curriculum materials can take place in school-based TDTs, whilst knowledge and feedback on the designed materials can be shared in a networked TDT. To put it differently, the integration of school-based TDTs and a networked TDT offers the opportunity to design custom curriculum materials for students within the school-based TDT whilst receiving external knowledge and feedback via the networked TDT.

4.2 Composition

All stakeholders state that PGS teachers across grades and fields of study can join the school-based TDTs. This approach fosters a cohesive whole-school strategy for PGS, enabling continuous mutual learning amongst teachers. Teacher educators believe that a large school with many teachers is required to organise several school-based TDTs, in which communication is key. They propose the composition of several school-based TDTs by grade, whilst teachers indicate a division based on fields of study.

According to education inspectors, the participation of teachers in a TDT programme should be voluntary. If only a part of the PGS department participates in the TDT programme, communication between the school-based TDT and the other members becomes important. After all, the designed curriculum materials of the school-based TDT must be introduced school-wide for all PGS lessons. In addition, teachers also believe that participation should be guided by the motivation of the teacher. They should be allowed to choose for themselves with whom they form the school-based TDT. The education inspectors indicate that roles and tasks can be assigned based on everyone's abilities and expertise. Finally, teacher educators point out the practical feasibility of meetings. Therefore, a school-based TDT should be limited to ten teachers.

Besides the involvement of PGS teachers within the TDTs, the inclusion of other participants may be needed. The education inspectors indicate that the requirement for such participation depends on the unique contextual factors within schools. A shortage of certain expertise can be compensated by collaboration with other departments in school-based TDTs or experts in networked TDTs. The participation of vocational teachers in school-based TDTs is also suggested by the teachers, teacher educators and pedagogical counsellors. As such, congruence between PGS and the practical subjects is achieved and authentic learning environments are designed. Pedagogical counsellors, however, raise concerns about the inherent motivation of these teachers, as they perceive less direct added value for their own vocational subjects. Therefore, their participation should not be permanent. The pedagogical counsellors recommend the composition of a networked TDT based on the expertise

of the participating teachers, where teachers can complement each other's expertise. If a networked TDT is composed of teachers from school-based TDTs, this complementary composition is not guaranteed to be possible. The teachers see the benefit of the participation of one or two teachers from different school-based TDTs. Didactic or subject matter experts can respond to the shortage of certain expertise during these meetings in a networked TDT.

Finally, all stakeholders highlight a notable turnover amongst PGS teachers. Consequently, a robust emphasis on the substitutability of teachers within the TDTs becomes imperative as new teachers will often join the team. To achieve this substitutability, prioritising the sustainability of the TDT programme is essential. Education inspectors advocate a structured approach that delineates clear intermediate objectives, enabling new teachers to easily comprehend and align with these targets. Teacher educators underscore the importance of documenting progress to facilitate the transmission of accomplished work to new teachers in the TDT.

4.3 Term, frequency and duration

All stakeholders state that TDTs should meet regularly and for several consecutive years. The education inspectors indicate that school-based TDTs should meet at least monthly. Teachers also mention the need to meet monthly, but stress that they want to decide autonomously when and for how long they meet. Teacher educators agree that meetings should not be dictated by the school principal, but initiated by the participating teachers themselves. Depending on the intermediate objectives of a school-based TDT, a meeting can be shorter or longer.

Teachers recommend meetings of the networked TDT two to four times a school year. Long-distance travel and difficult substitutions can be obstacle, so pedagogical counsellors propose a combination of physical and online meetings. Pedagogical counsellors emphasise the importance of alternating physical meetings with online meetings. Teachers suggest that a physical meeting should take at least half a day, whilst an online meeting can be much shorter.

4.4 Guidance and support

The questioned stakeholders consider two tasks for the coaches. The coach should (1) facilitate the process during the TDT meetings. Pedagogical counsellors suggest that the coach must ensure the teachers in the TDTs have a clear vision regarding the goals of the TDT. Consequently, articulating distinct and specific goals for each meeting becomes imperative. The other stakeholders agree that the coach should facilitate team interactions and monitor the structure by setting clear intermediate goals. All stakeholders perceive this function of the process coach as most essential. Consequently, it is crucial that the coach receives thorough training to fulfil this role. The coach may not only facilitate the process but also (2) offer substantive guidance, offering pertinent and valuable content advice. Pedagogical counsellors consider it as an added value, and teacher educators indicate that depending on the experience and expertise of the teachers, substantive guidance is needed. According to teachers and teacher educators, external experts can bring new insights and knowledge useful for the design of curriculum materials. The education inspectors state that these two tasks can be fulfilled by one coach, but they note that this is mostly done by several people. In a networked TDT, a permanent process coach and the occasional presence of subject matter or didactic experts can realise this.

In the case of school-based TDTs, teachers advocate an internal coach, which is a participating teacher. Teachers consider an external coach as an obstruction of their autonomy and flexibility, concerned that it might curtail their ability to independently arrange meetings and manage their own schedules. The education inspectors state that the coach must be someone the PGS teachers feel comfortable with as they must collaborate closely. An internal coach is the optimal choice, given their frequent presence amongst team members at school and their familiarity with the school's culture. According to the teachers, the internal coach is preferably (one of) the teacher(s) who also participate(s) in the networked TDT.

For a networked TDT, an external coach seems to be useful. All stakeholders believe that the external coach does not necessarily have to be an expert in the course PGS, but basic knowledge of the course and the vocational students is necessary. Depending on the participating teachers and their need for expertise, the networked TDT can be assisted by alternating didactic and subject matter experts. The coach facilitates the process of the networked TDT, whilst external experts contribute valuable content knowledge useful for designing curriculum materials within the school-based TDTs.

All stakeholders stress the importance of support from the school principal. Without the interest, support and cooperation of the school principal, the success of a TDT programme is almost impossible. The teachers believe that sincere interest in and belief in the course PGS from school principals have strong motivating effects. Teacher educators emphasise that school principals must acknowledge the time teachers invest and must provide the necessary replacements in the case of physically networked TDTs. Teacher educators and teachers believe that school principals should schedule time for meetings of the school-based TDT. In addition, teacher educators and pedagogical counsellors also demand material support. School principals should provide this by investing in course materials and equipment for the PGS classroom. Pedagogical counsellors consider giving a mandate, wherein a teacher is allocated specific responsibility and authority to execute designated tasks, to an internal coach. This mandate functions as a recognition of the importance of the TDT programme.

Finally, the teachers emphasise the need for an online platform on which school-based TDTs can share designed curriculum materials. This online platform, complementing the networked TDT meetings, operates as a tool through which the school-based TDTs mutually foster support, inspiration and motivation. By facilitating the exchange of designed curriculum materials, this platform can foster an environment conducive to collaborative learning and the interchange of innovative pedagogical approaches amongst teachers.

5. Discussion and conclusion

Interdisciplinary teaching in vocational secondary education presents numerous challenges for teachers as the integration of diverse disciplines requires teachers to navigate the complexities of integrating various knowledge and skills, fostering a cohesive and meaningful learning environment [33]. Additionally, vocational secondary education frequently presents a demanding setting for teachers characterised by a heterogeneous student group, encompassing students with varying levels of motivation and prior knowledge [6]. Consequently, this article assumes that the course Project Integrated General Subjects (PGS) in Flemish vocational secondary education, which involves an integrated approach to general subjects, poses a challenge for

all teachers. Teacher Design Teams have the potential to promote lifelong learning amongst PGS teachers, thereby facilitating the provision of high-quality general education for vocational students through the collaborative design of interdisciplinary curriculum materials [8, 17].

The central research question in this article is: 'Which conditions are desirable for the implementation of TDTs within the context of the vocational education course PGS?'. This research question was examined by the conduction of five focus groups with multiple PGS stakeholders (pedagogical counsellors, teacher educators, education inspectors and teachers). During the focus groups, the stakeholders brainstormed on how TDTs should be organised with a focus on four components: 1. Organisational structure, 2. Composition, 3. Term, frequency and duration and finally, 4. Guidance and support. This qualitative research contributes to the existing literature about TDTs as it explores desirable conditions for each component of TDTs in the context of an interdisciplinary course in vocational education amongst different stakeholders.

The results recognise the usefulness of both school-based TDTs and networked TDTs. During at least monthly school-based TDTs, materials can be designed customised for one's students. An additional networked TDT ensures the exchange of information across schools and the provision of knowledge and theoretical frameworks by experts. The composition of school-based TDTs depends on the size of the school and the voluntary participation and commitment of PGS teachers. The school-based TDT should inform and involve the PGS department. Depending on the expertise of the involved PGS teachers, it might be beneficial to occasionally engage other subject teachers to supplement any potential knowledge gaps amongst the PGS teachers. Due to the nature of the course PGS, this also applies to vocational teachers. In a school-based TDT, one PGS teacher is trained as an internal coach to supervise the TDT to maintain autonomy and close cooperation within the team. Given the frequent turnover of PGS teachers within secondary schools, maintaining sustainability in a long-term TDT programme is crucial. Thorough documentation of the TDT's progress becomes imperative to guarantee continuity during transitions amongst participating teachers. Additionally, four times a school year meeting in a networked TDT can be organised with one or two participants from the school-based TDTs. In this way, schools enrich each other with external knowledge and feedback on the designed curriculum materials. A combination of physical and online meetings can reduce travelling time for the participating teachers. An external process coach is assigned to the networked TDT. Subject matter and didactic experts provide additional support (during some meetings) according to the needs of the permanent members of the team. Support, confidence and resources from the school principal are important for the TDT programme to succeed. Finally, an online platform to share designed material from the school-based TDTs could be of great support.

This research offers three innovative insights. Firstly, the advantages of school-based TDTs and networked TDTs are united in one TDT programme in which collaboration within the same school but also across schools occurs. Literature (e.g. [16, 17, 21, 22, 34]) frequently focuses on school-based or networked TDTs and highlights the associated benefits of one organisational structure of TDTs. The findings of this research recognise the advantage of networked TDTs, attributed to their potential to enhance teachers' professional development by leveraging external knowledge sources as shown by Binkhorst et al. [22], as well as the advantage of school-based TDTs in facilitating school-wide reforms as shown by Handelzalts [16]. The research results in this article emphasise the imperative of conscientiously

tailoring curriculum materials to suit the specific student group, particularly within the context of secondary vocational education. Enabling this customisation is achievable through the collaborative design of curriculum materials by teachers within the same school, more specific by school-based TDTs. A networked TDT facilitates the acquisition of knowledge across different schools and thus promotes the design process in school-based TDTs. Ultimately, the combination of both organisational structures can ensure the integration of the benefits both TDTs offer. For example, curriculum materials can be designed specifically for the school's student population whilst integrating knowledge from outside the school. Secondly, the important function of a coach, proposed as mostly an expert in their field in the integrated conceptual framework of Binkhorst et al. [17], is further elaborated. The findings in this article propose an internal coach, which is a participating teacher, in the school-based TDTs allowing the team to work autonomously. An internal coach monitors the processes and provides content. This combination requires thorough training. Finally, an important consideration is made regarding the members of the TDTs in this article. Because of the high turnover of PGS teachers, it is recommended to think about the substitutability of the team members to ensure the sustainability of the team. Literature about TDTs often assumes a fixed team collaborating for a long time. However, it is crucial for TDTs in any context to consider the implications when a team member is replaced. In doing so, the progress of the TDT can be preserved. Setting well-defined goals with explicit milestones and recording progress in detail can make it possible for new members to function in the TDT.

Based on the results of this research, a TDT programme can be realised in different secondary schools to be examined. The findings can lead to adjustments in the TDT programme after which it can be reimplemented and re-examined in the schools. However, the results of this research also contribute on a practical level. Although this research focuses on the specific context of the course PGS, the insights can be transferred to TDTs for other (new) interdisciplinary or vocational education courses. The findings offer valuable insights to secondary schools when introducing TDTs within similar settings.

Author details

Tina Gryson*, Katrien Strubbe, Tony Valcke and Ruben Vanderlinde
Ghent University, Ghent, Belgium

*Address all correspondence to: tina.gryson@ugent.be

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Engineering the Future: Entrepreneurship, Design Innovation, and Lifelong Learning

Ghada Nafie

Abstract

At a time where rapid technological advancements challenge the conventional educational paradigm, integrating entrepreneurship education within engineering curricula stands out as critical to inspire innovation and creativity. This chapter explores the intersection of engineering design, innovation, and entrepreneurship, demonstrating how this triad prepares students for the future world, fostering resilience, adaptability, innovation, and a problem-solving mindset. As we move toward an age of AI and increasing automation, the role of engineers will not only be to design solutions but also to envision and realize opportunities for sustainable growth. By embedding entrepreneurial principles in engineering education, we cultivate engineers who do not only have a solid technical foundation but also entrepreneurial leaders who have the ability of turning problems into opportunities creating economic and social value.

Keywords: engineering education, innovation, entrepreneurship, lifelong learning, technological advancements, sustainable growth, future-ready engineers

1. Introduction

Engineering is the underlying factor behind standards of living, power, creativity, and human advancements. It is the cornerstone of innovation and technology [1], and it is the pulse of societal growth.

Traditionally, engineering education has focused on a tight set of defined problems with a direct path to the predetermined answer. Theory was memorized and formulas were applied in a rigid structure designed to pass information on from one generation of engineers to the next [2]. Professors lectured and students soaked in every bit of information possible, listening, memorizing, and executing what they learned in structured exams.

The world, however, is no longer that simple or straightforward. Now, we are looking for solutions to problems that have not previously been solved. These global issues require complex, transdisciplinary collaboration that involves a variety of approaches and diverse perspectives (**Figure 1**) [3].

Figure 1.
Global systems.

Global systems necessitate a triad of skills—design, innovation, and entrepreneurship, to push a concept from ideation to application. However, global systems do not exist in a vacuum. Its eclectic nature requires a multidisciplinary approach to produce both the soft and hard skills needed. In the diagram above, core to global systems is design thinking, gamification, diversity factors, sustainability, entrepreneurship, creativity, and innovation, and when these core elements are taught, the intention is to create resilience, self-directed exploration, investigation, self-efficacy, ethics, and mixed methods.

This chapter explores the intersection of engineering design, innovation, and entrepreneurship, demonstrating how this triad prepares students for the future world, fostering resilience, adaptability, innovation, and a problem-solving mindset. While the fundamentals of engineering will always remain core to the discipline, this new triad has an increasingly important role in shaping the engineers of the future.

2. Methodology

This research uses a qualitative and quantitative approach to explore how engineering education has evolved over the past twenty years. Data was collected in class and by reviewing engineering education practices from twenty years ago up to now. Comparisons were made between how the material was delivered and how students received information. Research categories included best practices for in-class student learning, measurement as to how assessments are taking place, categorizing how engineering theory is approached, and monitoring how professors provide access to information.

Emphasis was placed on a selection of courses that create the common core of engineering, such as engineering design and core fundamentals of engineering concepts, including behavior of fluids and engineering statics, as well as new topics

and classes that have been added to engineering programs over the last twenty years. Technical components, as well as options for design and creativity, were all included.

Research for this project was combined with studies provided by analysts covering the same topics over the past twenty years.

3. Evolution of engineering education

How engineering is taught, how the discipline is shaped, and how knowledge is passed on is a driving force behind the approach the next generation of engineers uses to uncover problems, find solutions, and innovate new ways of doing things, taking society to the next level and beyond.

And just as our problems have evolved, so have our students. Students are no longer conditioned to sit through hours of course lectures. Today's students have access to more information than ever before. They are impatient. They are curious, and they strive to find solutions immediately. The world has an increased awareness of different learning styles and new approaches that can accommodate all of this. Online content is being consumed at unmatched rates, and the education system is adapting to all of this [4].

As a discipline, engineering is evolving [5], and the education system is both a driving force and a reflection of these changes. To embrace this new way of learning and to reach students in the most effective way possible, educators are uncovering new techniques, as well as innovative methods and approaches that encourage effective and impactful learning.

The pandemic was a catalyst for change and accelerated the push toward online learning, but the process was not smooth. The immediate switch was difficult, and no one was ready for the semi-supportive environment that emerged. This change was more difficult for those from disadvantaged groups—those who did not have instant access to computers, technical support, and private tutors that others were able to rely on. Even those who did embrace the quick transition did so under the assumption that this was temporary and that everyone was on a countdown to return to the previous education environment.

The pandemic did reveal the huge industry-wide consensus that the engineering education system was due for a revamp. In addition to the systemic shift, the pandemic invited us to think about the political atmosphere and reconciliation efforts, which resulted in a global urgent call to question existing systems, structures, and ways to forge critical pathways for an equitable future. These realities unveiled an opportunity to explore new learning methods and to take advantage of technological advancements and access to online information. It opened up the opportunity to optimize and look for better ways of doing things, and it placed an emphasis and awareness of mental health issues, bringing this to the forefront.

The result of all of this is that student-led learning is taking over and changing the conversation, as well as the approach. In a classroom full of people with different needs, talents, desires, and goals, this is the fastest way to ensure everyone is working on the path most effective for them. This student-centric approach has ignited project-based learning models, encouraging students to explore theory with hands-on work, and through all of this, the role of the professor has evolved into one of an instructor, mentor, and facilitator, guiding students through these processes.

Change is not always easy, and everyone has felt some pushback in the process. Instructors worry that their messages are not coming through. Students are concerned that they are not covering all of the material needed to succeed, and yet, engineering students are entering the workforce in stronger positions than ever before. Student accountability is at an all-time high, as the awareness that these students need to be ready to compete in an increasingly competitive global workforce.

Another contributing factor in the evolution of engineering is the more desire to have a more diversified transdisciplinary approach [6]. Engineering degrees can now be combined with entrepreneurship certificates and MBAs that introduce topics such as finance, accounting, marketing, and communication. Students understand that engineers operate in business environments that expect this level of knowledge and agility, and programs designed to offer exposure to these fields are attracting more students each year [7].

The world is changing quickly, and engineering education is both a reflection and a driving force for this change!

4. Integrating entrepreneurship

Engineers, by nature, are problem solvers. They are innovative, they are creative, and they are driven to find solutions. Now, they are some of the world's finest entrepreneurs. Engineers have built the most disruptive companies in the world [8].

The connection between engineering and entrepreneurship is strong. Innovation spurs new ideas, and when these ideas are patented and shaped into companies, the modern-day fairy tale is fulfilled [9].

As entrepreneurship gains popularity, an increasing number of engineers are interested in exploring this option, and the education system is offering programs to encourage and accommodate this [10].

In fact, it is not only the idea of starting companies that is attractive. For engineers and employers alike, the entrepreneurial profile can propel teams to success.

Breakthroughs, by definition, are not accomplished when people do what has already been done before. Entrepreneurial thinking requires people to think outside the box. It sparks new ideas and gives people the courage to pursue paths off the beaten track. In a field where problem-solving is the ultimate goal, an entrepreneurial mindset is often required to look at fresh and new ways of doing something [11, 12].

So what skills are needed to expand into this new way of thinking? The entrepreneurial mindset empowers engineers with the approach and soft skills necessary to see technological advancements through to completion. The ability to identify and define a problem is not part of a traditional engineering program. Yet, this is a critical part of real-world success. Entrepreneurship involves teamwork and team leading, with project management, finance, accounting, marketing, and communication as part of the mix. It requires a holistic view of both problems and solutions for a well-rounded approach as to what is possible. This is relevant whether one will become an entrepreneur or work in a large company as shown in **Figure 2**.

Entrepreneurial certificates are now being run in conjunction with traditional engineering programs. Below is an example of a certificate that was developed for undergraduate students focusing on both entrepreneurship theory and interpersonal skill development and/or improvement. Through workshops, guest speakers, seminars, and pitch competitions students can hone an adjacent set of skills to the theory and technical skills covered in traditional engineering programs. Communication,

Figure 2.
Entrepreneurship and intrapreneurship.

marketing, and sales skills are introduced and valued as students discover how wide and diverse entrepreneurship is. Research, market testing, and trial and error are introduced as ways to identify a problem and propose a solution, and engineers discover how to augment their skillset to understand each field. This ultimately informs them of the entrepreneurial landscape and what it's all about, whether they create a new solution or join a group or company that is building something innovative. Student cognition is increasingly improved and the introduction of these complex systems of relationships allows them to think in new ways and apply their knowledge toward solving some of the problems around us today (**Figure 3**) [13].

Figure 3.
Certificate of engineering entrepreneurship content.

The combination of engineering, entrepreneurship, and interpersonal skills can create the fastest and most successful answer to the world's greatest challenges, and in the current context of rapid societal and technical change, this is the lens we need to approach global issues.

5. Engineering team-based design and innovation

They say if you want to go fast, go alone, but if you want to go far, go together. Project-based teamwork is taking an increasingly significant role in engineering education. This practical application of knowledge demands that students collaborate and build something here and now!

Team-based learning is done in a supportive environment where students, under the guidance of their instructors and mentors, come together to focus on a goal, share ideas, and work toward their outcome. The predefined topics are given in class, but the real assignment is not the topic, but on working through the process. Problem-solving and the hands-on application of theory are put into practice as students work to outline their plans, adhere to deadlines, and present their final project. There are groups coming out of psychology who specialize in working with and supporting students with teamwork. They particularly focus on team building, conflict resolution, and team development, which proved to be invaluable support to students [14].

Students recognize the value of problem-solving and are demanding these types of learning experiences as part of their curriculum. The ultimate goal for most engineering students is to be prepared to enter a competitive workforce. Studying theory alone will not accomplish this.

The practical application of knowledge sparks critical thinking. Having the opportunity to put the theory into action, in a supportive environment, helps students understand the relevance of the material they are learning in the lecture hall, and opens up the floor for new questions that can be answered immediately. Team-based learning develops project planning skills, leadership, and communication while building intrinsic motivation [15].

When developing new engineering design courses, it is important to structure and develop content based on five transdisciplinary building blocks (engineering design,
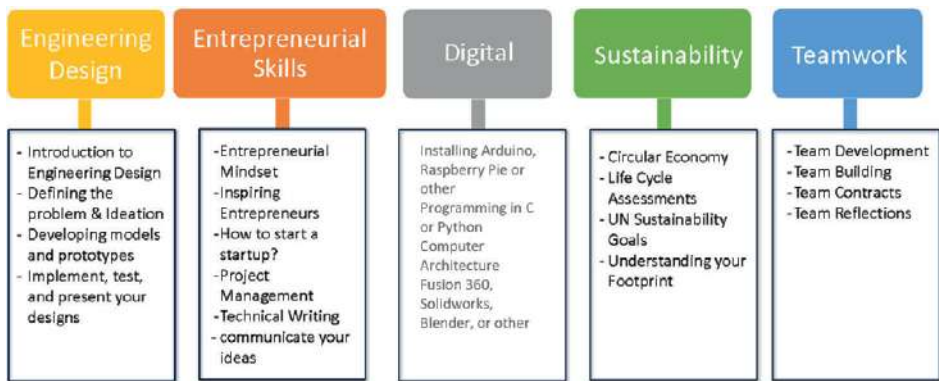

Figure 4.
Transdisciplinary blocks of modern engineering education.

entrepreneurial skills, digital, sustainability, and teamwork) from the core of modern engineering education (**Figure 4**) [16].

In one engineering design class, students were asked to build an automated garden. Groups were designed by the instructor to ensure each team had a diverse mix of students, and preexisting friends were not collaborating. Learning how to work with new people is a constant challenge in the real world, and these projects are structured to emulate that experience. Students were then asked to create an optimized garden. Just like that, creativity was ignited, and design innovation was unleashed.

These students combined the theory they learned in class with their creative knowledge of gardens. They researched possibilities, generated ideas, designed plans, and evaluated their proposals. They shared their ideas, offered their opinions, and practiced receiving feedback. They gained hands-on experience in programming, and they used digital sketch boards, CAD files, and 3D printers. They sawdered circuits and planted seeds, and they saw their visualizations transform into tangible finished work.

Finally, each group presented their projects to the class. They learned to showcase their work and defend their design in front of a group of peers. They saw the immediate impact of their projects, and they gained confidence and trust in their own teams [17, 18].

Putting theories to use in class, rather than waiting to get to the real world, offers students a more in-depth understanding of course material in a guided environment. When students are encouraged to innovate in a supportive environment, creativity flourishes and there is no limit to what they can achieve.

6. Sustainable growth

There is no industry in the untouched by the push toward ESG and sustainable growth. Transforming to a clean approach is the biggest challenge the world faces. Now, all solutions are evaluated through the lens of environmental impact so that solutions can eradicate existing problems and not create new problems. For engineers, this opens up the opportunity to improve existing solutions while also looking at entirely new ways of doing things [19].

Understanding where and how solutions can be optimized is a colossal opportunity for engineers and for the world [20]. Engineering education has evolved to address these points so that the most creative and innovative solutions are created in the context of minimizing environmental impact.

Circular economy offers a huge opportunity for engineers to re-evaluate solutions and find new ways of doing things. From sourcing of raw materials to manufacturing and reducing, reusing products, and monitoring consumption use, there are endless ways companies can optimize (**Figure 5**) [19].

One example is product returns which represent a significant cost for companies and an enormous waste of resources. The cost of returns can represent anywhere from 17% to 30% of the total product cost, and the environmental waste is horrendous [21]. From an engineering standpoint, there is a lot that can be done, and that is right from the very beginning of building a product.

Acer has an impressive and well-thought-out product management strategy that addresses all of these points. Their product life cycle management starts with low environmental material brought into play right at the product development and design phase. They use ocean-bound plastics in their notebook touchpads and have

CIRCULAR ECONOMY

Figure 5.
Circular economy.

established a list of banned, restricted, and controlled substances that are not used. In the manufacturing process, they intentionally work with suppliers to increase energy efficiency and reduce carbon emissions [22].

Another example is product development and how companies can integrate circular economy principles into product design. Implementing methods to minimize waste and maximize resource efficiency would contribute significantly to the development of circular economy. Engineers can play a crucial role through the development of these products.

First Solar company also has an impressive end-of-life recycling program that allows them to address these points as well. Their product life cycle management converts mining by-products into eco-efficient photovoltaic (PV) technology manufactured with low energy, water, and semiconductors than other available technologies. Additionally, they recover up to 90% of the materials used in their thin film solar panels to maximize resource recovery and increase the sustainability of PV [23].

Product engineers can collect useful feedback at the return stage and use this information to create better products that do not have those problems. They can create better designs and better products and eliminate the primary causes of product return. Several companies can embrace circular economy principles and implement a circular approach in their product developments. By looking at case studies, such as Acer and First Solar, engineering students are empowered with information and ideas, and they can implement at every stage of the innovation process, in any industry they choose to pursue [24].

In addition, to come up with sustainable growth solutions, engineers need to understand the framework and goals the world is aiming to achieve. The UN has set forth standards that can be researched and understood in engineering classes. These classes can also highlight processes and systems that optimize consumption and energy sources at every level. With this background knowledge, engineers are able to harness their creativity and innovation into solutions that address market needs and create value in the most sustainable way possible.

7. AI and automation

AI and automation are no longer advanced technologies, they are becoming mainstream. Understanding how to implement both AI and automation is a necessity as engineers strive to address challenges in the most efficient way possible. Companies using these new techniques are breezing ahead at record speed, while companies that are not following suit risk being left behind. Both AI and automation are tools for engineers to explore, understand, and use to streamline activity, increase productivity, and reduce the time needed to complete certain repetitive tasks [25].

AI engineers use machine learning techniques to develop applications and systems that reduce costs, predict customer behavior, and enhance the overall decision-making processes. To operate competitively, engineers need to understand how to develop AI tools, systems, and methods in the real world [26].

Big data represents a huge opportunity for AI engineers. Prior to AI, it was difficult and time-consuming to analyze large amounts of data and uncover trends. AI offers clear advantages in this field as it can quickly and effectively compress big data into valuable and decision-making pieces of information that organizations can integrate. AI can be used to create algorithms that detect mistakes and formulate solutions that improve operations overall, and engineers need to be aware of these tools and envision how to maximize productivity through all of this [27].

The future will bring many other ways that AI will shape our world, particularly in the area of energy storage. Using AI can create efficiencies in our world and reshape the current norms of our world. Engineers need to better understand and utilize AI to reshape this future [28].

As AI takes on an increasingly strategic role in engineered processes, several questions remain: Who owns IP created by AI? What limits should be placed on AI technology? How can engineers oversee all of this? and What inequities and divide AI is creating? These are questions that can also be explored throughout engineering education as the technology becomes more popular and the conversation continues to evolve.

Warehouses are already implementing automation to solve workflow issues. Robotics scale quickly, improving speed and profitability while decreasing employee turnover in a very transient industry. DHL and Carhartt recently revealed their journey integrating Locus Robotics into their workflow, improving distribution and speed. Order profiles are easily fulfilled and working conditions for warehouse staff increased, boosting morale with a 200% increase in productivity. The ability to easily add and eliminate robotics to the workflow is an idea for managing an annual retail cycle [29].

Understanding how automation works and where this can fit into systems and workflow is imperative. Engineers educated in automation quickly understand where and how they can add value with solutions designed to support workflow advancement (**Figure 6**).
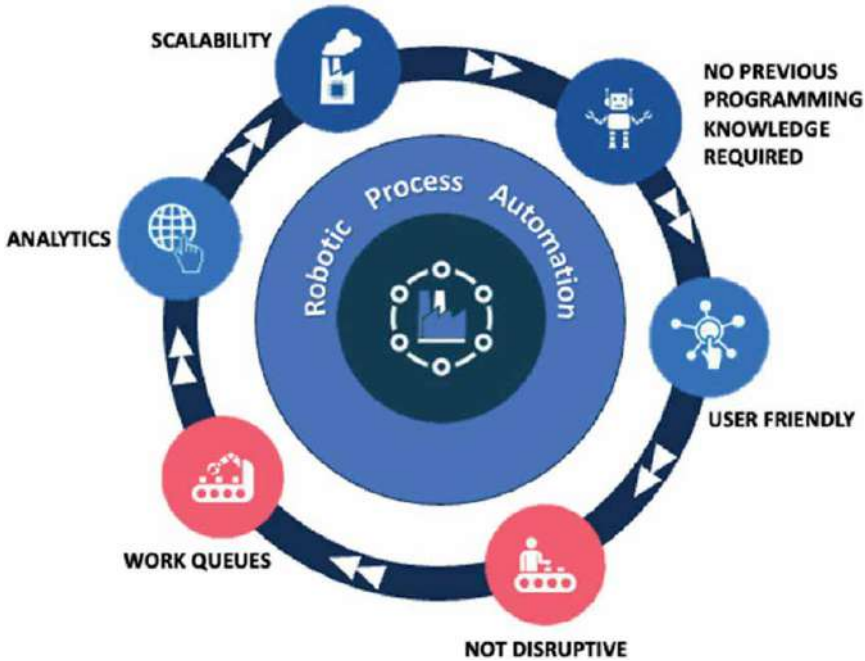
Figure 6.
Example of a robotic process automation.

8. Lifelong learning

If there is one thing, we have learned from the evolution of engineering education, it is that change is the only constant. As technology and systems evolve, we must be ready to revamp engineering education to integrate this new way of doing things.

The world is moving faster than ever before. To keep pace with these changes, finishing a university degree in engineering is not the end of an education path—in many ways, it is only the beginning. People need to constantly adapt to new wants of doing things, and education is the key to understanding all of this [30].

Universities are supporting lifelong learning with continued education programs. Designed for adults already working in their field, these courses are completed in the evenings and over the weekends, in person or virtually, to gain insight into the latest topics and technologies that help engineers, or anyone, take their careers to the next level. From MBAs to AI, social media to accounting, continued education classes offer a transdisciplinary look that propels knowledge and takes work expertise to the next level [31].

In the United States, 73% of adults consider themselves lifelong learners. There is a direct correlation between education level and lifelong learning—the higher the level of education and the higher the salary the more likely adults are to pursue ongoing education programs [32].

Lifelong learning is a mindset. And while there are formalized continuing education programs, there are also more informal ways of achieving this. The Internet offers an endless supply of knowledge and resources that individuals can use to advance their learning in any field, making it easy and accessible to pursue these programs.

Workgroups, networking, and opportunities to connect with other professionals in a field offer engagement, platforms to test ideas, and the ability to stay engaged with alumni and professionals' peers. Having the opportunity to communicate, express innovation, and market ideas, as well as to test and to gain the backing and support required to pursue these concepts, is truly valuable for everyone.

The evolution of engineering education does not only happen in the classroom, in fact, just as the modern classroom has flipped, so has the world. Education is ongoing and can happen every day and everywhere.

9. Conclusion

They say the more things change the more they stay the same. At a time when engineering education is evolving, universities and students alike continue to embrace the technical fundamentals, which have been studied by generations of engineers. Entrepreneurship, design, and innovation will inspire and drive the new generation of engineers to levels the discipline has not yet seen, with undiluted, traditional engineering remaining the center of this field.
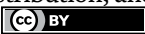
What is next for the future of engineering education? And where will these new heights take us?

Author details

Ghada Nafie
Schulich School of Engineering, University of Calgary, Canada

*Address all correspondence to: ghada.nafie@ucalgary.ca

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Chapter 11

Universities as Safe Spaces: A Place to Learn and Building Resilience? A Case Study on Education of US Military Veterans

Laila Nordstrand Berg and Paula C. Herring

Abstract

This study investigates how US military veteran students perceive the transition from the military to university and how education facilitates their adaptation to society. US military enlistees are often recruited from populations of lower socioeconomic status, and upon completion of military term, are returning to society disillusioned as to future employment and feeling apart from society. Low self-value and hopelessness haunts these men and women. Veterans are offered support for both education, housing and living expenses after ending service through the GI Bill, to help ease this transitional time back into civilian life. The teaching model to approach teaching this population is grounded in andragogical care and in active facilitation. The findings are based on a case study with interviews of veterans attending universities and earning academic degrees. The main findings indicate that professors who are working as relationship mentors in addition to being academic educators is of high value for creating safe spaces for university-society relationships, engagement, and confidence.

Keywords: andragogy, community, culture, education, facilitation, place-making, self-efficacy, university, veterans

1. Introduction

Reintegration into a civilian community following military service can be a stressful time for veterans. As a means to ease the transition back to civilian life, the veterans in the US are offered financial support for further education at universities [1]. Such efforts are reflecting a view of universities as providers of educations that can help individuals to improve their prospects in labour market and thereby support the weakest in society [2]. In the US, the military actively recruits soldiers from populations of lower socioeconomic status (SES). By offering education to the lower SES, the universities are delivering on their social mission [3]. While the service members are within the military system, they receive both education and a salary to provide for themselves and their families, but the retirement age is young. Many are returning to

society with an education that is not giving them further job opportunities, so taking education can be of high importance to avoid many of the hurdles that many veterans are facing.

When ending the military career, the veterans are leaving a shared culture behind and this can lead to lack of belongingness, hopelessness and emotional distress [4]. The incidence of depression and suicide is higher than in other groups of society [5]. The adjustment from the control and command environment that characterizes the military to the openness that characterizes life as a student, might be a daunting or at least challenging task [1, 6]. Without the uniform, the veterans are not visible as veterans (and the acknowledgement that includes from the surroundings) and they can feel isolated with no social network and this enhances the struggle to adapt to this new environment [6]. Veterans share experiences that are unique and can be difficult to understand for non-military people. Much of the literature on military veterans are focusing on "wounded warriors", veterans that are suffering from physical or psychological disabilities following their service [7]. However, most of the military undergraduates that enter higher education are not wounded, but there is a risk of being stigmatized as such. The veterans are often motivated and serious students, with a goal to achieve career development [6]. Such engagement also influences development of the area where the soldiers are living, either this is in rural or urban regions. Most of the ex-military are applying for education at colleges and universities close to home and intend to return to their neighborhood to apply their new skills and knowledge [6, 8]. In a report from the American Council of Education [9], it is claimed that 75% of the undergraduates are choosing education according to place. Thereafter the choice of program is of importance for selection of education (52%), followed by cost of education (47%). The ability to combine work or focusing on career advancement with studies is also of high value for non-traditional and mature university learners [10], as the veterans.

In our chapter we are focusing on education and how this can contribute to sustainable development related to education of veterans. In the literature on sustainability in place-shaping and development of regions, there is an increasing focus on education [11], and universities as part of their mission are expected to contribute to regional engagement, together with teaching and research [12]. On this background we are posing the following research question to guide our study:

> *How does the university create a space for educating veterans and facilitate their return to society?*

In the continuation of this chapter, we are introducing what options for US veterans are offered regarding education after service. We thereafter present our theoretical framework and methodological approach. The analysis is discussed in the light of theories thereafter and the chapter ends with a concluding section.

2. The US context

When soldiers are returning home after ended service, they are granted different kinds of readjustment benefits. Examples of such benefits are educational. The veterans can get funding to cover college tuition, living expenses and housing during their educational period. This arrangements goes back to second world war, to make the transition from the strict and hierarchical military life back to civilian life more soft [1].

This support system started in 1944 with The Servicemen's Readjustment Act of 1944 (also called the GI Bill), and the act has been expanded several times to come in line with the costs of education and living conditions [1]. Most recently, the Post 9/11 GI Bill increase the education benefits from 2009. Between 2007 and 2008 and 2011–2012, the use of Veterans' education benefits by military students increased amongst both undergraduates from 36 to 55% and graduate students from 22 to 46% [8].

In 2011–2012 there were about 1.1 million military students enrolled in undergraduate education, up from 914,000 in 2007–2008 [8] and the prognosis was that this number would pass 2 million enrolled students around 2020 [1]. It is interesting to note that based on statistics from 2016, more veterans than non-veterans in the US have earned and taken some college courses, have earned an associate degree and/or an undergraduate bachelor's degree than non-veterans. And though graduate (master) and doctorate level numbers compared veteran to nonveteran populations are similar, veteran numbers are higher than non-military populations in every category of degree completion [13].

The largest campus group of military undergraduates is prior-service military veterans: individuals who have served in the military for at least three years, have been medically discharged for physical or mental injuries. Others have completed their service commitment and are transitioning to their next career path or life goal and returning home to family. Compared to traditional students, this demographically diverse tends to be older and married or partnered than the traditional student. The majority are male (26% female) [14].

Faculty grounded in best practices to reach this particular population of adult learners approach their classroom interaction through the andragogical model of learning, a model specifically designed for working with adult learners [15]. The andragogical classroom acknowledges that students and faculty are equal, that both teach and learn together and that students want to be pro-active in their learning process. Additionally, students and professors constructing learning together through intimate and intense interactions is a methodology respected for effective adult education experiences [16].

3. Theoretical framework

As a framework to study US veterans entering higher education, we are drawing three theoretical strands from the literature: placemaking, culture and social cognitive theory. The reasoning for this is to have theories that are suitable to analyze different aspects of our theme. Placemaking emerges from anthropology and urban planning fields within academia and is suitable for highlighting the relationship between institutions and individuals in development of regions. Cultural theories are suitable to analyze characteristics of society we are living and operating in, and the social cognitive approach is suitable for studying individuals and their reflections of personal development and how this tie into regional development.

4. Place-making and role of higher education

From the view of place-making, all human beings creates places to live from the areas they are finding themselves [17]. Place making happens in a physical space, and such spaces can be public or private, they can be marked by physical walls, maps, they

can be found on GPS monitors and boundary or geographic dividers [18]. The physical space is more than a physical space, it is 'space plus meaning' [18], This meaning is socially constructed and operated through the individuals or groups that is taking part [19]. Place-making focuses on the processes between different actors to shape and develop the geographical area they are living in [20]. Placemaking is discovered through the experience of being within it and allows for the transformation of one to be in the space and the space as a reality and a space for exploration [21]. The sense of space is referred to as a reflection upon a space of individual experiences and the emotional ability to be able to identify a place of familiarity and awareness [22].

Placemaking for military personal can in the light of this population, be less engaged to specific geographical places, as the workspace for military personal is not confined to an office and during active duty, they risk moving several times during their career. Military life is characterized by work and deployment in shifting environment. Still, as placemaking depends on that the individuals and communities are willing to engage in bottom up activities through direct citizen participation or citizenry to make the places [23], serving in the military can be seen as such activities to build the places they are sited. Our focus in this chapter is not directed to the military space, but rather to the spaces they are entering *after* returning to their communities to follow up on placemaking activities when they are entering the classroom space while pursuing higher education.

In this study we are applying the lenses of "safe spaces", areas where students can feel accepted, not isolated or alienated, threatened or intimidated [24]. Active-duty combat is a space of danger, and military workers know their life may be lost due to the space in which they are fulfilling their job requirements and their commitment to their country and being in such an environment can influence the students' perceptions of their surroundings. From the educational side, there has been a focus on creating 'safe spaces' that can ease the transition to civilian life. But the concept of safe spaces is contentious and are meeting critics for coddling the students. Gill [25] is addressing this ongoing debate and is emphasizing that this is not a context for such coddling. The spaces are supposed to provide room for the contestants to be challenged on their abilities, ideas and views and encouraged to grow personally and professionally, but within the frames of freedom of abuse. Some American universities and colleges are specialized in targeting ex-militaries to enhance their educational background and increase their capacities to engage in community and work life and in that way participate in development of the local communities they are living. Acknowledging the experiences former military bring to the classroom is an enhancement, rather than an accommodation [26] and thus, the totality of the course experience in enriched for all involved.

In our chapter, placemaking is hereby divided in two: Firstly, from the educational side, the university and faculty contribute directly into shaping society through supplying education, performing research, but also third mission activities. Our focus is narrowed to the classroom and teaching related activities spurred towards improving living conditions for former military, but we also take a closer look at the education situation and how this can create a safe space where the students can be equipped for getting a job and otherwise contribute to their surroundings. Secondly, we focus on how the individual veterans are bringing the capabilities they have gained through education back to the communities they are living. From the view of place-making, the veterans are not passive recipients of teaching and education, but co-creators together with the faculty. The development of society relies on this interaction and co-creation between the actors involved. This perspective provides a framework

to look at the co-creation that goes on through education of the veterans, between university and the individual students. In placemaking, the focus is on 'locatedness', being *here* – what is special for this region or location [20]. This could be followed up by taking a closer look in relation to social elements (e.g., what characterizes this particular social setting); political elements (what problems are to be addressed and prioritized and what framework are available or hindering development) or managerial elements (e.g., within the educational or local setting). Placemaking is both a policy and a practice [19].

5. Cultural features of society and the military

To focus on culture of military and education, we are applying Hofstede's model of cultural differences within society and between countries [27]. Hofstede's model remains the most widely adopted in the field of education [28, 29], still, critiques are raised towards applying this model on the study on education. E.g. Signorini et al. [30] claims that there is a lack of empirical evidence from this sector, and there is a risk of treating culture as static and not dynamic. We are further investigating this critique and claims by incorporating some questions from Hofstede's theory in relation to our study, individualist/collective cultures, and power distance.

The American society holds cultural characteristics that is considered opposite of the culture in the military, and this can influence the potential confusing path back to society. Culture provide patterns of thinking and feeling with huge impact of the acting of individuals [27]. The American society is by the surveys of Hofstede [27] characterized as the most individualist country in his study, whereas the military can be considered by a collectivistic approach. In individualistic societies, people are expected to look after themselves and the ties between people are loose. People prioritizes their own goals over others and are motivated by personal preferences, needs and rights [31]. In collectivistic societies or groups of society, the culture is based on (and depend on) tight coupling between people [27] and the cultural norms reflect that the group dominates over the individual [32]. The participants are integrated into groups with unquestioning loyalty in exchange for protection of the members. This is particularly salient in war situations, but the soldiers are socialized into such a mindset in the pre-war service. In such groups, the individuals are willing to prioritize the collective goals over own preferences, and another hallmark is collaboration, teamwork, and relationship-building. Due to a mutual dependency and loyalty are other features, and the interest of the group shadows the individual [33]. There are of course individual differences also in collective groups, but collectivistic oriented people are more motivated by the norms and obligations following the group. When the former military are entering higher education, the approach are shifting from the collective military that fosters more of a communal and collaborative work environment [34] towards an individualistic approach. Assignments and university coursework in higher education is a strongly individualistic endeavor and from this approach we are interested in studying how the ex-militaries are experiencing this transition and what experiences they are bringing into the student life that is of value for a student.

Another feature studied by Hofstede [35, 36] which can be of importance for ex-militaries returning to society is the power distance. Power distance is related to the distribution of power amongst people (e.g., leaders have more power than subordinates or followers). This distance tend to be rather low in English speaking countries [35, 37], while the military is built by a hierarchical system that is based upon power

distance between the levels. The level of inequality is supported and endorsed by the leaders as well as the followers (ibid). When the veterans are leaving the military, they are leaving a culture where everybody has their place and tasks within the hierarchy and entering higher education where they as students are individually responsible for finding their way. This gives the soldiers two sets of contradictive cultures to relate to (high power distance in the military, and low in civil society). Even so, the image is perhaps not so simple, as the university system also has its hierarchy of academics and managers and where the students are at the bottom of the knowledge hierarchy. In our study we are following up on how the power distance is perceived by the students and how this is influencing their benefit of education.

6. Social cognitive theory

We now turn to a theoretical angle that is oriented towards the individual student and how they assess their abilities to learn and develop, social cognitive theory. In this perspective, the actors are also perceived as pro-active agents who exercise control of their own development and change [38, 39]. People are not passively adapting as re-active organisms towards the influences that are coming their way. Still, such human adaption takes place within socio-structural settings, so this is not solely an individual project. Bandura [40] therefor claims that people are both active agents that are producing social systems, at the same time as they are products of the systems.

Individuals are able to reflect on their abilities to regulate behavior, feelings and thoughts [41]. These self-reflective actions can be studied from different angles. Self-assessment relates to what ability the individuals have to consider their personal qualities and qualifications. Self-esteem reflects the ability individuals have to appreciate themselves and their self-worth [42]. The self-efficacy relates to the ability of individuals to work towards specific goals and achieve the outcomes they wanted [40]. This is closely related to confidence and perceived capability [43]. In the regulation of behavior, the choice of actions relies on past experiences and the social systems they are a part of [44]. Persons who have been performing well, tend to have higher level of self-efficacy and motivation than persons with low performance [42]. The effort from HEIs to create so-called safe places can be of importance to influence the self-efficacy of students with lower confidence. Here we are following up on how students are working on assignments and how this is influencing their self-esteem. The contact between students and professors, but also though the different types of networks that is built through education can also be of importance here. And Knowles' [15] method of weaving real life experiences into a classroom of active learning evokes real-time learning from both faculty and from students.

One aspect of being in a social environment, is that attitude and behavior is learned by observing others in similar situations [45]. Perceptions of self-assessment can spread to others within the social setting and work as a model between groups at a collective level. As mentioned above, the veteran students are often older than other students [1], since they have been in the military for years before they are entering colleges or universities. Through their service, they can have developed a high level of self-efficacy due to mastering their work but entering a new scene like the HEI-sector can have negative impact on their confidence. Many of the veteran students come from segments of society that have not received higher education, and many of the students are the first in their families to get into higher education. How do this influence of their self-efficacy? Is there anything the

HEIs can offer to support the learning environment for this student group? Studies have shown that enjoyment and positive learning related emotions have a positive effect on learning and academic performance [46].

7. Methods

Our study adopts a mixed-methods approach [47], combining desk-top analysis of policy initiatives regarding education of the ex-military and interviews with reflections recalled during these educational experiences post-military service. We interviewed eight US military personnel of various rank and branch, all of whom were university students in the US following their service in the US military. To secure the anonymity of the participants, we are labelling them P1–P8. It is to be noted that study participants represent all four branches of the US military and various rankings are mentioned in interview responses. For example, E7 is a first non-commissioned officer rank, designated as a senior non-commissioned officer.

The interviews took place via Zoom during the global COVID-19 pandemic, and were conducted in traditional, 1-1 style. While both authors conducted interviews, there was only one author and one subject on each zoom call. The interviews ranged in length from 30 minutes to 90 minutes and were recorded and transcribed verbatim by a third party for this study. The interview guide was following by authors for each interview and a consent form was sent and returned via email by each candidate.

8. Analysis in the light of the theoretical framework

In this part we present the empirical observations from our study and analyze these in the light of the theoretical framework.

8.1 When placemaking is shifting from the global to the regional

The participants in our study were based at different parts of the US, through their service, depending on where their military branch was sited. The veterans had also been stationed farther out at different parts of the world during their services. After retirement, the world map has been replaced with local maps into the classroom, but the impact of changing geographical surroundings is a part of the experiences the students are bringing into the classroom. What we emphasized from this is not their efforts in placemaking and building (or harming) societies in relation to battles and preparations for going into armed forces, but how their experience from the military is intertwined with their further education when entering higher education.

The motivations for pursuing higher education amongst our participants varied, some had deliberately served in military so they could be able to get education afterwards, others wanted to fulfill educations they started during services, others wanted to elaborate on their skills and qualifications, and one was tired of manual work and wanted to get more education so he could use his talents differently:

> *I think it was probably about the 1000th time that I had to scrub rust off a diesel engine and pickup heavy things and carry them around I decided, that... actually, I would rather do things where I am paid to think rather than paid for what I am capable of lifting and carrying. P7.*

Placemaking emerges from the meetings between the actors in the geographical areas they are acting [20], and through the interactions and processes they are developing the spaces. Through the classrooms and campuses at the HEIs, the veterans are engaging with several groups. The students emphasized the support from a range of people in different positions within the educational system:

> *I was engaged with the finance department to make sure that everything was taken care on that side. That they didn't need anything else. I was engaged with the advisor from the Military Club. I was engaged with my professor, or the Dean of Academics there and even some of the campus deans and so yes, there was a connection there. There was a connection to other veterans. There was a connection to other students. P4.*

Most of the participants highlighted the importance of other students. One told that the other students; *...understood the struggles we go through. These secret codes, like, you know, just little things... like the showing up 15 minutes early or having a hard time focusing (P2).* On this background, it seemed like the students also contributed to building the 'safe spaces' [24] needed for being able to pursue education. The contribution from the faculty was also of importance to create the safe spaces. Professors who were giving extra attention to the students, in addition to classroom education, were valuable for the student group. *They taught me more than just getting a great education, they really helped me getting a lot of things into place*, P4 illustrated. P3 highlights:

> *There is... like... a professor that I had for... like... 3 semesters in my undergrad. I had a connection with her, the reason being is because she actually took the time. You know, sacrifice her personal time, to actually meet up with students and she guided us and actually answered the questions that we were actually confused about. Some other professors would tell us: Review the syllabus! But, I mean, that was not answering my question. P3.*

The experiences from the military were supplemented by education after service and through the education, the students gained further qualifications to participate in bottom-up activities to build society through citizen participations [23]. In placemaking the focus on locatedness is also of importance, what is special in this region [20]. The student came from different areas, and some of them came from poorer regions and lower SES. By being in the educational system, they were giving opportunities to contribute with third mission activities that was gaining the society around. In such areas, placemaking activities could be practical activities, as: *...going to read for the [local annual] Dr. Seuss weeks, go reading to the schools and stuff like that. Giving back to the community that way* (P1). Third mission activities could also be geared towards supporting other veterans, as illustrated here form the establishment of the "PCs for Vets"-group:

> *We started the "PCs for Vets" [Personal Computers for Veterans]. When we started that, it created an atmosphere, not everybody needed a computer, but some people wanted to learn how to refurbish a computer, so that became magnetism and some people needed computers and that became a magnetism. And then the professors were talking about it in class. Like if you don't have a computer at home, go see PCs for Vets and we would look and see and make sure they were veterans. There were a couple people that weren't veterans, you know, they were poor. We tried to help them out too. You know, it is not only veterans, but we tried to help others too. P5.*

Placemaking are dependent on contact between different actors [20], and the professors, students and through student activities they elaborated on their networks. These networks were also of importance to getting into the job market in the region – but also at national and even international level.

> *Now I have these lifelong friends who are so supportive, and I think that as veterans, we need that network of support and I have gained that through education, but it has also opened so many doors... I have gotten the opportunity to do some really high-level work and now I'm... um you know... my goal is to work for the United Nations and do UN work and I am already on track for that. I am also doing other things that I could never imaging. I have to pinch myself because, yeah, a door is going to but international level also?... It is without me even seeking it. P2.*

But not all the students are telling those 'Happy stories'. We want to follow up on the concern of Benneworth et al. [48] regarding presenting simplistic stories. The university do play a significant role in providing a base for people to sustain and improve their lives, but the role of universities to improve lives for the individuals by strategies and leadership is questioned [49]. Most of the participants in our study are representing such success stories, but the path is not without hurdles and some of the students are telling stories of struggle to find their place. For the youth entering the military, the transitions from civil society to the military might be challenging, to fit into the military system likewise, but also the return to society can be a daunting task – regardless of education. Some of the students were also relating to the downsides of being poor and seeing the military as a solution for a steady income to support themselves and their families. One of the participants entered the military and felt he did not fit into the system:

> *I actually got uncomfortable with not fitting in. Because I was very nerdy, kind of precocious... um... and went into the Marine Corp and was enlisted and did not entirely fit in there. And then I got out of the Marine Corp and went through academia and was a former enlisted Marine amongst a bunch of people who had gone to college, gone to college, gone to college, until finally college kicked them out. Yeah, I have never really fit in and that was just kind of an extension of that. So, I may not be a good example of I guess a more standard transition. P7.*

Later in the interview this participant is telling about how it was to enter the civil labour market and the skepticism he was meeting in the job situation, due to his former military background. "*Overall, they hold me at arm's length a little bit more than somebody who did not go in the military*." (P7).

8.2 The return to the individualist society

The veterans grew up in the individualist US society, before entering the more collectivistic oriented military life. The transition period from military to civilian life can be a highly anticipated time and a turning point in the life of a military professional. This is also a time of fear, fear of the unknown, of what is to come and the trepidation with not knowing the future. When asked about this transitional period, we heard a variety of responses from our participants, but most of them found the transition unproblematic. The quote from participant 7 is illuminating this transition from being part of a collective culture where the participants were depending on

each other [27, 32] for survival until the role as individuals and students where the student were embracing this new situation:

> ...We should all be having fun doing this...Nobody dies because of what we do....I guess my first job in the Marine Corp, I was responsible for keeping a vehicle crew alive if anyone started shooting at us. And now, my job amounts to filing paperwork and coming up with new research. (P7)

The participants also highlighted that even in collectivistic societies as the military, the individuals also must take responsibilities, and staff with higher ranks are in more autonomous situations.

> Well, even in the military you had to figure out some things on your own. Especially as you get up higher rank, so you are developing everything else. My job when I was in the military was in training, planned training and operations. So, we naturally used prior exercise, prior scenarios to build a new one. So, we didn't have to reinvent the wheel all the time. So, with that, transition between the military and schoolwork wasn't any problem for me at all. (P6)

Still, the transition from the military life to life as a student was a shift in pace and lifestyle, that the participants had to deal with on the individual base. In the individual society, the persons are supposed to look after themselves [27] and that can be challenging:

> It was very difficult because I was, actually, like... on the go... and very rapid lifestyle. Now that I am in school, it was actually kind of a hard transitioning because I have so much energy. I actually had to try to learn how to experience that by myself. (P3)

As mentioned in the introduction, some veterans are ending their service due to injuries. The militaries are socialized and trained to the collectivistic approach, and the greater good is trumping individual needs. By the end of the service, it can be a daunting task to start looking after yourself to heal and be able to function in society:

> It was not realizing I had PTSD and also because it is so taboo to ask for help in the military. Because you are trained to keep pushing, keep going. You could be bleeding to death, and you will be trying to get to the finish line, whatever that finish line is. So, for me, the transition was difficult because, um... I now had these disabilities, that I had to deal with while going to school, working and now with these disabilities, it was like a big bomb! (laughing). You know, so that was the difficult part for me. (P2)

We were also curious about how the professors were meeting the participants and how they were a part of this transition. *Some professors are just... they just want to do their job and go. Some professors they care* (P5). It seems like meeting professors who actually cared about the students who struggled, was of high importance for easing the transition period, and this is in line with creating the safe spaces for the students [24].

> ...There were some professors that were actually hands on, actually explained everything so you can better understand it. Or, like, when I turned an assignment in, they didn't hit me on too many points. They actually explained it, like, how this is going to be important... going for your Master's degree and moving forward and I will be when

> *compared to like some other professors where just how I explained about the Master's program, you need to follow the … they actually just deducted all those points without an explanation" (P3)*

The last thing we highlight in this section in related to race and the experiences both in the military and the university, here expressed by one participant:

> *First of all, all of those things [race, gender, religion] mean a lot more in academia than in the military. In the military, they really couldn't care less what colour anybody was. You are all there for the same reason …Relate that to academia and suddenly all these things matter a lot more. To be honest, I still have a hard time taking them seriously. I really don't think it should matter (P8)*

If we are interpreting this in the light of the cultural framework, it seems like the collectivistic culture were depending on each member [32], no matter race, gender or religion. This became more of an issue when entering higher education and thereby the individualistic culture. We are not saying that discrimination is not to be found in the military, but it is more subtle, not so easy to catch as in the university. Still, such themes seem to influence the exit from the military, the transition process and ability to come back to society, as reflected on by participant 2: *Um… I think the underlying to everything to my personal trauma was definitely racism. And I think that is what drove me out (P2).*

The second theme we focused on in relation to Hofstede [35, 36], is the power distance and how this was influencing the managerial styles of the professors in comparison to the military.

> *Oh, so different! I mean, I think that the beautiful part of having the professors that I did … they are really interested in your success. Really interested in seeing you succeed, versus telling you what to do, which is very different. In the military, its orders. We are given orders, so I guess it could be a little bit of a loss in translation sometimes [at university] because that transition, right, and no one is telling you what to do directly can be a little bit challenging when you are the receiver ….There can be a little bit of a loss of translation there like not being ordered, or being like so respectful and I think that sometimes the professors are like okay, you know, this is too anal, you know like too robotic and perfect and I think that veterans, I can speak for myself, we are always really worried about doing things super right, super perfect. It was about learning so, yeah, so as far as the difference in leadership was that they are teaching you, they are not ordering you. (P2)*

The managerial style in the military, as reported here, was influenced by higher power distance and the hierarchical structure [37]. In such a system receiving orders also provide a kind of security, and the veteran is telling that it can be challenging to transfer to the managerial style in the university where the professors are taking more of an inspirational leadership style. This is particularly challenging because the ex-militaries are focused on not doing anything wrong, and now no one is telling them what is right or wrong. The same bias is reported by other veterans, it is nice to be treated as equal, but easier to deal with the strict hierarchy were everybody know their place.

Another aspect in relation to managerial styles, is that the veterans also adapted their personal managerial styles as a part of their transition into society.

> *… I was a military instructor. If someone came into my class 5 minutes late, or they were 2 or 3 minutes late, they went to the office and found out what the heck happened to them. They were accountable that way. The leadership style… you can't conduct yourself the same way that you did in the military. You are going to burn too many bridges to get the result that you are trying to so…That was a lot to try to take in, but it was good that we were exposed to that because now I would much rather learn that lesson inside of a classroom then inside of a boardroom. (P4)*

It seems like the educational period offered an environment where the students could adapt to the managerial style that was more appropriate in the environment they were going to work, and that the university was a preparing them for that. The university by the professors were establishing a safe space [24], where the student got feedback that the military way of leading would not function in a job in the civil society.

8.3 The development of self-esteem

One aspect of transition from the military life to becoming a student is confidence. People with high achievements tend to have a higher level of self-efficacy and this also influence the motivation for working on new kinds of tasks [42], as becoming a student. The veterans gave stories on how their self-esteem were changing through their years of service, but also through the climbing in ranks. Here illustrated by one participant:

> *It has been changing. Once I hit E7, that is when my confidence level went up. It is like very hard to make E7 in the Navy. It is already like an elite force. And then when I did that, I actually gained the courage to actually speak up to like my bosses compared to when I was younger sailor. I just did what they told me to do and that was the end of it. P3.*

Bandura [38, 39] claims that people are not passively adapting influences that are coming their way, but being in lower ranks in the military, you are expected to accept what is coming your way, obey and fulfill orders, as illustrated in the quote above. In higher ranks they told there was room for expressing individual views, discuss and raise critical questions and this rank climbing seem to build their self-esteem and gave them confidence to give input to their superiors. The transition to becoming a student also influences their perceptions. The self-assessment in relation to their achievements in the military might have a positive impact of their base of self-worth, but entering higher education gave them new knowledge that was useful for other types of positions in society, and this was boosting their confidence. This link is expressed by participant 2:

> *To be honest, when I received my undergrad diploma, I cried so much! It meant so much because of all that the work that I put into it. So, although I was already pretty confident coming out of the military, because I was, like… wow… if I can do that…[laughing]! …then I can bring some skills to your company because I have been through all this, right? Um, but I think… what education has brought to me, is being able to articulate and expand on those skills. P2*

When we tried to dig deeper into this, and what was contributing to build their self-esteem, we focused on the learning processes and what particularly was of

importance for them, but we also explored what role the other actors, as professors, had in this. The students were taking different types of education, and gave examples on qualifications they were learning, that was of high importance for them in pursuing a career after military. Also, the working methods as writing papers and doing research was highlighted. Participant 6 were in line with this view: "*I really liked to be able to write papers, more so than to just take a test, which I don't think really test what you really learn or what you really know and stuff.*" Working in groups with other students seem to suit most of the students, and this also match the collective approach they were used to from the military. But one important factor on building their self-efficacy and support their ability to work to reach their goals, was the influence from the professors. The professors that went 'the extra mile' to support them, pointing them into new directions, helped them build their networks and in that way also influenced their possibilities to get interesting jobs after graduation.

> *I suffered from imposter syndrome for the longest time... Just not believing in myself, and um... that confidence had to be nurtured and developed and the professors... like encouraging you and telling you how... you know... like giving you feedback on your work... and helping you open your eyes to your possibilities, and its thanks to professor's encouragement and their constructive feedback that helps you with that. And also... I think it is just also like them believing in you can do... where you can go in life. P2.*

Attitude and behavior is learned in social settings [45] and the group of participants share characteristics that is reflecting their time in the military; they are punctual (rather 15 minutes early than on time), they deliver (rather in good time than too close to deadline) and many of them took the lead in the group assignments they were working on. By working with other veterans like this, can influence the perceptions of the veterans at a collective level [45] and such an image can work as a model for other veterans entering higher education.

9. Discussion

The main elements from the analysis above will be discussed in this section. In the first framework to analyze how universities create spaces for education of military veterans, we focus on the physical spaces as the universities in the light of place-making. The meaning of universities are socially constructed [19] and whether this would be considered a space of value for the veterans seems to depend on the group of students they were enrolled with, but also how the educators were dealing with this group of students. By studying together with other veterans, they felt 'at home' with a group of people who had been socialized into a similar culture through the military service. This gave the space a sense of familiarity [22] and this is building up on the feeling of safe spaces [24] which seems to be of importance for the veteran students. By this, they could use their energy and focus on the education, instead of trying to fit in and hiding their struggles. Having professors who not only were dedicated regarding providing good quality education, but also caring, were of high importance for the students. By going the 'extra mile' and follow up on the students according to their needs, to support and encourage when they were struggling, to challenge and make the students exploit their abilities, they were also building the resilience of the students [50].

This study takes place amongst American participants who were raised in the individualistic culture [27], before entering a military career focusing on the collective. Returning to society as adults who now had to find their own ways, they were supposed to provide for themselves and their families, could be challenging. To figure out what education they wanted to pursue and how to handle the finances and other practicalities, all the choices and options was an individual responsibility that was far away from their military experience. Once more the role of the professors was emphasized. Professors who took time and explaining systems and options were helpful through their education process and the transition back to civilian life. Still, the inspirational leadership style of the professors was not all easy. The students liked to be treated as equals with low power distance [36] between professors and students. This supported the notion of safe spaces [24], but it could also underline the struggles. As ex-militaries they were focused on doing the right things and now the professors did not tell them what was good or wrong. They had to find their own path, and that included their own styles as leaders. The professors were both modeling a way of being leaders, but also provided frames where they could work on their leadership styles that was more in line with the part of society they were entering after graduation.

The last angle we are applying for studying the veterans is through social cognitive theory. According to this framework, people are not passive agents but they also participate in producing the social systems they belong to [38, 39]. This goes for both the military systems as well as the educational system, even though the students are supposed to be more pro-active when leaving the military behind. The ability to be pro-active and work towards desired goals depends on how the individuals reflects on their personal qualifications and qualities [40]. The self-esteem built through a military career seemed to be of value for their confidence and this was further developed through education. The individual learning processes as e.g. writing papers and doing research, in combination with working in groups helped the students to reach their goals. In this way they could benefit from their experience of the collectivistic approach in learning to build knowledge and self-esteem amongst the individual students. The students were active in building safe spaces [24] for the learning environment and supporting each other to increase their self-efficacy, but the role of professors was also highlighted in this process. How the professors saw the potentials in the students and tried to nudge them in the right directions was something the students were appreciating and helped to boost their self-worth and self-efficacy. Also, how the professors included students in networks had an impact on how the students perceived themselves and had practical implications for life after graduation. In this way, not only the education itself, but the networking and third-mission activities also was of importance for their path back to civilian life.

The takeaway from analyzing universities as safe spaces for educating military veterans is a combination of two things: the value of studying together with others who had served in the military and the role of engaged professors. This knowledge can have implications for how the educations are organized.

10. Conclusion

In the title of this chapter, we are asking the question regarding how universities as safe spaces are providing a place for learning and building resilience of the students. Findings from our study indicate that veterans entering higher education might struggle and the transition is not necessarily effortless. The veterans are offered

support for both education, housing and living expenses after ending service through the GI Bill. The participants in our study are reflecting findings in other studies, where it is emphasized that the students are highly motivated and serious students [6] – despite suffering from previous and still-present obstacles such as physical injuries, and from psychological damage such as Post-Traumatic Stress Syndrome (PTSD). To dig further into how the university is taking part in preparing veterans for life after service, we have analyzed this from three different theoretical angles.

In the light of placemaking, the students emphasized the value of getting an education that could provide a career and, in that way, contribute to placemaking where they were living. The focus in this chapter is on placemaking at an individual level under the auspices of the university, and the interaction between the students and the professors, but also between the group of veteran students. This cluster of actors were building a room where the students felt safe. The contact between students who were familiar with military experiences also built on this feeling of being in safe spaces, they did not need to explain themselves. From this safe base, the individual students were educated, and trained into new skills, but also challenged on their view of society (e.g. regarding leadership styles) and not at least on their own capabilities. They were challenged to perform task they newer expected to do – and the ambitions raised. From this 'cocoon' of safety, the veterans went back to their scattered communities (either they were rural or urban) and took on new types of jobs. One of them even went much farther out to a job in a high profiled international organization.

The students who were socialized to work in the hierarchic system in the military, where the individual voices were less emphasized, were retrained to cope in society again. Entering the more individualistic educational course, were liberating for some of the participants, while it was challenging for others. In the military you were told what to do and your job was to figure out how to do that the best way. Now they, on their own, had to figure out what to do, while they still were keeping the attitude of doing it the best way. This could be a bit overwhelming. Having professors that were building up on a safe space, was helpful through this transition. The low power distance and leadership style was supporting and guiding the students, and the professors also took on the role as mentors for the students. This mentorship was of high value for the students as they were finding their way through academia towards a job in society. The safe space also provided an arena where the veterans could get input and adjust their own behavior as leaders, so they did not continue give command in a hierarchical way.

Education – both as a process and an outcome was boosting the self-efficacy amongst the veterans. By viewing education as a process, we are thinking of the interactions between the students, professors and other actor within the educational sector that is supporting the students. This is contributing to the safe spaces that are needed for building confidence and enhance the ability to learn. It also contributes to the learning process, ending with a degree that is useful for the purpose of gaining employment. Working on assignments, individually or in groups, doing research, developing speaking, and writing skills were also confidence building of soft skills. The veterans had accomplished climbing in the hierarchical ladder in the military and this had been contributing to building their self-esteem. The past was a good base for setting new goals and working towards fulfilling their educational place in the present and gaining momentum and acceleration of networking and people skills for the future. These results also support androgogical approaches to effective adult learning as presented early in this paper. The safe classroom space and faculty methodology of acknowledging students as having an important and relevant past to bring into the learning process enhanced the student experience for safe learning.

It seem like the term 'safe space' [24] can be seen as a meta-element that was crosscutting through all three of the lenses we were using in our analysis. The educational space for military students was physical and mental, safe, and supportive. In the academic space, students had the time and the support to apply military experiences into coursework and for classroom relationships. Formerly learned military skills of survival and dreams of desiring a new career and future, became reality through assignment completion and coursework objectives. The academic environment opened possibilities for a population of people who did not know their potential and did not have a former benchmark to consider the possibilities. This path was not smooth and straight forward. The students were challenged, they might not be able to participate in the social environment with the other students, the academic assignments could be challenging, the feedback from tutors and fellow students could feel harsh, to maneuver in the system with so many choices and opportunities could be daunting. From this view, the university might not feel like a safe space, but is contributing to build the resilience of the students if they are able to deal with this. Resilience can be described as: "the ability of an individual to adapt to and overcome harmful stimuli in healthy ways that lead to good outcomes [50]. Resilience is an elasticity and sponginess. Resilient people can bounce back from traumatic events. They bend, but they do not break. They absorb. They retain. They have the ability to take in others' viewpoints." ([25], p. 4). The universities need to gain better knowledge on how to assist veteran students and ease the transition back to society [51]. And by this study we have shed light on this. The main finding is that the professors 'going the extra mile' seem to have the most impact on the students for finding their own path. Those professors were creating a space for learning, and they were mentoring the students and guiding them through andragogical approaches. The students were challenged to build on their self-reliance, instead of leaning to the chain of command in the military and in that way build resilience that is needed if they shall function in the complex settings at their home areas.

Author details

Laila Nordstrand Berg[1]* and Paula C. Herring[2]

1 Western Norway University of Applied Sciences, Norway

2 DeVry University, California, USA

*Address all correspondence to: laila.nordstrand.berg@hvl.no

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Minimum Viable Products Launching for Start-Ups and Vocational Training Using No-Code Tools Learning Resources

David Orok, Joseph Akpan and Oludolapo Olanrewaju

Abstract

No-code tools (NCT) for minimum viable products (MVP) creation have been popular among start-ups in recent years. This technology form allows entrepreneurs to replicate working prototypes without developing code, which can save time and money when launching a product. However, the use of these techniques requires that users be acquainted with the selected hosting interface. Such interaction has posed a challenge in the massive adoption of the use of NCT by individual start-ups. To bridge this gap, a learning platform to introduce the public to the procedures and benefits of these tools was developed, and over 1000 learners have signed up. Hence, this study presents an overview of the learning resources development, the user satisfaction rate, and challenges based on the pros and cons of employing NCT. These learning resources are in the form of three software applications, namely a medical booking app, an online learning mobile app, and a grocery e-commerce shopping app. Investigation toward this study revealed that the need for technical skills and no-code solutions' scalability is desirable. The significance of the findings is envisaged to offer more learning support to African and developing countries' entrepreneurs and for future research in vocational education and training.

Keywords: no-code, entrepreneurs, minimum viable product, vocational education, sustainable businesses, developing economies, engineering education, sustainable education development, start-ups

1. Introduction

The global adoption of no-code tools (NCT) in start-ups and entrepreneurship has been on the rise in recent years. According to a report by Gartner, the no-code/low-code market is expected to grow continuously from $4.3 billion in 2017, reaching $13.8 billion within the same decade [1], indicating an anticipated significant increase in the adoption and usage of NCT. A survey conducted by Forrester found that nearly 60% of global developers have used low-code platforms, with another 25% planning

to use them in the future [2]. This indicates that NCTs are becoming more popular among developers and businesses worldwide.

The benefits of NCT include rapid development and deployment of MVPs, cost-effective development, improved productivity, faster time-to-market, reduced development time, increased efficiency, simplified development process, increased agility, streamlined development process, and increased collaboration [3, 4].

Due to the several advantages of the use of NCT, it has been widely adopted globally [5]. Most particularly prevalent in North America and Western Europe, where start-ups and businesses have been quick to adopt new technologies and tools. However, emerging markets such as Asia and Africa are also starting to see an increase in the adoption of NCT in start-ups and entrepreneurship [5].

In a report by IDC, it was observed that the Asia–Pacific region (excluding Japan) is expected to have the highest growth rate in the no-code/low-code market over the next few years [6]. This growth is attributed to the increasing demand for digital transformation and the rise of start-ups in the region.

In Africa, the use of NCT in start-ups and entrepreneurship is still in its early stages, but there is growing interest in these tools due to their simplicity and cost-effectiveness [5]. Based on the authors' wide experiences, NCT tools such as Bubble, Glide, Adalo, and Thunkable are some of the most used tools in Africa, and they are being utilized in various industries, including fintech, e-commerce, and health care.

The adoption of NCT in start-ups and entrepreneurship is a global trend that is expected to continue growing in the coming years. While North America and Western Europe have been quick to adopt these tools, emerging markets such as Asia and Africa are also starting to see an increase in usage [7]. As the demand for digital transformation and cost-effective solutions increases, it is expected that more start-ups and businesses may turn to NCT to launch their MVPs and streamline their operations [7]. Most African start-ups struggle to raise venture capital, and even if they do, the process can be lengthy and bureaucratic. The lack of funding and other resources often leads to a slow and uncertain product development process, which can hinder their ability to compete with established players in the market [8].

Eric Ries first introduced the concept of the minimum viable product (MVP) in his book, The Lean Start-up [9]. The MVP approach allows start-ups to test their product in the market before investing significant time and resources in its development. Launching a successful start-up is a challenging task that requires significant time and resources [4].

One solution to this problem is the use of no-code tools for fast and cost-effective minimum viable product (MVP) development [10]. These tools allow entrepreneurs to create functional prototypes without writing any code, significantly reducing the time and resources required to launch a product. The use of NCT has gained popularity in recent years in developed economies. However, their potential applications in emerging markets, such as Africa, have not been fully explored [4, 11].

This paper aims to examine the challenges and solutions while presenting the NCT development process for the fast launching of MVPs without venture capital for start-ups. Since there is hardly any literature addressing these issues, the existing literature on the use of NCT is used within the context of start-up development and vocational education, as well as their potential benefits and limitations for start-ups. The study also evaluates a key solution of using NCT to develop and launch MVP with three cases of applications developed as a learning resource intended to serve as a vocational training resource for users in developing their apps for employment in start-up businesses.

The rest of the paper is structured into the following sections, namely the introduction, definition of key concepts & terms, a comprehensive review of literature on NCT adoption, the developed learning resources with the corresponding process, user case evaluation of the learning resources, and ends with a final remark & conclusion.

2. Definition of key concepts and terms

In this section, the definitions of key terms and concepts used in this work are presented.

- Minimum Viable Product (MVP): A product with enough features to satisfy early customers and provide feedback for future development. The MVP approach allows start-ups to test their product in the market before investing significant time and resources in its development.

- Venture Capital (VC): A type of private equity financing provided to start-ups and early-stage companies that have high growth potential. VC investors typically take an equity stake in the company in exchange for their investment, and they provide funding, mentorship, and network support to help the company grow.

- No-code Tools (NCT): Software tools that allow users to create functional prototypes and applications without writing any code, using drag-and-drop interfaces and pre-built modules. No-code tools have gained popularity in recent years to reduce the time and resources required to launch a product.

- Fast Launching: The process of quickly launching a product or service in the market, typically using lean methodologies such as the MVP approach to test the product and iterate based on user feedback.

- African Start-Ups: Start-ups that are based in Africa or focused on serving African markets. African start-ups face unique challenges, such as limited resources and access to funding, which can make it difficult to develop and launch a product.

- Emerging Markets: Economies that are transitioning from developing to developed status, characterized by rapid economic growth, rising income levels, and increasing globalization. Emerging markets offer significant opportunities for entrepreneurship and innovation but also face unique challenges and risks.

- Lean Start-up: A methodology for developing start-ups and launching new products characterized by iterative development, rapid prototyping, and continuous customer feedback. The lean start-up approach emphasizes the importance of testing assumptions and validating business models before investing significant time and resources.

- Product Development: The process of creating and refining a product or service from conception to launch, typically involving research, prototyping, testing, and iteration.

- Cost-effectiveness: The degree to which a product or service provides value for money, considering both the cost of production and the benefits it delivers to the user.

- Early Traction: The initial success and adoption of a product or service, typically measured by metrics such as user acquisition, revenue, and engagement. Early traction is an important indicator of the potential success of a start-up and can help attract further investment and support.

- Bootstrap: The process of starting and growing a business using personal savings or revenue generated by the business rather than external funding such as venture capital. Bootstrap start-ups typically focus on cost-effective growth strategies and lean product development methodologies.

3. No-code tools adoption

As a response to the problem of insufficient developers to fulfill the increased demand for apps, low-code development platforms were established [12, 13].

The idea of citizen developers was introduced to the application development area by low-code development platforms, which allow developers to build efficient, scalable, and rapid apps with minimal coding [14]. The application of NCT concept has been adopted and applied in different aspects, such as follows.

- Research application [15].

- Design enterprise services [16].

- Training the next generation of experts [17].

- Data pipeline for low-code development augmented with machine learning [18].

- Chatbot development framework [19].

- Smart personal assistant [20].

- Internet of things [21].

- Model-driven engineering [22].

- Mobile app development [23].

- Improving developers' experience with low-code process modeling language [24].

- Manufacturing business process automation [25].

- Collaborative manufacturing and logistics environment [26].

- Fast launching of MVP for start-ups and for vocational training (this study).

The use of NCT for MVP development has gained popularity in recent years. NCT allows entrepreneurs to create functional prototypes without writing any code, using drag-and-drop interfaces and pre-built modules [27]. However, the platform used in the tool development should be well supported [28] and should require the least experience [27], ease usability [29], and ensure a satisfying user experience [24], as well as enable proper software engineering [30]. This approach significantly reduces the time and resources required to launch a product, enabling start-ups to test their ideas quickly and iterate based on user feedback [31].

In the sub-sections below, the level of adoption of NCT in MVP development across developed countries, emerging markets, and African start-ups is discussed.

3.1 Developed economies: adoption and progress of no-code tools usage in start-up businesses

NCTs have gained significant traction in developed economies, where start-ups have been quick to adopt these tools due to their simplicity and cost-effectiveness.

The United States and Europe are leading the adoption of no-code tools in start-ups and entrepreneurship. Start-ups in these regions are using no-code tools to launch MVPs quickly and cost-effectively, streamline their operations, and improve their customer experience. The adoption of NCT is particularly prevalent in industries such as fintech, e-commerce, health care, and education, which serve as part of the drivers of digital transformation [14].

Similarly, in Europe, NCT is gaining momentum, with a growing number of start-ups and businesses using these tools to launch their products and services.

However, start-ups in developed economies have also faced some challenges in implementing NCT. One of the main challenges is the lack of technical expertise among team members, which can lead to the development of subpar products or services. Additionally, some start-ups have struggled to integrate NCT with their existing systems and processes, leading to delays in implementation.

Despite these challenges, start-ups in developed economies have also derived several benefits from using NCT. These tools have allowed them to launch MVPs quickly and cost-effectively, test their products or services in the market, and get feedback from customers. NCT has also helped them streamline their operations, improve their workflows, and reduce their development costs.

The adoption of NCT in start-ups and entrepreneurship in developed economies is on the rise [5]. Start-ups in these regions are using these tools to launch their products and services quickly, streamline their operations, and improve their customer experience. While there are some challenges associated with implementing NCT, the benefits they provide are significant, making them a valuable tool for start-ups and businesses.

3.2 Emerging markets: adoption and progress of no-code tools usage in start-up businesses

NCTs have gained popularity in emerging markets due to their ease of use and cost-effectiveness. Start-ups in emerging markets are increasingly adopting these tools to develop and launch their MVPs rapidly. **Table 1** highlights the adoption of NCT in start-ups in emerging markets, the challenges faced during implementation, and the benefits derived from using these tools.

NCT Adoption		
Emerging Market	**Adoption of NCT**	**Challenges during Implementation**
Nigeria	High	Limited Internet connectivity and lack of technical expertise
India	High	Cultural barriers to tech adoption and lack of awareness of no-code tools
Kenya	Moderate	Limited access to funding and limited access to mentorship
Brazil	Moderate	High cost of no-code tools and limited access to the Internet
South Africa	Low	Lack of awareness of no-code tools and high cost of Internet
Source: Authors' elaboration.		

Table 1.
Overview of NCT adoption in emerging markets.

Start-ups in emerging markets are adopting NCT at a moderate to high rate. In countries like India and Nigeria, the adoption rate is high, while in countries like South Africa, the adoption rate is low.

While the adoption of NCT in emerging markets is growing, start-ups still face several challenges during implementation. One of the primary challenges is the limited Internet connectivity in some regions. Start-ups in remote areas may have difficulty accessing no-code tools due to slow Internet speeds. Another challenge is the lack of technical expertise in some regions. Start-ups may not have the necessary skills to fully utilize no-code tools, resulting in slower development times and increased costs [8, 32].

Despite the challenges, start-ups in emerging markets are benefiting from the use of NCT with support from crowdfunding toward entrepreneurship in emerging economies [33]. One of the main benefits is the rapid development and deployment of MVPs. No-code tools allow start-ups to develop and launch their products quickly, giving them a competitive advantage. Another benefit is the cost-effectiveness of no-code tools [31]. These tools are significantly cheaper than traditional software development, making them an attractive option for start-ups with limited resources [34].

3.3 African start-ups and entrepreneurship: adoption and progress of no-code tools usage in start-ups businesses

African start-ups and entrepreneurship have gained significant attention in recent years due to the increasing recognition of the continent's potential for economic growth and innovation. The start-up ecosystem in Africa is still in its early stages, but there have been significant developments in recent years, with the number of start-ups and venture capital investments increasing steadily.

The African start-up ecosystem has made significant progress in recent years, with a growing number of start-ups and investors showing interest in the continent. According to the African Tech Start-ups Funding Report 2020, African start-ups raised a total of $1.3 billion in funding in 2019, with the fintech sector receiving the largest share of investment [35]. This represents a significant increase from the $400 million raised in 2015. There has also been significant progress in terms of government and institutional support for start-ups and entrepreneurship in Africa. Many African countries have launched initiatives to promote entrepreneurship and

innovation, such as tax incentives, funding schemes, and incubator and accelerator programs.

Several successful cases of African start-ups that have used no-code tools to launch their products and achieve early traction have been documented. For example, an e-commerce platform for African fashion used NCT to develop its MVP and launch it in just 6 weeks. Another example is a Nigerian financial technology start-up which used NCT to develop its MVP and launch it in just 4 weeks.

Despite the progress made, African start-ups and entrepreneurship still face significant challenges. One of the biggest challenges is the lack of access to funding, with many start-ups struggling to secure investment due to limited venture capital availability and a lack of angel investors. This has resulted in a funding gap, which has limited the growth and development of many start-ups. Another challenge is the lack of infrastructure, including reliable electricity, Internet connectivity, and transportation, which can make it difficult for start-ups to operate and scale their businesses. The education system in many African countries also needs improvement, with a lack of technical skills and knowledge among the workforce hindering the growth of tech start-ups. Other challenges include regulatory barriers, corruption, and political instability, which can make it difficult for start-ups to operate and attract investment. Finally, cultural attitudes toward entrepreneurship in some African countries can be negative, with many people preferring to pursue more traditional career paths.

There are growing solutions to the needs of start-ups and entrepreneurship in Africa. One solution is the increasing availability of incubator and accelerator programs, which provide support, mentorship, and funding to start-ups. Examples of such programs include the Tony Elumelu Foundation Entrepreneurship Programme [36], which provides seed funding and training to African entrepreneurs, and the MEST Africa incubator, which provides training, mentorship, and funding to tech start-ups in Ghana, Nigeria, Kenya, and South Africa.

Another solution is the increasing availability of alternative funding sources, such as impact investment and crowdfunding [33, 37]. Impact investors are investors who seek to create positive social or environmental impact alongside financial returns, and they have become increasingly active in Africa in recent years. Crowdfunding platforms, such as Kiva, GoFundMe, and Seedrs, have also become more popular in Africa, providing a way for start-ups to access funding from a wider pool of investors [38].

Other solutions include government and institutional support, such as tax incentives and funding schemes, and the development of infrastructure, such as improved electricity and Internet connectivity.

The African start-up ecosystem has made significant progress in recent years, but there are still many challenges that need to be addressed to unlock the full potential of African entrepreneurship. These challenges include limited access to funding, infrastructure deficits, and cultural attitudes toward entrepreneurship. However, there are growing solutions, including government and institutional support, incubator and accelerator programs, and alternative funding sources such as impact investment and crowdfunding. With continued support and investment, African start-ups and entrepreneurship have the potential to drive economic growth and innovation on the continent. The use of NCT for the fast launching of MVPs without venture capital (VC) has gained significant attention in recent years, particularly across African start-ups.

The use of NCT could potentially address some of these challenges by enabling start-ups to develop and launch MVPs quickly and cost-effectively.

4. Development of learning resources with no-code tools

The learning resource was developed comprising three courses on building mobile and web apps without coding using FlutterFlow.

The courses created by the FlutterFlow developer tool cover the development of specific mobile applications, namely

1. A grocery shopping app

2. A medical booking app, and

3. An online learning app.

The key features and functionality of the three apps are shown in **Figures 1–3** for the grocery, medical booking, and online learning apps, respectively.

Each course leverages FlutterFlow, a platform that enables app development without the need for traditional coding and is hosted on Udemy.com.
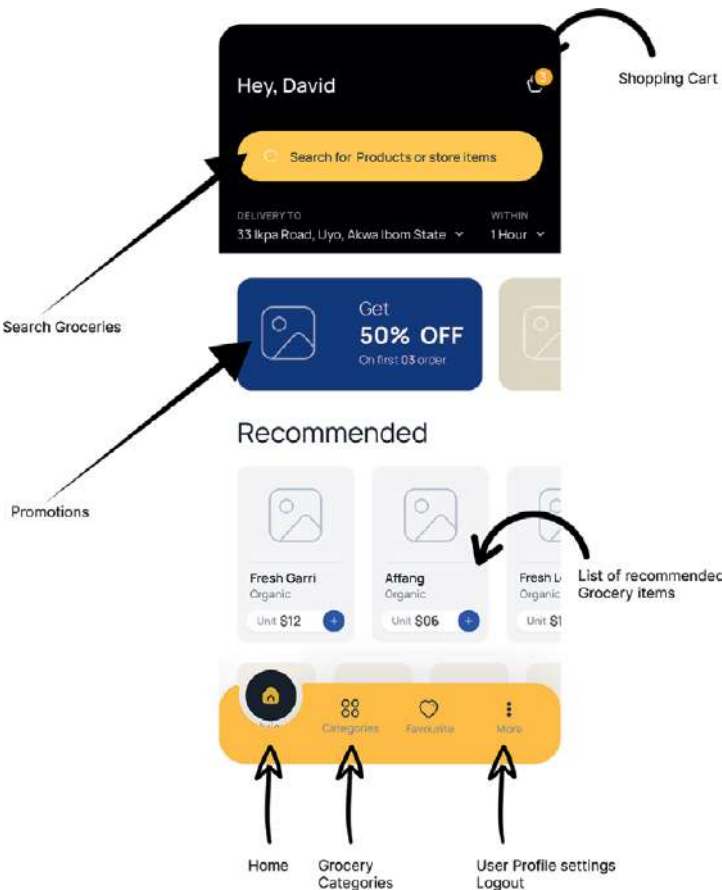

Figure 1.
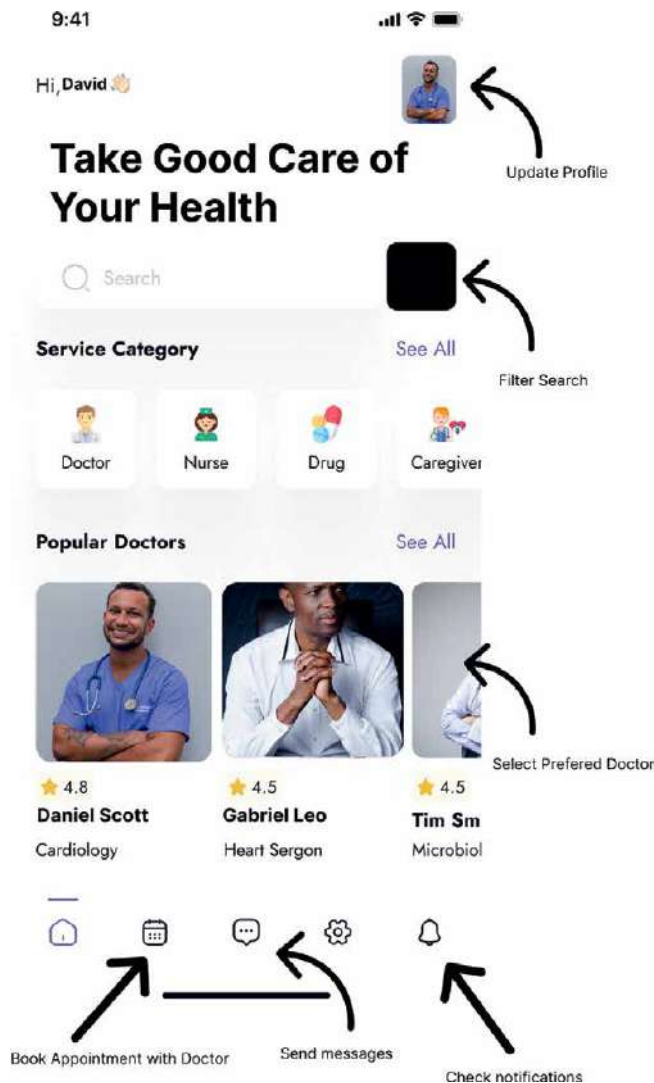*Feature of the grocery app. Source: Authors' elaboration.*

Figure 2.
Feature of the medical booking app. Source: Authors' elaboration.

The hosting platform is an online learning platform that provides a marketplace for instructors to create and sell courses on a wide range of topics. It is accessible to learners globally, offering a diverse range of courses in various domains.

It allows instructors to utilize different teaching formats, such as video lectures, downloadable resources, quizzes, and discussion forums. This diverse set of tools facilitates effective and engaging learning experiences for learners. Additionally, Udemy provides a certification mechanism upon course completion, adding value to learners' resumes or professional profiles [39].

The courses span different durations, with the grocery shopping app course being 11.5 hours long, the medical booking app course lasting 8 hours, and the online learning app course being 9.5 hours in duration. These durations indicate the depth and
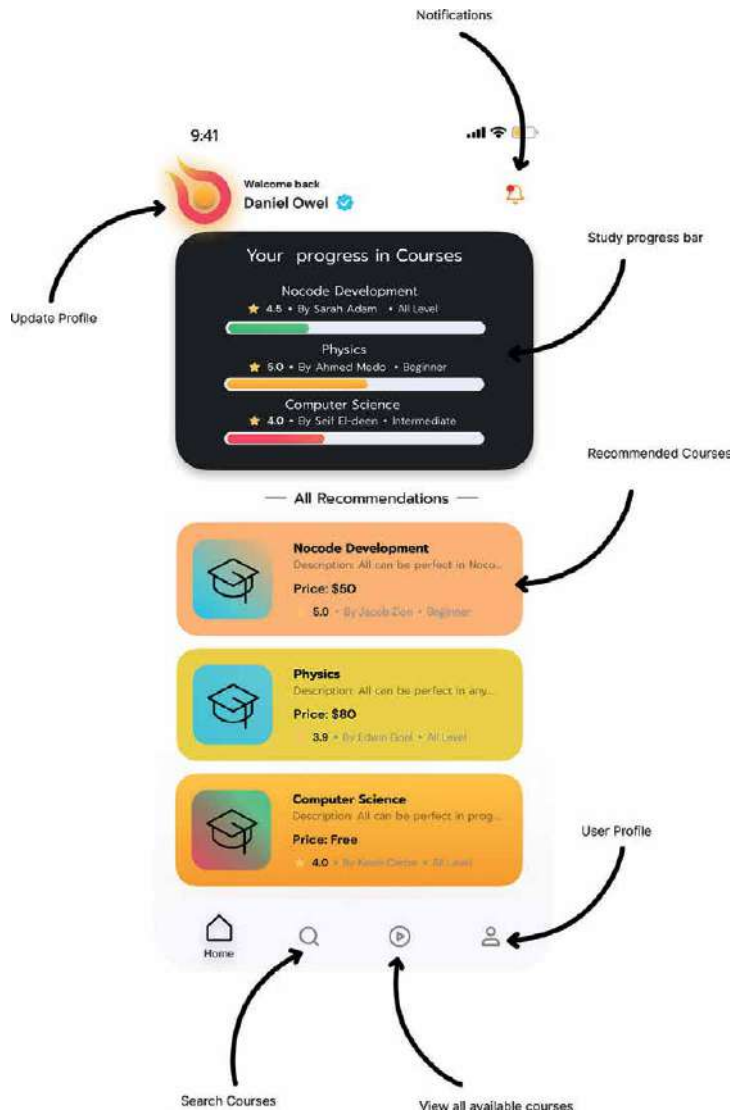
Figure 3.
Feature of the online learning app. Source: Authors' elaboration.

comprehensiveness of the content, ensuring that learners receive thorough instruction in app development using FlutterFlow.

It is noteworthy that the online learning app course is labeled as a bestseller, indicating its popularity and positive reception among Udemy users. This attests to the effectiveness of the course content and the value it provides to individuals interested in building online learning applications without coding.

Overall, the hosting platform serves as a widely accessible and user-friendly platform for hosting and disseminating educational content, enabling both instructors and learners to participate in a global learning community. Based on the authors' experiences and the work by Inouye J & Johns R. [39], the pros, cons, and comparison of Udemy with other hosting platforms are presented in sub-sections A, B, and C, respectively.

4.1 Pros of the hosting platform

Large User Base: It boasts a massive user base, providing instructors with access to a diverse and extensive audience interested in a wide range of topics.

Diverse Course Topics: The platform covers an extensive array of subjects, allowing for the creation and consumption of courses across various domains, including technology, business, arts, and lifestyle.

User-Friendly Interface: It is known for its intuitive and user-friendly interface, making it easy for both instructors and learners to navigate and engage with course content.

Certification: Successful completion of Udemy courses results in certification, offering learners a tangible credential to showcase their newly acquired skills.

Lifetime Access: Once enrolled, learners often enjoy lifetime access to course materials, enabling them to revisit content and stay updated on any additional resources or updates provided by the instructor.

Promotional Tools: It offers tools for instructors to market their courses, including promotional discounts and affiliate programs, helping them reach a broader audience.

4.2 Cons of the hosting platform

Pricing Model: It frequently offers deep discounts on courses, which may lead to lower revenue for instructors. Additionally, the pricing model might undervalue the efforts put into creating comprehensive courses.

Limited Communication: Interaction between instructors and learners can be limited, relying heavily on discussion forums. While there are ways to communicate, the platform might lack the real-time engagement found in live or interactive learning environments.

Quality Control: It has an open marketplace, meaning anyone can become an instructor. While this encourages diversity, it also raises concerns about course quality and consistency. Some courses may lack depth or accurate information.

No Ownership of Learners' Base: Instructors do not have direct access to the contact information of their learners. This can be a limitation for instructors who want to build their own community or market future courses directly.

Competitive Environment: With a vast number of courses on similar topics, instructors face significant competition, making it challenging for new courses to gain visibility without effective marketing strategies.

Limited Customization: Instructors have limited control over the design and customization of their course pages. This may restrict branding opportunities and the ability to create a unique learning environment.

4.3 Comparison with other platforms

Udemy stands out among various online learning platforms, and when comparing it to other existing platforms, it is important to consider both its advantages (pros) and drawbacks (cons). Here is a comparative analysis:

Udacity and Coursera: These platforms often partner with universities and corporations, offering more structured, degree-oriented programs. While they provide a more formal education approach, they may lack the flexibility and variety found on Udemy.

Skillshare: Skillshare emphasizes project-based learning and a subscription model. It fosters a sense of community with learner collaboration. However, it might have fewer courses on specific technical topics compared to Udemy.

Pluralsight: Pluralsight focuses on technology-related courses and offers assessments to gauge skill levels. It is more specialized but might not cover the diverse range of topics found on Udemy.

Udemy's strengths lie in its extensive user base, diverse course offerings, and user-friendly interface. However, the pricing model and limited instructor–learner communication may pose challenges. When choosing a platform, instructors should consider their specific goals, the nature of their content, and the level of engagement they desire with their audience. Each platform has its unique features, catering to different preferences and needs within the online learning landscape.

5. No-code tool: hosting description and procedures

In Section 4, the learning resources developed were done using FlutterFlow and Firebase, which involves a streamlined development process flow, as shown in **Figure 4**. Below is a description of the key steps involved in developing the grocery shopping app, medical booking app, and online learning app.

Planning and Ideation

- Define the purpose and features of the app.

- Identify target users and their needs.

- Sketch a basic outline of the app's structure and functionalities.

FlutterFlow Setup

- Sign up for a FlutterFlow account.

- Create a new project for the specific app.

- Familiarizing with the FlutterFlow visual development environment.
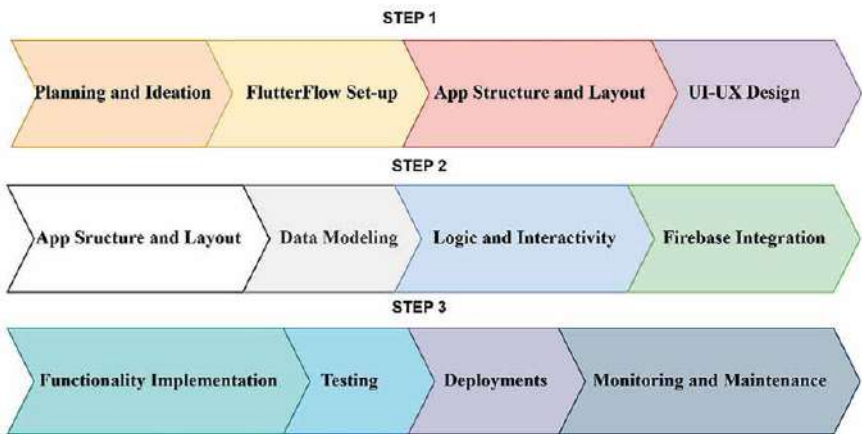

Figure 4.
Development process for the learning resources.

UI/UX Design

- Use Figma or other design tools to create or customize UI/UX designs.

- Import or design app screens, incorporating elements like buttons, images, and navigation.

- Ensure a user-friendly and visually appealing interface.

Figma is a collaborative design tool that aids in creating user interfaces for mobile apps. It offers a robust platform for creating detailed, visually appealing UI designs, accelerates the design process, facilitates collaborative design, and supports interactive prototyping. However, it has a learning curve for new users, lacks dynamic functionality for app development, and requires a stable Internet connection for collaborative work. Figma's visual design and layout are crucial for a user-friendly interface, and its ability to create interactive prototypes is beneficial for learners. The tool's learning curve is significant, and learners may need additional resources to implement dynamic functionality. Despite these limitations, Figma remains a valuable resource for app development.

App Structure and Layout

- In FlutterFlow, visually arrange the components and elements on each screen.

- Define the layout, such as rows, columns, and containers, using the drag-and-drop interface.

Data Modeling

- Define the data structure required for the app.

- Use FlutterFlow's visual data modeling features to set up databases and collections.

- Connect elements on screens to corresponding data sources.

Logic and Interactivity

- Implement app logic without coding using FlutterFlow's visual programming.

- Define interactions, such as button clicks, form submissions, and navigation.

- Incorporate conditional logic and data binding to create dynamic app behavior.

Firebase Integration

- Connect the app to Firebase for backend services.

- Set up Firebase authentication for user registration and login.

- Utilize Firebase Firestore or real-time database for storing and retrieving data.

Functionality Implementation.
Implement specific functionalities based on the app type:

- For the grocery shopping app: Implement product listings, shopping cart, and checkout.

- For the medical booking app: Implement appointment scheduling, video/chat meetings, and notifications.

- For the online learning app: Implement course listings, enrollment, and payment processing through Stripe.

Testing

- Test the app's functionalities and interactions using FlutterFlow's preview feature.

- Conduct thorough testing for different scenarios and user interactions.

- Ensure the app is responsive and functions as expected.

Deployment

- Once satisfied with the app, deploy it to various platforms (iOS, Android, web).

- Follow FlutterFlow's deployment process for exporting or publishing the app.

Monitoring and Maintenance

- Implement analytics using Firebase Analytics to track user behavior.

- Monitor app performance and user feedback.

- Address any issues and release updates as needed.

This development process flow leverages the visual development capabilities of FlutterFlow and the backend services provided by Firebase, allowing developers to create feature-rich apps without traditional coding.

6. Results: user case evaluation of the no-code tool learning resources

In this section, the evaluation of the three courses based on users' experience over an extended hosting and training 7 months is presented. The range of users' demography spans across the globe to validate the usefulness of the NCT.

The data was collected from the hosting platform with subscriptions from 1326 users consisting of 718, 565, and 302 users for the grocery shopping app (GESA), medical booking app (MBA), and online learning resources app (OLA), respectively. Some users had subscriptions to more than one course and an indication of interest in the applicability of NCT for multiple purposes of MVP development.
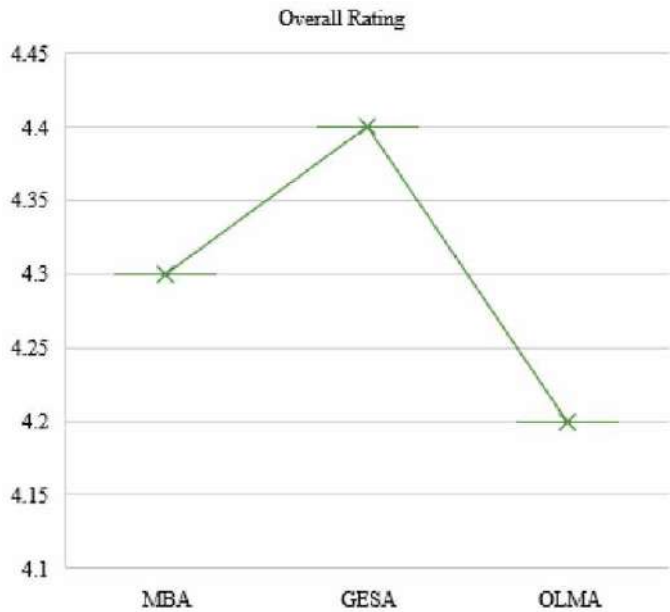
Figure 5.
Overall course satisfaction across the three learning resources.

General Reasons		
Emerging Market	**Satisfaction (comment)**	**Dissatisfaction (comment)**
MBA	Very High (Good, interesting, beginner-friendly, and great value, resourceful)	Low (Technical challenges due to sound, desire for additional content beyond the course scope)
GESA	Very high (Simplified, good, interesting, beginner-friendly, and great value, comprehensive, resourceful)	Low (Technical challenges due to sound, desire for additional content beyond the course scope)
OLMA	Very High (Good, easy, and great value)	Low (Technical challenges due to video speed, desire for additional content beyond the course scope)
Source: Authors' elaboration.		

Table 2.
Summary of users' feedback on satisfaction and dissatisfaction.

The user and overall course satisfaction rates are shown in **Figures 4** and **5**, respectively.

Based on **Figure 5**, the users' satisfaction is within the range of 48–56%, 16–29%, and 10–28% for 5, 4, and 3 stars, respectively, where the maximum satisfaction is at 5 stars.

Only between 3 and 5% of the users had the least satisfaction, which may have been primarily owing to the organization of the learning resources and not necessarily the usefulness of the concepts explained.

Some of the reasons for the satisfaction and dissatisfaction, as highlighted by the users, are included in **Table 2**.

7. Final remarks and conclusion

Based on the forecasts by Gartner and Forrester, there is an expectation that low-code development platforms may soon experience widespread use for app creation. This paper has explored the use of no-code tools for the fast launching of minimum viable products (MVPs) in start-ups without venture capital (VC). We conducted a literature evaluation to gather information on the utilization of NCT and identified the adoption levels globally under three economic categories, which were developed countries, emerging markets, and developing countries.

Our discussions show that NCT can provide a cost-effective and efficient means for start-ups to fast-track their development without the need for VC funding. However, some challenges need to be addressed, such as limited access to reliable Internet and low levels of digital literacy. Despite these challenges, we found that emerging markets with some African countries are beginning to adopt NCT in their start-up ecosystems.

Furthermore, results from a 7-month hosting and training period were used to evaluate three courses. The GESSA grocery shopping app, the MBA medical booking app, and the OLA online learning resources app all had data collected from 1326 users worldwide. The percentage of satisfied users varied between 48% and 56%, with a maximum rating of 5 stars. Perhaps because of how the learning materials were organized, only 3–5% of users were the least satisfied.

In the future, there is a need for more research on the specific needs and challenges facing African start-ups and how NCT can be utilized to address them. There is also a need for research on the potential impact of NCT on the overall development of the African start-up ecosystem and how it can contribute to economic growth and job creation.

In conclusion, the utilization of NCT in the launch of MVPs can provide a valuable solution for start-ups to overcome the challenges they face. As the adoption of no-code tools continues to grow globally, there is a need for more research and investment in the development of tailored solutions for start-ups in each economic category. By leveraging the benefits of NCT, start-ups can be better positioned for success and contribute to the growth and development of the economy of that nation.

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Conflict of interest

The authors declare no conflict of interest.

Credit authorship statement

The first author developed the learning resources and currently teaches them via the platform (https://www.udemy.com/user/david-orok-2/). Both the first and

second authors conceptualized the paper. The writing was done by the first and second authors, with the methodology developed by the second author. The third author handled the review of the paper. Consent for the publication has been given and agreed upon by all the authors.

Author details

David Orok[1], Joseph Akpan[2]* and Oludolapo Olanrewaju[2]

1 Information and Technological Entrepreneurship Program, Innopolis University, Innopolis, Russia

2 Industrial Engineering, Durban University of Technology Durban, South Africa

*Address all correspondence to: 22176142@dut4life.ac.za; m.mrdavidorok@gmail.com

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Section 5

Democratic Society in Future Education

Self-Transformation through Attitude and Mind-Set Change in a Democratic Culture: A Participatory Action Research Approach

Avhurengwi Samson Mabade

Abstract

The transformation brought about by man should lead to the transformation of man himself. Many African countries have fought for democracy, which includes the transformation of amongst others, the individual, the group, organization transformation, and the workplace. Although there is an abundance of literature about transformation, literature about self-transformation is scarce. The researcher planned to encourage individuals to transform themselves through attitude and mind-set change. An understanding of political, psychological, and philosophical dimensions can contribute significantly to an individual's self-transformation. The researcher selected twenty-two community members for a participatory action study. The participants comprised three educators, three civic members, three traditional leaders, three community policing forum members, three members from victim empowerment, three policing staff, two church leaders, and two members from community health care groups. The researcher used a qualitative technique for data collection. The participants formed a focus group that included discussions and individual interviews. The purpose of discussions and interviews was to ascertain how participants could understand change from a selfish attitude and mind-set to show the significant self-transformation in a democratic culture. Responses were recorded in a reflective diary and transcribed by the researcher. Responses were analyzed using data matrix and then reported on in a participatory action research approach study.

Keywords: attitude, culture, democracy, mind-set, self-transformation

1. Introduction and motivation underlying the study

In a democratic culture, individual expectations are greater than in a nondemocratic culture. A democratic culture promotes transformation of many existing aspects, including infrastructure, programe design, school culture, subject matter, administrative issues, and individual transformation amongst others. In addition, people must know their rights, although some appear not to understand that rights should be coupled with responsibilities, openness, respect, and tolerance. It is also important

that an individual develops critical thinking in a democratic culture to enable one to be judgmental of oneself before judging others. However, learning can assist an individual to change his/her behavior through attitude and mind-set change. This learning can occur formally, informally, or non-formally to the extent that one's personal growth is enhanced. Nobody knows everything but through learning people can share knowledge to enhance self-realization and self-actualization. These can develop and sustain self-transformation of a responsibly coherent individual. Self-transformation is also a significant factor in the economic development of each community globally. Organizations, schools, departments, and all spheres of management can benefit from self-transformation through attitude and mind-set change. An individual perception cannot always be true to reality; therefore, an individual is likely to change attitudes and mind-set to enhance social contract.

Failure of self-transformation appears to be the aftermath of numerous community-based problems such as gender-based violence, ritual murders, theft, and other criminal activities, while some communities dominate through local land capture that hampers the distribution and modernization of land for economic development due to lack of self-transformation by the leadership in a democratic culture. Medda [1] states that land capture refers to a situation where the land is not accessible to all people who have the right to access. Accessibility refers to the extent to which land use enables individuals to engage in all relevant activities. In this study conducted in South Africa, the traditional leadership works with local committees elected from community members. The elected members seem to be more predominant; they have neither respect nor civic-mindedness in their discussions more, especially the elite who work without a land distribution policy in a supposedly democratic culture that promotes fairness, justice, and equality for all. The elite would decide what to do on a particular piece of land as individuals rather than including other community members in the development of the land. Elite land capture is, therefore, likely to exacerbate rural income inequality. The elite adopt negative attitude toward some community members despite these community members having magnificent ideas. The authority emanates from committee members themselves, especially the elite due to a lack of self-transformation in a supposedly democratic era. Often a business cannot be easily established if one of the committee members has an interest in the business of that nature unless the applicant is somehow related to the committee members concerned. In most instances, committee members appear to have more than three projects in a particular community, hence those in authority being the chief beneficiaries of the land. The growth of emergent farms is often a process of elite capture of land and public spending. The elite are the ones who gain concessions regarding the land.

In Zambia, land capture has been dominated by salaried urbanites and by relatively privileged rural individuals. Land administration has been in the hands of opportunistic and selfish people. The transformation of Africa's rural landscape has been characterized by the predominance of very small-scale, semi-subsistence farms to more productive commercially viable farms. There is, however, a rapid increase in the number of so-called emergent farmers over the last decades after the outcry of community members. The smallholders cultivate more than five up to twenty hectors of land. Between 2001 and 2011, the population of emergent farmer householders in Zambia grew by 62% since there has less land capture by the elite people [2].

In America, land use planning favors the elite, and there is a lack of attention to formal economic planning tools. Land prices have increased since the scattered spatial application of the tax to favor the elite only. Rural landownership is politically biased. Brazil and Colombia have implemented Land Value-Capture Strategies in a context

full of controversies. The Colombian-value capture is named Captura de Plusvalia, and it is a Land Value Development Tax [3]. In this study, community members might be given land for business and sites for residential development, and they are given a period of 6 months to establish a business. Those who fail to establish their infrastructure within a given period are dispossessed of the site by the leadership who can then decide to sell for profit, thus benefitting individual member of the leadership. The above result from lack of self-transformation within the leadership as individuals. Such attitudes and mind-set regarding leadership need to be changed. In a democratic culture, all people are equal, and they should be treated equally and fairly.

Democracy combines attitudes that share an emancipative thrust in pursuing the freedom of ordinary people, involving an emphasis on people's power, tolerance of nonconforming people, and trust in people. It is, thus, possible that an emancipative mass attitude does not show a significant impact on democracy when a broader measure of democracy is used. When testing the effect of emancipative mass attitudes against the influence of socioeconomic factors, broader modernization cannot be used; hence, emancipative mass attitudes might not show significant effect on democracy when an encompassing measure of modernization is included; however, emancipative mass attitudes can help to achieve democracy. Prodemocratic mass attitudes become an effective support factor only to the extent to which they motivate powerful mass actions that demonstrate people's willingness to struggle for democratic goals [4].

The mind-set behind powerful mass action is the most appropriate for governing because it enables politicians more readily to recognize opportunities for desirable compromise. Political scientists have exposed the harmful consequences of misplaced campaigning but have not connected this problem with the mind-set. We analyze here and its implications for democratic compromise. The mind-set associated with campaigning, therefore, deserves greater attention than it has received because it reinforces all other factors. If we want to make democracy more amenable to compromise, we need to understand not only the partisan positions and political interests that affect comprise but also the arguments and attitudes that politicians use to resist or support it [5].

According to Barret [6], openness is an attitude toward people who are perceived to have different cultural affiliations from oneself or toward beliefs, world views, and practices, which differ from one's own. It involves sensitivity toward curiosity about and willingness to engage with other people and other perspectives on the world. Respect consists of positive regard and esteem for someone, or something based on the judgment that they have intrinsic importance, worth, or value. Having respect for other people who are perceived to have different cultural affiliation or different beliefs, opinions, or practice from one's own is vital for effective intercultural dialog and a culture of democracy. Civic-mindedness is an attitude toward a community or social group to which one belongs that is larger than one's immediate circle of family and friends. It involves a sense of belonging to a community, an awareness of the people in the community, and an awareness of the effects of one's actions on other people. Responsibility for self-efficiency is a significant attitude in a democratic culture. Tolerance of ambiguity is an attitude toward a situation, which is uncertain and subject to multiple conflicting interpretations. It involves evaluating this kind of situation and dealing with the above constructively. Lifelong learning about transformation involves people knowing who they are, relative to the rest of humanity, how they differ from others, and what the similarities are in order to transform. This involves integrating the various facets of the psyche to develop a full and deep consciousness of the self [7].

Clearly, in this study, openness and responsibility do not always prevail in communities, therefore, people should be encouraged to attend adult and community education so that they understand these principles of democracy. With this in mind, there are a few knowledge institutions that could contribute to knowledge enrichment so that everyone can move from general knowledge to specific knowledge that can benefit communities by clarifying how an individual can change his/her attitudes and mindset. It is, however, imperative that lifelong learning be promoted to enhance personal growth and understanding of self-transformation, a democratic culture, and participatory action in each community. This includes how personal transformation can be developed and promoted since each person has the right to education and training.

2. Literature review

Achieving personal transformation in the workplace involves setting milestones and tracking progress. Many people struggle with personal transformation in trying to achieve their goals within an established time frame. Personal transformation involves the motivation and discipline required to grow, develop, and improve in one's personal and professional life; transformation occurs internally and externally. Internal transformation occurs by investigating one's improvement or by defining one's-identity; hence, external transformation leads to a tangible transformation of things outside oneself. This includes a career transformation with a new role or promotion. Some people rely on goal-based strategies for a holistic type of personal transformation. Goal-based strategies focus on big goals as the motivation force for change; hence, this includes shifting goals and focusing on new goals that can help one to discover talents, skills, and responsibilities, which prompt personal transformation; progressing goals occur when one sets goals for oneself, and one continues to reach and expand on them. The initial goal oneself sets oneself should remain consistent while continuing to be challenging. This allows one's capabilities and talents to expand further [8].

Shifting how people think about social issues is critical for social and policy change. There are widely shared patterns of thinking in American culture that can obstruct progressive change. Individualization often prevents people from seeing the need for structural changes to the economic, justice, health, education, and energy systems, amongst others. Toxic stereotypes lead privileged groups to blame marginalized people for the problems they face and impede efforts to address sources of violence and exploitation. Misperceptions about human development across the lifespan undermine recognition of the best ways for our society to support children, families, and older adults. There has been a recent groundswell of interest in mind-set shifts and narrative change as a way of addressing these challenges [9]. For this study, transforming another person through attitude and mind-set change is not a simple undertaking, but an individual can easily transform her/himself through attitude and mind-set change if she/he has self-knowledge. It is, however, not easy to transform oneself if one does not know oneself. Therefore, self-transformation is a process that cannot be achieved easily. Unless a person has something in mind to achieve, that person can struggle to change; hence, self-knowledge is crucial changing one's attitude and mind-set.

Self-transformation implies what it is we seek to reshape ourselves, so as to shift into a whole new person. Self-transformation starts with a tiny spec of hope, and that is letting loose of unwanted personality trails in one's inner saboteur. Fighting this inner saboteur is, however, the wrong approach that will just make it harder for one

to transform oneself. To be successful in one's transformation, one must adhere to the self-transformation steps. These include believing that change is possible and is to be conceived. One must have hope and avoid telling oneself that it can happen; therefore, one has to stop repeating oneself, questioning everything, and push oneself, and this refers to challenging oneself again and again and again if you want to live your dream. Your self-transformation is in your own hands (Kavanagh [10]). For this study, people need to be trained to know where to start when they want to transform themselves because this is not an easy process to undergo. The researcher agrees with Kavanagh [10] that to be successful in self-transformation, one has to understand the steps that you must adopt to be successful in one's personal transformation.

Indeed [8] suggests certain methods for achieving personal transformation in the workplace. These include identifying one's success and improvement areas. One has to identify any achievements one has reached so that one can better analyze one's skill sets and abilities. When one has a better idea of one's strengths, one can determine which one wants to improve upon and use more often in one's career. Assessing these skills makes it easier to evaluate any improvement. The second step is to adjust one's mind-set. It can be easier to reach the goals one sets for oneself if one shifts one's mind-set to approach these objectives with more encouraging attitude. One needs to try to remain positive when working toward goals. If one can reach a certain milestone, assess the outcome in order to understand why. The third step is to understand one's values. After setting one's own values and following them closely, one can provide meaning and purpose in one's professional life. Now, one has to examine one's personal beliefs or values and use this information to find a career or company that values the same things. The fourth step is to establish and track one's goals, and to think about where one wants to be in one's career within the next few weeks, months, or years. This allows one to set short-and long-term goals and to work toward them each day, but one has to ensure one's goals are reasonable and attainable. The fifth step is to enhance one's knowledge and skills by finding different ways to challenge oneself, learn new skills, and increase your knowledge. One can read various materials relating to one's industry or career to understand innovative solutions, methods, and strategies for different challenges.

Although personal transformation is not a simplistic process, there are crucial steps that can be taken to achieve self-transformation. The first step shows the recording of the outcome. In order to get what one wants, one must first know exactly what the final outcome will be. One can hardly get there if one does not understand exactly what one wants, so it is necessary to define one's problems and decide what they will be like once one has transformed them. Thinking is not enough; it has to be concrete. Indicate why one wants to make these changes. Write down all the great things that will happen once one's transformation is complete. This will motivate one when tempted to fall back into old habits. The second step is to take baby steps by keeping the change as a gradual process; most big changes are made by taking small steps every day over a long period of time. Personal transformation, therefore, takes time, and it is not linear. Sometimes one takes three steps forward then two steps back and be prepared for this reality and do not give up when change does not happen quickly enough, or it feels as though one is not making progress. The third step is to learn from others because change always involves learning new things, but one can create one's own shortcut. Instead of starting from scratch, learn from the journeys and mistakes of others who have already taken the path one is embarking on. Avoid the mistakes they made and adopt the habits that helped them to achieve their goals. Be the outcome as the fourth step. When one acts as if an outcome has already occurred,

it is much more likely to happen. One's brain cannot always distinguish between what one visualizes and what is out there in the real world. Adopt the identity of yourself as someone who has already made the changes one aspires to, and one's actions will be those of someone who has already made the successful transformation. The fifth step is to be willing to be uncomfortable because change is uncomfortable. People tend to cling to stability and comfort, but one's personal transformation requires one to step into the new environment, meet new people and do things that one is not used to; embrace the feelings, and work though them; do not let them stop one. The last step is to be one's own cheerleader; when one changes the people around one, then will react. Some will support one, and some will work actively to resist one. Build up one's inner strengths and realize that one does not need anyone's approval. If they give it to you, that is a gift [11].

Transformations are personal journeys, and the goal of personal transformation is to improve one's life to make it better. A personal transformation is the change or improvement of oneself to better ones. Despite the complexity of self-transformation, the journey has comprehensive steps to the destination, such as figuring out what personal journey one wants to take on; being sure that it is a personal transformation that will improve one's life or help to make one's personal and professional life better at the same time. What does one need from this personal transformation? In the second step, one makes a list of all one's goals and prioritize them. One has to figure out what personal journey one wants to take on and make a list of all one's goals set for that personal transformation. It is necessary to prioritize them in order from the most important to the least important, or just put down every one of them if possible. The third step is to create a plan for how one will chain these goals. The goal of personal transformation is to improve one's life, so it is up to one as an individual to figure out the best course of action. In the fourth step, one must find accountability partners to support one on one's journey. Everyone has people around; therefore, one knows those who support one and that can continue to support one in one's journey. It is very important to write down what one learns every day and to reflect upon it at regular intervals. One must find a purpose so that one knows the reason why one needs personal transformation so that one is no longer anxious about it. It is also important to find what is meaningful outside of work and life in general since these things can make personal transformations more fulfilling. A support system can assist one to transform oneself. A way to find a support system is by going back to school as an adult and having classmates who understand the struggles in personal transformation, or finding online programs that offer personal transformation coaching. To transform oneself, one must set aside time for personal transformation so that one can get out of the comfort zone. It is also advisable to commit to the process to succeed and keep on reminding oneself that transformation is a process not a once-off process [12].

Transformative experiences are built upon a personal history and often constitute a critical "detonation point of experience" [13]. This often happens in a logical way from one state to another. The stages include the following: conflict stage- this refers to a dissonance in the soul; interlude of scanning- this includes a search for a resolution; intuitive insight- this is the breakthrough experience of truth, release, and openness for new patterns of thinking and being; interpretation and verification-experience is filtered through significant others for validation. In addition to the stages, there are tools that can be used through a personal transformation. The research identified two tools that can be used discussed below:

2.1 Reading fictional narratives

It is useful read a fictional narrative or novel that in turn has a profound impact upon one's life. By relating to the characters in the book, the reader develops greater self-awareness. The inspirational examples in characters can lead to attitude change.

2.2 Experiential learning

The relationship between experiential learning and personal transformation is described best by Gene Wade's Model Case that is a conceptual map of a transformation process. This is an excellent model that gives an individual going through personal transformation the opportunity to not only reflect and write down their feelings but also work in a setting which allows them to work through, conquer their fears, and make a decision that is ultimately best for his/her life [13].

3. Clarification of concepts

The concepts for the profound understanding of this study are discussed below:

3.1 Self-transformation

Self-transformation refers to the act, process, or result of transforming oneself into a better person. This process happens step-by-step going on one own journey of self-transformation without fear of having to share one's whole head after a slip of the scissors. This is a transformation of one's thoughts, actions, or behavior. There is also spiritual self-transformation that is a faith-binding self-transformation [14]. Self-transformation refers to the reshaping of oneself that is beyond self-awareness. One shapes oneself to the best of one's ability through self-awareness and through transforming steps. The first step of transforming oneself is to know that one can. One can change anything, including how one acts, what one says, and what one thinks. Decide what shape one's life experiences and get rid of the beliefs of self-doubt and know that one can change, one can also transform one's life. One's actions and choices will automatically transform your life, but one must be willing to change [15].

Self-transformation is the key to getting oneself unstuck but changing others is tough. The fastest way to get results is to change oneself rather than inspiring others, motivating, or influencing them. One can change one's perception or change one's procedure. Self-transformation needs not be dramatic, though to have a dramatic effect it often means simply opening one's mind to something to which one has been closed, perhaps learning a new skill or sharpening an old one, seeking expert help, conquering self-doubt, fear of failure, or fear of success, or developing a new attitude, adopting a new way of doing things, or forsaking a deluded belief. Even if we do not know how we need to change, the simple act of looking inward with a mind-fully accepting of responsibility for strengthening what weakens, and finding and correcting what misconceptions are held frequently yields remarkable results [16]. Placing self-transformation before workplace transformation is essential not only to create a better work environment but this is also proven to benefit the individuals who practice the key principles of success. Developing attitude and knowing how to transform it in a positive way can show good results. Self-transformation also refers to the process of equipping oneself with essential personal and relational skills to

create a more open environment in an organization to maintain a positive attitude. Self-transformation makes one profession-ready and brings immense personal satisfaction too. One cannot make a positive and relevant impact at work without actually practicing certain positive principles/habits. Interventions, such as coaching, management training, and mentoring, create a platform for and facilitate the process of self-transformation of employees, which, in turn, promotes a positive, mutually helpful work environment and creates healthier peer-to-peer, as well as manage-team member relationships. Self-transformation, therefore, does not only benefit an individual but creates a positive impact on people with whom the individual maintains interaction [17].

For this study, self-transformation refers to the transformation of an individual through changing attitudes and mind-set that ultimately reshape an individual. This can result from self-judgment and critical thinking. Self-transformation enables an individual to understand his/her responsibility, openness, willingness, respect, and civic-mindedness. Spiritual-transformation is also included in this understanding of the concept resulting changes in the propensity for doing positive things in the community and at the workplace. In this regard, one must know that everything is possible to change. This self-transformation benefits both the community and or the workplace and the individual. Self-transformation is only possible if one knows oneself.

3.2 Democratic culture

A democratic culture is a culture of living together as equals in culturally diverse democratic societies. People live peacefully together with others in culturally diverse democratic societies. A democratic culture is a culture that values human dignity and human rights. This value is based on the general belief that every human being is of equal worth, has equal dignity, is entitled to equal respect, and is entitled to the same set of human rights and fundamental freedoms and ought to be treated accordingly. This value is also based on the general belief that other cultural affiliation, cultural variability and diversity, and pluralism of perspectives, views, and practices ought to be positively regarded, appreciated, and cherished. The principles of justice, fairness, equality, and the rule of law should predominate the culture [6].

A democratic culture also refers to a set of values, attitudes, and practices shared by citizens and institutions, without which democracy cannot exist. This set includes commitment to the rule of law and human rights, a commitment to public sphere, conviction that conflicts must be resolved peacefully with acknowledgment of, and respect for diversity, a willingness to express one's own opinions, willingness to listen to the opinions of others and a commitment to a decision made by the majority [18].

For this study, democratic culture refers to a culture designed within the framework of democracy where human dignity is of paramount importance, a culture where people treat one another with equality and fairness. No one is expected to be dehumanized in this culture. The proselytizing ideologue leadership does not have a platform but leadership that adheres to the egalitarian principles is imperative. The researcher agrees with both Barrett [6] and Lahdesmaki [18] in that the democratic culture's value is based on the general belief that every human being is of equal worth, has equal dignity, is entitled to equal respect, and is entitled to the same set of human rights and fundamental freedoms and ought to be treated accordingly.

3.3 Participatory action research approach

Community-based participatory action research includes those affected by a community-based problem in collaboration with someone who has research skills required to conduct research on and analyze the problem with the aim of developing strategies to resolve the problem. Community-based participatory action research replaces the traditional research, which relies on the academic researcher. Community members refer to those directly affected by the problem, and they should be asked what they need. The researcher recruits members of the community affected because they are familiar with and are known by the community. The community members work with the researcher as colleagues and participate in the conception and design of the project, data collection, and data analysis. The community members can also participate in reporting the results of the project or study [19].

The people affected by the problem decide to address that problem. They explore, discuss, and negotiate as people affected by the problem. Community members generate ideas and develop plans that can help them to solve their problems. They implement the plan and evaluate the effectiveness of the plan. The effectiveness of the plan should result in the adoption of the plan or the development of another plan. This process develops in a spiral until the people affected are satisfied. During the whole process, all participants develop learning with real understanding of the situation. Community members recognize the problem identified, collect evidence, organize, and analyze the information [20].

For this study, participatory action research refers to the process of involving community members actively in the identification of their problems and development of strategies that can be adopted toward mitigating community-based problem in a particular community. The participants are involved in the analysis of the findings from their discussions and individual interviews with the assistance of a researcher. Participatory action research is half academic and half reality. The participants generate implementation plan for what they would like to do in their community to mitigate the problem. This enables community members to evaluate their strategies for improvement. The researcher confirmed the statement of the Center for Community Health and Development [19] and Wals [20] that community members work with the researcher as colleagues and participate in the conception and design of the project, data collection, and data analysis.

4. Research design and methodology

The researcher adopted a participatory action research approach within a critical paradigm. Critical paradigm aims toward the empowerment of the participants. Participatory action research seeks a more holistic understanding and better ways of achieving change than traditional research. The whole process is based on the principle of self-development, in which people must organize themselves into action. This methodology acknowledges the value of the opinions and thoughts of all people in the community. The researcher and community members are equal partners in the research process, and the beneficiaries should participate in solutions to their own problems. All parties involved should continue to feel that they are contributing and that it is significant both personally and for the group [21]. For this study, critical paradigm focuses on the empowerment of the community members to transform themselves as individuals and understand the principles of a democratic culture. The

focus group was established after several discussions with community members at the Chief's kraal. The purpose of the discussions and interviews was to ascertain how participants could change from a selfishness attitude and mind-set. Another purpose was to show the significance of self-transformation in a democratic culture. The focus group was duly established and included three traditional leaders, two church leaders, three policing staff, three civic organization members, three educators, two health care practitioners, three members from the victim empowerment group, and three community policing forum selected purposively. Twenty-two (22) participants were purposively selected for the study. The purpose of selecting these participants was to ascertain their perceptions and strategies that could be adopted to encourage self-transformation in the community. The researcher employed a qualitative technique, including focus group discussions and interviews for data collection. Each focus group member used his/her means of transport to a particular selected school. The discussions and interviews were conducted in the afternoon from 16 h30-18 h30. The purpose of conducting discussions and interviews in the late afternoon was to use the most convenient time to the participants. The focus group discussions and interviews were based on identified themes. The findings were then discussed and synthesized by the focus group. Their responses were analyzed using data matrix. It was recommended that the suggested strategies should be communicated succinctly and clearly with community members at their meetings. Their feedback was reported as participatory action research.

5. Focus group's responses to discussions

The focus group's discussions clearly indicated the ontology and the epistemology of the study. The first phase of the discussions reflected the nature of reality, while the second phase alluded to the suggestions to alleviate community-based problems through self-transformation linked to a positive attitude and mind-set change. The responses are discussed below:

5.1 The nature of the reality

In the first phase of the discussions, the focus group identified some of the community-based problems that emanated from the lack of self-transformation through attitude and mind-set change. As a result of a negative attitude and mind-set, numerous problems developed in some communities. These problems included crime, poverty, teenage pregnancy, water pollution, ritual murders, sexually transmitted diseases, poor quality of education, corruption, unfair land distribution, leadership style, kidnapping of children, drug and alcohol abuse, mental health problem, stroke, and spiritual transformation.

In a democratic culture, people are expected to respect one another, as well as their properties and belongings. In most of the communities, the survival of the strongest prevails because those who have power and money appear to enjoy privileges in their communities forgetting that equality and fair treatment are for all. If perpetrators could change their attitudes and mind-set in this democratic culture, people would live harmoniously and peacefully. There are many people who are poor for different reasons, for example, teenage pregnancy is increasing and is a serious community-based problem, and in the country. This appears to be triggered by the desire for misunderstanding and misuse of the child grant. Although water is one of the basic

needs, people still pollute water by dumping pumpers in rivers and valleys. In this democratic culture, laws and policies are in place for justice for all, but some community members do not adhere to or comply with them.

The community is also plagued by ritual murders for different reasons or beliefs. In addition, sexually transmitted diseases are destroying the lives and future of the people, especially youth. HIV/AIDs is one of the most dangerous sexually transmitted diseases. Furthermore, drug and alcohol abuse are impacting on communities negatively since most of the youth are seriously involved in this abuse; with some community members even suffering from mental disorders due to drug and alcohol abuse. Moreover, participants reported that children were kidnapped almost time and again for self-enrichment of the perpetrators. The perpetrator would demand millions to release children back to their families. This mind-set needs to change. Again, community is reluctant to contribute significantly to the education of their children for better quality of education in different ways, including the motivation of their children. Corruption seems to be dehumanizing some of community members because they are not treated equally with those who have opportunities to be in the leadership or authority in all spheres of governance due to selfishness and egoism. This also affects the distribution of land to community members by the proselytizing ideologue leaders. The leadership have illusion about themselves. Such attitude and mind-set need to change.

All the above formed the nature of reality in some of the communities despite the fact that they were in a democratic culture that emphasized the principle of responsibility. The question remains: Who is responsible for what is discussed above? Community-based problems can be alleviated if community members transform as individuals. Perspective transformation relies primarily on critical reflection, reason, and nationality. Individuation and authenticity are all significant in the transformation of an individual and closely related. People have to see who they are and express that sense of self in the community and in relationship with others. If there is no self-transformation, life appears to be falling apart. The participants made suggestions regarding the mitigation of the community-based problems through attitude and mind-set change. The suggestions are discussed below: **Figure 1**: Life before self-transformation.

5.2 Suggestions relating to self-transformation through attitude and mind-set change

The focus group suggested that if people individually understood the concept of human rights, people would respect one another and even the possessions of others. If people do not understand human rights, they should read them comprehensively so as to change their attitude and mind-set. Knowledge plays a magnificent role in changing the attitudes, behavior, and mind-set of a person. If you are uncertain of something, one has to ask someone who appears to be knowledgeable about the problem. It is possible to change if one can analyze the principles of democracy as an individually. If one does not want to be dehumanized, it is important to be a humanitarian in one's country and community. Self-knowledge can drive the principles of democracy resulting in own self-transformation. When people use to influence others to achieve their own interests, they should think critically to transform their attitude and mind-set. People in the community kill one another labelling victims as witches hence change in mind-set, through awareness of self-transformation should be organized to enable these individuals to transform themselves. Another level of thinking

Figure 1.
Life before self-transformation.

is reflected in stealing someone's belongings so as to build and develop one's business. Respecting another person and according him/her dignity, through hardworking and building and developing one's business instead of resorting to theft.

Many people in communities do not want to work because of unfavorable work-place conditions some of which have resulted from the leaderships or unsuitable infrastructure. Such people remain jobless, including educators who resign due to the new curriculum, lack of promotion, and resistance to change, and they blame other people for not being able to support their families. Instead of self-transforming so as to cope, they opt to resign. However, if there are no job opportunities, one must think of creating job opportunities oneself. This may mean a change in attitudes and mind-set instead of expecting things to happen or beyond their control, such as workplace transformation. Sometimes to establish a better workplace, one should transform oneself. Some learners, for example, change their schools yearly thinking that they can find better schools instead of changing their attitudes and mind-sets. Others blame educators for poor performance, and they often play truant instead of changing attitude and mind-set. If learners can transform themselves, they could be supported by educators in any school. A better school can be established by self-transformed educators and learners; hence, workplace transformation can prevail. A better educator or learner can make for a better school. Parents too can only blame themselves when they shifted their responsibilities after the advent of democracy. Each parent is responsible for the upbringing of his/her children with a full understanding of their culture and customs. Nobody understands their culture and customs better than they themselves. Both tradition and culture can contribute significantly to attitude and mind-set change of the youth through moral regeneration. For this reason, parents need to change their attitudes and mind-set when advising their children. There is nothing wrong with the re-enculturation of their children for the development and

promotion of a responsibly coherent individual who can analyze ways of doing things in an ethical manner.

The participants indicated that those who would like to be community leaders should develop civic-mindedness so that they can work with the people's interests in mind instead of their own interests. A leader should forget about him/herself and think about the community. To avoid corruption, one should have the ability to balance his/her interest with the community's interests, for example, when one knows that one does not have the capacity to do something, one has to accept that someone else could do it better. One has to be open and transparent with other people and take one's responsibilities seriously. Learning to criticize an idea instead of a person especially if the idea is new is the mark of a transformed person who knows that nobody knows everything just as no one knows nothing in life. In changing one's mind, one must not be too ambitious, selfish, self-centered, and egoistical.

Communities are plagued by Gender-based violence. Ignorant individuals need to change their attitudes toward women and children as they are the most vulnerable groups in the community. A woman is a person who deserves to live like any other person. If there is a problem with a particular female, there are many ways to find the solution rather than assaulting, killing, and/or raping her. Manhood or parenting education is paramount in this regard in order to change attitudes and mind-set of the perpetrators. Most problems have solutions, even if it means discussions, one's problem and reaching out for sound advice. There are some in the community, such as businesspeople who believe in the power of human body parts to establish and develop their businesses. Such people should gain entrepreneurial knowledge by attending workshops, courses, and/or conferences to glean knowledge related to business. All these knowledge institutions can help them to modernize their businesses through mind-set change. Self-knowledge, self-analysis, self-acceptance, and self-empowerment are fundamental in the journey of self-transformation. In short, there are strategies that can be used to develop one's business without resorting to having human body parts to buy good fortune. Partnerships and financial support from finance institutions can be considered. Adult education can play a significant role in changing one's business. A person who does not have knowledge is often a danger to the community. Self-transformation is, therefore, crucial for the development of a business in a modern world where expertise and ethics are required.

In the community, unprotected sexual activities, which result in sexually transmitted diseases, are common. If one needs to change one's attitude and mind-set about sexually transmitted diseases, one needs to obtain explicit information from the right people, including health practitioners so that one knows there is a risk to life. Reliable knowledge about these activities can change the general level of thinking and the desire to be responsible. The same applies to diet, for example, respondents were aware of salt and fat being the cause of hypertension, obesity, and another lifestyle. To avoid such and complications one needs to get rid of the excessive use of these. This does not need to be enforcement, but an individual responsibility is recommended. When selecting food, nice food is not necessarily healthy and to consult the health practitioners can be considered. Life after self-transformation appears to be harmonious and peaceful. **Figure 2** shows life after self-transformation.

The responses to the interview and discussion questions indicated that there was vast number of community-based problems, resulting from a lack self-transformation. The participants showed an understanding of some of the principles of democracy. There was a need that whenever community members have meetings the issue of self-transformation should always be on the programe. Their responses confirmed
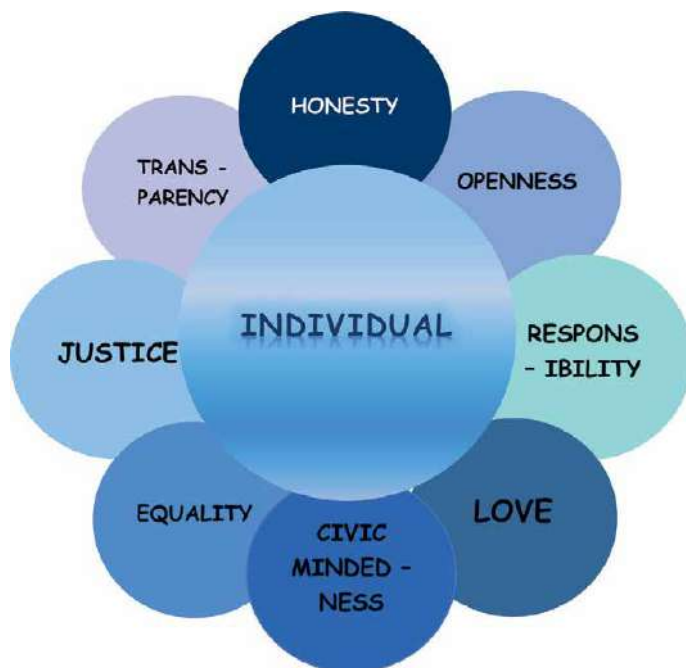
Figure 2.
Life after self-transformation.

that self-transformation could strengthen the interpersonal relationships, restoration of human dignity, and the economic development. Without the knowledge of consequences resulting from certain activities, attitude, and mind-set changes are difficult to implement. Self-transformation is fundamental in both the community and workplace for the improvement of the quality of life and production. No matter how one has been characterized by other personalities, one can however still transform oneself into someone who has admirable and desirable qualities.

6. Conclusion

Self-transformation was confirmed not to be a difficult process, but participants believed that self-transformation could help to develop communities. Knowledge and understanding are crucial in the self-transformation. The participants, however, appeared to lack knowledge regarding the starting point of self-transformation. Self-reflection and critical analysis can assist an individual to become a new person, even by using others as role models. The participants needed education and training to respond to their challenges, that needed a new person with a new goal to achieve. The participants confirmed that their beliefs needed to be re-evaluated but the "how question" remained; however, the need for someone else with knowledge of a particular aspect was included in their suggestions.

The literature clearly ascertains that self-transformation is a journey toward improving the quality of one's life. This is a continuous process that needs to be developed through knowledge and skills acquisition. Although personal transformation is not an easy process, there are strategies that can be adopted to empower people to do

better in their communities and workplace. Learning, therefore, plays a significant role in the transformation of an individual. No one can simply become what he/she does not envisage in relation to his/her profession or relationship with other employees or community members; therefore, one must know what one would like to be and set goals and strategies to achieve objectives.

Unless otherwise self-transformation prevails within an individual, peace, harmony, and economic development can hardly be expected in communities and the workplace. Communities are endangered by community-based problems, resulting from the lack of self-realization and self-esteem. Democracy solely is not enough to change a community without self-transformation. Unfortunately, people fight for workplace transformation rather than self-transformation that can have a significant impact on their lives and workplace, especially in a democratic culture where people are expected to respect one another. A change of attitude and mind-set can create harmonious and reciprocal relationships in communities. Young people are negatively affected by drug and alcohol abuse. Some of them happen to involve themselves in criminal activities because of a lack of self-transformation. Although they can attend church services, such spiritual transformation can never happen if they do not change their attitudes and mind-set regarding own wrongdoings. If people can fight for democratic culture, they can also fight for an individual transformation to add value to democracy, which requires mutual respect one another. Lifelong learning, Adult and community education can provide knowledge that can change the attitudes and mind-set of an individual, that can ultimately improve the quality of life; hence, lifelong education is paramount. There is a need for education for community members to transform their unacceptable antisocial detrimental habits into acceptable habits for the benefit of the community and the country. This includes education that can provide training for people on humanitarian principles, sensitivity, and relationships, and education and training that can explore methods and strategies for one's transformation that also benefit organizations and institutions.

Author details

Avhurengwi Samson Mabade
Department of Adult and Foundation Phase Education, Walter Sisulu University, Eastern Cape Province, South Africa

*Address all correspondence to: amabande@wsu.ac.za

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Bridging the Gap: Traditional vs. Modern Education (A Value-Based Approach for Multiculturalism)

Oksana Chaika

Abstract

The dynamic landscape of education has witnessed a profound shift from traditional to modern pedagogical paradigms over the years. The discussion of results delves into the intriguing debate between traditional and modern educational systems (TES and MES), examining them through the lens of a value-based approach. This exploration is crucial in understanding how these two approaches shape the educational experiences of learners, faculty, and impact society at large. Drawing from the literature review and insights from a survey involving 179 students and 28 faculty staff, the work advocates a balanced integration of traditional and modern educational approaches. It underscores the pressing need for a value-based model that harmonizes age-old wisdom with contemporary innovations. The survey reveals student aspirations for a holistic, value-driven education, while the faculty acknowledges challenges and opportunities inherent in bridging this educational gap. In conclusion, the data reinforce the value-based approach, emphasizing its importance in curricula and pedagogy to promote ethical values, critical thinking, and empathy. Furthermore, the findings shed light on practical implementation challenges and offer valuable guidance to educators and policymakers. In an era of transformative education, bridging theory and practice will resonate with both students and faculty who recognize the societal benefits of a balanced synthesis between tradition and modernity.

1. Introduction

The contemporary state of education is subject to be in constant flux, paving new ways and vision for the pedagogical paradigms with technological advancements, evolving societal needs, and being parallelly shaped by historical traditions driven by established educational practices. In recent decades, the dichotomy between traditional and modern educational systems (TES and MES) has emerged as a central point of debate [1–3]. Traditional education, deeply rooted in heritage, often emphasizes rote learning and discipline [4, 5], especially for science majors such as math, physics, etc. that lay primary focus on calculation and comprehension, that

is, according to Wang "some subjects that focus more on thinking application and deep calculation should be taught in traditional ways" ([4], p. 272) and "although traditional lecture-style teaching is more boring than high-tech classrooms, it can be more effective at improving test scores" ([4], p. 271); it is also stated that "rote learning is a well-practiced approach at all educational level, where education and assessments emphasize on memorization of content rather than comprehension and application of content in real life events" ([5], p. 114). On the other hand, modern education emphasizes innovation, learner-centric methodologies, and the integration of technology, among which cultural literacy, originality, and creativity play a crucial role, for example, "the content [of cultural literacy] in the pedagogical culture is seen pertinent to the modern FL teacher" and at the same time, it includes "professionalism, non-standard way of thinking/thinking out of the box, originality, high level literacy, expressiveness, logic, lexical wealth and communication, creativity, and culture awareness and readiness for diversity in perception" ([2], p. 103). This evolving educational landscape necessitates a critical examination to address the challenges and opportunities it presents.

Thus, the research problem at hand is the need to navigate this evolving terrain of education effectively. Understanding the dynamics, strengths, and limitations of TES and MES is crucial. Moreover, it is essential to explore how a value-based approach can bridge the gap and create a more holistic educational experience [6–8] for students and teachers. In this regard, Dogan believes, "the empowerment of the employees who believe in the organization's values and respect to employees enable the employees to work at full capacity and to become happy" ([6], p. 84); moreover, "making radical changes in the behaviors of individuals based on the values is composed of three stages, including seeing, feeling and change" and for instance, "the stage of 'seeing' increases the employees' awareness towards the values" [6]. The significance of this research lies in its potential to inform educators, policymakers, and stakeholders on the path towards a more balanced and meaningful educational model.

That noted, the objectives of this research arise twofold: first, to comprehensively analyze the TES and MES from the perspectives of faculty and those of students, and second, to propose a model that integrates value-based education into the educational landscape. To achieve the aim and goals, the following research questions should be answered:

1. What are the key characteristics and pedagogical paradigms of TES as defined by faculty and students?

2. How does MES differ from TES, and what innovations does it bring to the educational landscape?

3. What is the concept of a value-based approach in education, and how can it be implemented effectively, for example, for foreign language teaching and acquisition (FLT and FLA)?

4. What is the potential impact of a value-based educational model on learners and society?

To address these research questions, a comprehensive approach, combining literature reviews and the survey, was employed. This mixed-method approach [7] allowed

for a deep exploration of the topic, incorporating both theoretical data and comments by the students and faculty from perspectives of their empirical value as real-world experiences from the educational community.

The research findings break into several sections. The introduction is followed by the review of the literature related to TES and MES, value-based education, in the light of the research agenda. Following that, the methodology section explains the survey design, data collection, and analysis. Then, the focus is laid on a discussion of the value-based approach, including its principles, theoretical framework, and practical implications. Finally, the research explores the challenges and opportunities in implementing a value-based approach in education, offering the educational model to be considered by educators, policymakers, and stakeholders. It concludes by summarizing key findings, emphasizing the importance of a balanced approach to education, and suggesting potential future research directions.

2. Theoretical readings

Education, deeply intertwined with culture and tradition, has a rich historical legacy. TES, often characterized by rote learning, discipline, and the transmission of societal values, can be traced back to ancient civilizations [8, 9]. For example, the Confucian educational system in ancient China placed a strong emphasis on the teachings of classic texts, which became a cornerstone of traditional education [10]. The emergence of MES marked a shift towards learner-centric approaches, innovation, and the integration of technology [1, 11, 12]. In the eighteenth and nineteenth centuries, educational reform movements in Europe, such as those initiated by Rousseau and Pestalozzi, laid the groundwork for contemporary educational principles with Rousseau's three components in education: "This education comes to us from nature itself, or from other men, or from circumstances" as cited in Bazaluk ([13], p. 17) and Pestalozzi's "new understanding of the meaning of human life and a cultural ideal", as well as the philosopher's basic principle of education: "education should be built according to the natural course of mental development in a child" [13]. The implementation of compulsory education and the advent of public schooling in the United States and Europe, including Ukraine, further exemplified this shift [14–16]. Value-based education, rooted in the philosophical underpinnings of moral and ethical development, seeks to instill values such as empathy, critical thinking, and global awareness in learners, based on fostering poly- and multiculturalism in educational classrooms [12, 16, 17]. This approach draws from various theories, including Kohlberg's theory of moral development, which emphasizes the importance of nurturing ethical reasoning in education [18, 19]. Moreover, McKenzie and Blenkinsop's "ethic of care" highlights the significance of empathy and relationships in the educational process [19].

3. Research methodology

The methodology for this study involved the creation of a structured survey instrument to gather data on the perceptions and experiences of individuals within the traditional and modern educational systems. The survey was meticulously designed to explore key aspects of both systems and their potential convergence in a value-based approach [17]. Development included the formulation of clear

and concise questions that addressed the objectives of the research and followed either the Likert scale or open-ended questions that allowed for argumentation and substantiation of opinions. Statistically, the research sample consisted of 179 students and 28 faculty staff members from the National University of Life and Environmental Sciences of Ukraine. A purposive sampling technique was employed to ensure a representative mix of participants with varying educational backgrounds, experiences, and perspectives. Informed consent was obtained from all participants.

Data collection primarily relied on an online survey platform, allowing for the efficient distribution of the questionnaire to the selected participants. The survey comprised both closed-ended and open-ended questions, providing a balance between quantifiable data and in-depth qualitative responses. Participants were given a reasonable time frame to complete the survey to ensure thoughtful and accurate responses. The data collected from the survey was subjected to both quantitative and qualitative analysis. Qualitative data from open-ended questions were subjected to thematic analysis to identify common themes and patterns. The integration of both quantitative and qualitative analyses allowed for a comprehensive understanding of the research questions.

The study adhered to ethical guidelines and protocols. Informed consent was secured from all participants, assuring them of anonymity and confidentiality. Data was stored securely, and all personal identifiers were removed during data analysis to ensure participants' privacy and confidentiality. The research was conducted with the utmost integrity and respect for the rights and well-being of the participants.

4. Results and discussion

The research findings point to the dichotomy between TES and MES, reinforcing the approaches to education. Thus, the study by Alsubaie investigated the effects of traditional and modern teaching methods on student achievement and found that student-centered modern approaches tend to yield better results [20]. Contrarily, another study by Chavan and Chavan [21] emphasized the value of traditional education, on the one hand, in preserving cultural heritage and moral values and certain concerns, on the other, for example, "Within the traditional knowledge system, there was a natural obligation, empathy, and overall mentoring towards students by teachers and reverence and submissiveness was exhibited by students towards teachers. Today, teachers, students, and knowledge are all treated as 'objects' whose value depends on the quantitative returns 'it' can provide" ([21], p. 278).

According to the comments of participants represented by 53.7% female, 41.5% male and 4.9% "prefer not to say" groups (gender criterion) and whose age varied from 18 to 24 (75.6%), 25 to 34 (2.4%), 35 to 44 (4.9%), 45 to 54 (9.8%), 55 to 64 (4.9%), and 65+ (2.4%), as displayed in **Figure 1**, the majority of answers link to the main five characteristics of TES as opposed to MES. These are:

a. TES focuses on teacher-centered instruction while MES embraces learner-centered and interactive approaches: P18, "I reckon most of the seminars being conducted traditionally are rather good, especially when all the students are asked the questions and no one is bored", P54, "MES offers personalized learning, technology integration, and a focus on critical thinking and problem-solving";
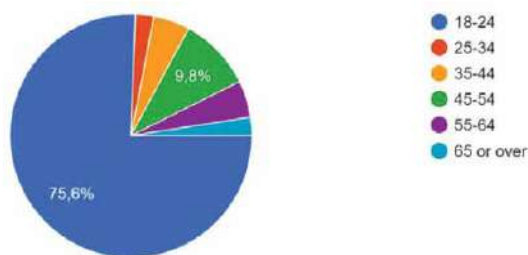
Figure 1.
Demographic information: participants' age range.

b. TES uses textbooks and printed materials as primary resources as contrasted to MES which utilizes a wide range of digital and multimedia resources: P53, "TES provides a time-tested approach to education. This can offer a sense of stability and familiarity for students. However, MES incorporates modern technology and teaching methods, promoting more interactive learning and adaptability to individual student needs", P75, "The usage of most of the online pros, such as laptops, presentations, there are more opportunities for the future; Nevertheless, I can't deny the effectiveness of TES";

c. in TES, teachers are seen as the primary source of knowledge and authority, however, in MES, teachers would rather encourage student autonomy and self-directed learning: Participant 14 (P14), "The main advantages [of TES] are the opportunities for students to master the theoretical part of knowledge. This will allow them to use it in the future with possible practical skills"; P36, "TES has limitations, such as potential limitations in adapting to individual learning styles and the rapid pace of technological advancements. MES, on the other hand, offers benefits such as personalized learning, technology integration, and global connectivity";

d. TES is mainly characterized by its hierarchical and discipline-oriented structure whereas MES is perceived as flexible and adaptable, and according to the students' answers in their key focus—often tailored to individual needs of the learner: P27, "TES can provide stronger learning of core knowledge through in-depth interaction with teachers and a focus on core academic subjects. It also often includes a rigorous curriculum and structured learning process, which can promote a disciplined approach to learning", P122, "TES often prioritizes the basics, such as reading and writing. In addition, the teacher plays a central role, providing direct instruction and guidance, which can be beneficial for students who learn well in a structured learning environment. Also, traditional systems emphasize discipline, punctuality, obedience, and compliance.", P81, "MES often provide more accessibility through technology, learning experiences, and up-to-date content. They can better cater to individual student needs and adapt to a rapidly changing world, making education more engaging", and

e. TES promotes uniformity and conformity in learning while MES encourages creativity and independent thinking of the learner: P162, "TES - Stability and reliability, cultural heritage, specialization, number 1 system", P171, "Modern education often allows for more flexible scheduling, catering to non-traditional

students, working adults, or those with diverse time commitments", P72, "MES focuses on fostering twenty-first century skills such as critical thinking, creativity, communication, collaboration, and digital literacy", etc.

These and other comments were made by the participants with the following educational background: 29.3% were participants with a college degree (high school) and incomplete bachelor's that referred mainly to students in their first through fourth years at university; 51.2% were master students; 9.8% were faculty staff with a Ph.D. and/or more advanced degree in science, and ultimately 2.4%—"other", that stands for a visiting researcher.

Moreover, 78% of participants experienced education in both the systems—TES and MES whereas 22% underlined their good acquaintance and journeys with either TES or MES (**Figure 2**).

Finally, when the questions regarded the emotional part of the participants' experience with TES and MES and the information about their education systems awareness and educational preferences, that is, which educational systems they feel most familiar with or have spent the most time in, under the half (41.5%) replied they felt comfortable and familiar with both the systems and the other two groups had a difference of 14.6% as to their understanding and preferences for TES (36.6%) over MES (22%) (**Figure 3**).

Among the answers to specify advantages and disadvantages of TES and MES, the following can be mentioned as it displays the general mood of many other replies:

1. P44, "TES typically follows a well-defined curriculum, providing a structured and organized approach to learning."

2. P56, "Traditional education often leads to recognized degrees, diplomas, or certificates, which are widely accepted by employers and institutions. This provides students with formal qualifications that can enhance their career prospects."
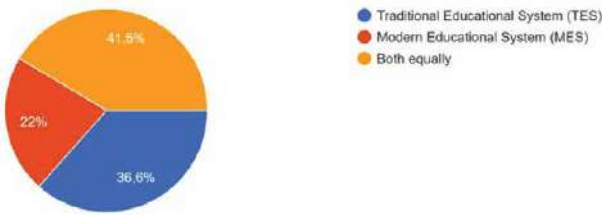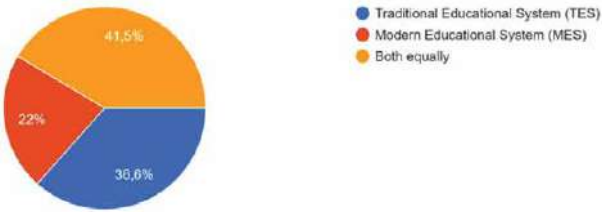

Figure 2.
Education experience.

Figure 3.
Familiarity with TES and MES.

3. P32, "In traditional educational settings, students have access to experienced educators who can provide guidance, support, and mentorship."

4. P101, "Traditional educational institutions typically provide access to libraries, laboratories, and other resources, which can be essential for hands-on learning and research."

5. P49, "MES is better in the practical part of learning of any subject. You receive more applied information and learn new practical skills, which are more similar to real-life situations." and P94, "An individualized approach to each student and a variety of techniques are the strengths of the modern educational model. This allows the student to feel comfortable and apply knowledge in practice."

6. P8, "Modern education leverages technology to enhance learning. This includes e-learning platforms, multimedia resources, and online collaboration tools, which can make education more engaging and accessible."

7. P78, "Modern education often allows for more flexible scheduling, catering to non-traditional students, working adults, or those with diverse time commitments."

8. P163, "Educational technology allows for the collection and analysis of data to gain insights into student progress and areas of improvement, enabling more targeted interventions."

These and many other comments, feedback, and remarks allowed for grouping the received data under the keywords and phrases that resulted in **Table 1**.

TES	vs.	MES
Emphasizes rote learning and memorization	→	Emphasizes active learning and critical thinking
Focuses on teacher-centered instruction	→	Embraces learner-centered and interactive approaches
Uses textbooks and printed materials as primary resources	→	Utilizes a wide range of digital and multimedia resources
Assessment typically relies on standardized tests and exams	→	Assessment includes diverse methods, such as projects, presentations, and group work
Limited integration of technology in the classroom	→	Integrates technology for research, collaboration, and learning tools
Teacher is the primary source of knowledge and authority	→	Encourages student autonomy and self-directed learning
Hierarchical and discipline-oriented structure	→	Flexible and adaptable, often tailored to individual needs
Promotes uniformity and conformity in learning	→	Encourages creativity and independent thinking
Often follows a fixed curriculum	→	May offer a more flexible and evolving curriculum
Limited emphasis on critical thinking and problem-solving	→	Focuses on practical skills, and real-world applications

Table 1.
Traditional educational system vs. modern educational system.

Another remarkable aspect of the survey makes it conclude that it is not always that the younger generation, as compared to the teaching/lecturing faculty of more age seniority and less digital proficiency, would favor MES, for instance, let us follow P86, "For me, a person who doesn't like to explore new things, the traditional system is the best, as it has everything I'm used to."

Next, like the above, where behavioral patterns and/or values play their crucial role, the below comments shed light on what may be significantly valuable while designing and implementing curricula. The values of critical thinking, future vision, and empathy matter to a greater degree, that is, P49 names critical thinking as a value because "MES places a strong emphasis on developing critical thinking skills, students are encouraged to analyze, evaluate, and synthesize information independently" and adds that "This skill is invaluable in various aspects of life, including problem-solving and decision-making"; P90 focuses on the importance of preparation for the future as "MES equips students with skills relevant to the rapidly changing job market" and "Emphasis on subjects like computer science, coding, and digital literacy prepares students for careers in technology and other evolving fields."

That underscores the importance of scanning the learning mood and educational preferences in classrooms and outside; in an ever-evolving world, the need for innovation is not limited to technology alone; it extends to the way we approach education and pedagogical systems.

5. Value-based approach in education

Taking the discussion further, the exploration leads to the integration of a value-based educational model and bridging the gap between TES and MES, offering real-world solutions that can enhance quality, progress, and enjoyment.

A value-based educational model is a holistic approach to learning, emphasizing the development of not only academic knowledge but also strong ethical principles and values. In this model, core values such as integrity, empathy, and responsibility are integrated into the educational process, ensuring that students not only excel academically but also grow as responsible, ethical individuals [22].

Drawing from educational theories such as social learning, constructivism, and moral development, the integration of values into education is a well-structured framework [23, 24]. These theories provide a foundation for teaching critical thinking, ethical decision-making, and empathy, allowing students to become well-rounded individuals who can navigate an ever-changing world while adhering to timeless ethical principles [13, 16, 22].

Traditional education often relies on rote learning, while modern education places an emphasis on critical thinking and creativity. The value-based approach bridges this gap by combining the strengths of both, nurturing individuals who can adapt to a changing world while upholding ethical principles [1, 3, 17].

According to the survey, 85.3% of participants believe that values are very important/important in education as contrasted to only 4.9% who do not find them very important almost similar to 2.4% who state they are not important at all as only technical knowledge, expertise, and practical skills matter in the job market today (**Figure 4**); and 7.3% neither agree nor disagree, where the comments specify that the value component is fully personal and plays little role in education; however, it will play its role in family and work life in future.
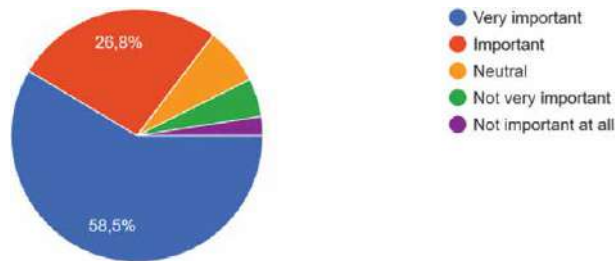
Figure 4.
Values in education.

To bridge the gap between TES and MES *via* a value-based approach, participants suggest as follows: P3, "We should try to change the basic course of study and let students decide for themselves what to prioritize. Some people prefer practical knowledge, some prefer theory. We should respect people's preferences in exploring the approaches that suit them."; P70, "Implement a blended learning approach that combines elements of TES and MES, this can involve a mix of traditional classroom instruction and technology-enhanced learning experiences."; P32, "Provide comprehensive and ongoing professional development for teachers to adopt innovative teaching methods and effectively integrate technology into their instructional practices", which can ensure that teachers are equipped with the skills and knowledge to harness the benefits of both TES and MES in their classrooms; P162, "Design educational frameworks that allow for individualized learning paths" to involve incorporating personalized learning plans, adaptive learning technologies, and student self-assessment; P117, "Place a greater emphasis on developing essential skills such as critical thinking, creativity, communication, collaboration, and digital literacy because these skills are crucial for success in the modern world and can be integrated into both TES and MES approaches.", etc.

Implementing a value-based educational model has practical implications that positively impact both students and the education system. Students exposed to this approach are more likely to become empathetic, socially responsible individuals who can address complex ethical challenges, leading to improved classroom behavior and a positive school culture [3, 4, 16].

6. Impact on learners and society

The study has brought to the forefront the contrasting characteristics of TES, rooted in tradition and discipline, and MES, driven by innovation and learner-centric methodologies. Participants have expressed a resounding consensus on the need for a more holistic educational model, one that combines the strengths of both systems while emphasizing values such as empathy, tolerance, and cultural diversity.

Speaking about the impact on learners and society, it is required to spotlight (a) the imperative of a balanced approach, (b) the need to transform the educational landscape, and (c) a call to action for educators and policymakers, in particular.

Thus, the implications of the research underscore the critical significance of a balanced educational approach. A value-based educational framework that seamlessly integrates the merits of TES and MES can give rise to a more comprehensive and harmonious learning environment. It fosters not only academic excellence but also the

ethical and emotional intelligence essential for thriving in an increasingly intercon-nected world.

Next, the findings extend beyond the boundaries of this study. They have far-reaching implications for the educational landscape, offering the promise of trans-formation. The integration of a value-based approach carries the potential to shape a generation of learners who are not only academically proficient but also socially responsible, empathetic, and culturally aware. Finally, the present research calls for consideration, further reflection, and most importantly, action. It calls upon educa-tors, policymakers, and stakeholders to reevaluate the core values that underpin education and the pedagogical methodologies employed. A value-based approach rep-resents an opportunity to redefine the educational landscape, nurturing empathetic, critical, and globally aware individuals. With the onward look to the future, education is not confined to the acquisition of knowledge alone; it is about the transformation of individuals and the enrichment of society. It is believed that with an embraced bal-anced approach and prioritized value-based education, learners and society at large may reap the benefits of the best of both traditional and modern educational systems.

7. Conclusions and recommendations

In the realm of education, the coexistence of TES and MES presents a fascinating landscape for researchers. Along with the challenges, there are opportunities and les-sons learned from the coexistence of these systems, that lead to shape future research directions.

To be realistic, it is necessary to address the obstacles in implementing a value-based approach, especially the two identified with the processed and analyzed research data—resistance to change and assessment methods.

Following the findings, one significant challenge in integrating a value-based approach into both TES and MES is the resistance to change. Educators, parents, and institutions may be reluctant to shift from traditional content-focused teaching to a more values-oriented curriculum. Another challenge arises with the assessment methods. Traditional systems often rely on standardized testing for assessment, making it challenging to evaluate students' personal values and ethics. It also reads in Halstead and Taylor [25] that developing effective and standardized methods for assessing values is an ongoing challenge.

However, by laying more focus on incorporating technology in classroom and advancing community engagement, TES and MES can find more opportunities for promoting value-based education. The integration of technology, such as e-learning platforms and educational apps, offers a promising avenue to promote value-based education. Today, more and more researchers are exploring how technology can be used to deliver values-centered content [1, 8, 9]. Collaborating with community organizations and stakeholders provides an opportunity to reinforce values taught in school. There have been many works published where research focuses on strategies to engage local communities in shaping students' values [17, 23].

Ultimately, the lessons learned from the survey conducted to gauge the impact of value-based education have revealed valuable insights and may lead to such recommendations:

- To design and implement strategies (a) for integrating values into educational curricula, (b) guidance for educators, policymakers, and stakeholders as

educators should effectively integrate values into their teaching methods, policymakers should establish these clear guidelines for values-based curricula, and stakeholders should offer support through resources and advocacy.

- To consider future research directions for long-term impact, cross-cultural studies, and teacher training.

Future research should focus on assessing the long-term impact of values-based education on students' personal and professional lives, examining its influence on career success, societal well-being, and global citizenship. Comparative studies across different cultural and socio-economic backgrounds are needed to determine the adaptability and effectiveness of value-based education in diverse settings. In the end, more research should explore effective teacher training programs that prepare educators to deliver values-centered content and foster ethical development in students.

In conclusion, the coexistence of TES and MES presents both challenges and opportunities in the integration of value-based education. Lessons from the survey and literature review highlight the positive impact of values-based education on students, while recommendations emphasize the importance of standardized curricula and support from educators, policymakers, and stakeholders.

A. Survey questionnaire

Section 1: demographic information
1.1. What is your age?
18–24
25–34
35–44
45–54
55–64
65 or over
1.2. What is your gender?
Male
Female
Prefer not to say
1.3. What is your educational background?
High school
Bachelor's degree
Master's degree
Ph.D. or other advanced degree
Other (please specify)
Section 2: experience and preferences
2.1. Have you experienced education in both traditional and modern educational systems (TES and MES)?
Yes
No
2.2. Which educational system do you feel most familiar with or have spent the most time in?
Traditional educational system (TES)
Modern educational system (MES)

Both equally

2.3. What, in your opinion, are the key strengths of TES in comparison to MES? Why?

2.4. What, in your opinion, are the key strengths of MES in comparison to TES? Why?

Section 3: values in education

3.1. How important do you believe it is to integrate values such as empathy, tolerance, and cultural diversity into the education system?

Very important

Important

Neutral

Not very important

Not important at all

3.2. Do you think traditional educational systems place enough emphasis on teaching these values?

Yes

No

Not sure

3.3. Do you think modern educational systems place enough emphasis on teaching these values?

Yes

No

Not sure

3.4. What other values in your opinion are important for education today? Why?

Section 4: bridging the gap *4.1. In your opinion, what strategies or changes could be made to bridge the gap between TES and MES and create a more balanced educational model?*

Section 5: overall impressions

5.1. Overall, do you believe it is possible to create a value-based educational system that successfully combines elements of both TES and MES?

Yes

No

Not sure

Section 6: additional comments

6.1. Is there anything else you would like to share or any additional comments related to traditional and modern educational systems?
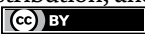
Author details

Oksana Chaika
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine

*Address all correspondence to: oxana.chaika@yahoo.es; oksana.chaika@nubip.edu.ua

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Chapter 15

Basic Theory of Lifelong Learning Spaces in a Highly Networked Society

Hidekazu Sasaki

Abstract

In this chapter, the necessity of broadening the concept of education through a lifelong learning lens is emphasized, proposing a new, learner-centric theoretical framework for educational spaces. This shift requires a fundamental reevaluation of the relationship between education and learning, prompting a significant transformation in modern educational thinking. Primarily, it is proposed that the learner's world comprises five layers: absence of learning, unintentional learning as a result, intentional learning activities, receiving education, and being taught. Secondly, in a highly networked society's lifelong learning context, a comprehensive framework should be derived spatiotemporally, encompassing four types: Here-Now, Here-Anytime, Anywhere-Now, and Anywhere-Anytime. Corresponding teaching spaces are thus categorized as the Classroom Gathering Model, On-Site Learning Model, Live Broadcasting Model, and Message-Leaving Model. Contrasting "Stage Teacher" with "Studio Teacher," four teaching styles emerge: Stage Actor, Tour Guide, Announcer, and Film Actor. The potential for instructional concepts to coexist in hybrid forms is best considered using the attributes of Here-Now, Online-Now, and On-Demand. Thirdly, the advent of metaverse spaces powered by virtual reality technology has created novel learning environments. Within the Another-Here Now and Another-Here Anytime types, learners can engage in learning activities, receive education, and participate in self-expression and interaction.

Keywords: lifelong learning, learner-based approach, here and now, anytime and anywhere, classroom, on demand, virtual reality, another here

1. Introduction

When discussing education, the prevalent image is often that of a teacher educating students in a traditional classroom setting. Similarly, the concept of learning spaces for children is frequently confined to this traditional classroom setting, reinforcing the idea that educational activities should occur within these four walls. However, in the Information and Communication Technology (ICT) era, such a narrow view of educational spaces appears increasingly outdated. Upon closer examination, we find that these conventional views are not only fundamentally flawed but also obstructive to progress, as evidenced by the emergence of online

learning and other innovative educational methods. This chapter aims to challenge these entrenched perceptions and argues for the development of a new, universally applicable basic theory, one that remains relevant and effective in our rapidly evolving advanced information society.

2. Introductory understanding of lifelong learning

As is widely known, lifelong education is an educational ideal that has developed around the core idea proposed by Paul Lengrand at the UNESCO International Commission on the Advancement of Adult Education in 1965 [1]. Before rushing to discuss the future of lifelong learning, it is important to reaffirm the most essential points of understanding regarding lifelong learning.

2.1 Lifelong education and learning

A fundamental premise in discussions about lifelong education and learning is the need to move beyond the traditional concept of education, predominantly embodied by formal school-based education. Initiating this requires an expansion of the categories encompassed by the notions of learning and education.

Firstly, re-evaluating the term *lifelong* from a temporal perspective reveals that learning and education extend beyond early life stages and are pertinent throughout one's lifetime. Based on the concept that education continues from birth until death, it becomes essential to consider every individual—from young children to adolescents, middle-aged adults, and seniors—as potential learners within this expansive framework. After completing the initial stages of formal education, the nature of further education and ongoing learning processes in all aspects of living becomes a critical topic of discussion.

Secondly, in expanding the meaning of *lifelong* from a spatial theory perspective and considering the entire living space, it is evident that educational and learning environments are not confined to schools but also include homes, workplaces, local communities, and online realms. In striving for an education system that spans from the cradle to the grave, it becomes imperative to acknowledge that education and learning take place in myriad settings worldwide, permeating every facet of our living spaces. This concept of space encompasses not only the physical dimension but also virtual environments.

Ultimately, lifelong learning demands a substantial leap of imagination to transcend traditional educational boundaries and paradigms, encompassing the full spectrum of our living spaces. Concurrently, the utilization of Information and Communication Technology (ICT) in education and learning is already beginning to de facto dismantle these traditional educational perspectives, extending its reach into the entirety of our daily lives.

2.2 Recurrent education in lifelong learning support

In Japan during the early 1990s, recurrent education was inaccurately perceived as a synonym for adult lifelong learning [2]. This conceptual confusion has persisted up to the 2020s, continuing to be one of the factors that complicate the promotion of lifelong learning policies. To understand the conceptual origins of recurrent education, it is ideal to look at the basic ideas in the 1973 Organization for Economic

Co-operation and Development (OECD) report "Recurrent Education: A Strategy for Lifelong Learning" [3]. This report defines recurrent education as an educational policy that encompasses all post-compulsory education. Its key feature is the distribution of education across an individual's life, interweaving with activities like work, leisure, and retirement.

At least three key aspects of recurrent education emerge from this report. First, it views education as an integral part of an individual's entire life. Second, it entails a dispersed mix of educational and other activities. Third, *recurrent* suggests a cyclical repetition of these activities.

This approach differs from the traditional education system, which is typically concentrated in early life. This conventional model, known as the "front-end system," offers education that ends early in life. In contrast, recurrent education, with its flexible approach, challenges the notion that formal education is solely for the young. Thus, contrasting the "front-end model" with the "recurrent model" is essential in discussing recurrent education system design.

The fundamental principle of recurrent education is full-time attendance in formal schooling. However, part-time recurrent education, originally intended as an exception, now almost exists as an established fact. This presence has led to a diffusion of the concept of recurrent education.

3. Reconsideration of the most fundamental concepts of education

Numerous individuals are, often subconsciously, ensnared by entrenched stereotypes regarding education. In this discourse, it is imperative to re-evaluate and challenge the entrenched beliefs surrounding the core concepts of education, teaching, and learning. Furthermore, predicated on this paradigm shift, this chapter endeavors to present a theoretical framework for a structural comprehension of learning environments.

3.1 Education, teaching, and learning

Careful conceptualization of lifelong learning offers an advantage in theorizing and investigating education. Lifelong learning means going beyond the scope of prolonging the span of school education, and it requires a great leap of imagination to debunk some traditional stereotypes of education [4].

First of all, we must destroy an ambiguous borderline between education and learning, although, so far, "lifelong education" and "lifelong learning" have been very often viewed as being synonymous. The distinction between education and learning is the most fundamental when we discuss the importance of lifelong learning assistance. The subjects of education are educators, including teachers, while the subjects of learning are learners including students. Stressing the most fundamental point in advance, lifelong learning is an idea based less on educators than on learners, necessitating the distinction between educational spaces and learning spaces.

Second, learning is not limited solely to being taught in principle or practice, although many passive learners regard these two concepts as the same. To be sure, being taught something leads mostly to learning it, and not being taught something generally results in not learning it, but being taught does not necessarily lead to learning, and not being taught something does not prevent it from being learned. Taking account of the theoretical feasibility of the last two cases, we

discover that being taught is only one means of learning. In reality, human beings have the potential to learn anything by themselves anytime, whether they are working, playing, housekeeping, or studying at school.

Third, we must not conflate education and teaching. Indeed, teaching is one effective method of education, but it is not only a means of assisting learners. On the contrary, not teaching is sometimes more effective than teaching, partly because the former situation compels learners to abandon their passivity, making them independent of educators and promoting self-direction. The need to distinguish between education and teaching necessitates a distinction between the "educator as the subject of education" and the "teacher as the subject of teaching." Similarly, this distinction results in the conclusion that spatially, educational spaces and instructional spaces do not necessarily align. This is why we must not confine education to the cyclical relationship between teaching and being taught.

3.2 The scheme of learner-based educational theory

In provisional conclusion, we need learner-based educational theory to create, practice, and analyze lifelong learning assistance. We should develop a structural discussion of learners' opportunity to learn something. **Figure 1** exhibits the whole framework, comprising five layers, namely, absence of learning, learning as a result of experience, learning activities, receiving education, and being taught [5].

As a preliminary argument, we must strictly distinguish between "learning" and "learning activity." The former concerns learners' cognition, but the latter concerns learners' intentional action. The former can exist when a person could have learned something as a result of some experience, regardless of whether the learning process was purposeful, but the latter can exist when a person executes concrete action such as reading books and taking classes, irrespective of whether the learning effect leads to success. In sum, learning activity is defined as intentional in order to actualize the situation for a person to have learned something as a result.

In reality, a human being does not always become a learner, even though he or she might be a learner by nature. It is not until a person can become a learner that he or
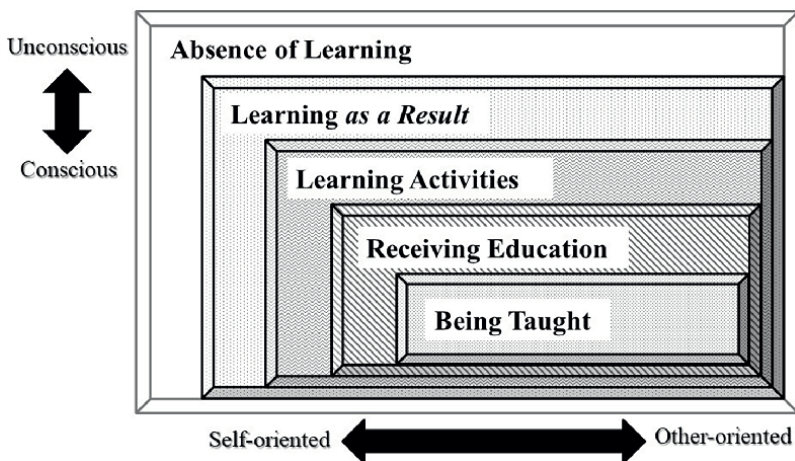

Figure 1.
Learner-based learning space structure.

she comes to learn something. On ground zero, we assume the possible existence of opportunities for someone to learn nothing.

At the first level, a living person becomes a learner as soon as he or she has some lived experience and has thus learned something. There exist opportunities for someone to have learned something as a result. A learner can exist without educators. Learning is not only an intentional activity but also significantly characterized by its incidental nature. It includes both a conscious endeavor and an unconscious process.

At the second level, a person can execute learning activities as intentional acts, and then he or she certainly deserves the name "learner." Opportunities exist for a learner to practice intentional learning activities. A learner can spontaneously choose the content and methods of learning activities. Just because one engages in enthusiastic learning activities does not necessarily guarantee the achievement of the intended learning outcomes. In this sense, learning as an outcome must be considered separately from the learning activities themselves.

At the third level, a learner can choose to embrace the opportunity of "receiving education," including schooling, as one of the methods of imparting learning activities. A learner can receive education without being directly taught by someone, such as being endowed with the right to enjoy free access to libraries and museums. Also, receiving education differs from being educated, although very few people including educators can distinguish them. Being educated is an effect by which a learner may be influenced, but receiving education is a choice that a learner can select alone, proactively. In both cases, a learner needs educators in a broader sense, whether consciously or unconsciously. Just because one has the opportunity to receive a superior education does not guarantee that one will be well-educated or achieve higher learning outcomes than expected. However, as an option for learners, pursuing education is both effective and important.

At the fourth level, a learner can choose the opportunity of "being taught" by others, including teachers, as one learning method for receiving education. Indeed, being taught is a passive action, but it is, at the same time, an action that enables a learner to choose independently. If a learner is aware of his or her limitations of self-study, theoretically, he or she can select to be taught by someone, including professional persons, although this situation does not always manifest itself in actuality.

Schematically, a learner's lifeworld theoretically consists of five layers, as follows: absence of learning, learning as a result of experience, learning activities, receiving education, and being taught. Thanks to this abstract theory, we can reverse our way of thinking by reconsidering the relationships between education and learning. As an implicit premise, learner-based theory is essential and effective for associating lifelong learning promotion.

4. Learning opportunity in an advanced information and communication society

In the modern era, the landscape of information is characterized by its remarkable diversity. We have evolved from traditional mass media such as newspapers, magazines, television, and radio to a digital paradigm where online news sites deliver information in real time. This transformation extends to a variety of media forms, including blogs rich in personal perspectives and social media platforms known for video-sharing capabilities, such as Facebook, Instagram, X (formerly known as

Twitter), YouTube, and TikTok. These various media forms have revolutionized the way information is transmitted and consumed.

Amidst this complexity, the task of analysis has become increasingly intricate, presenting significant challenges in classification. However, from the perspective of educational and learning spaces, it seems effective to classify not by the technical differences of the media but by how humans experience what they do through each media. In this sense, the concept of "media experience" becomes key. To avoid remaining at a superficial understanding of the various complexly intertwined phenomena, we need to devise a theoretical framework at a fundamental level that is easily understandable by everyone. This article endeavors to articulate a comprehensive and foundational theoretical proposal tailored for the Information and Communication Technology (ICT) era.

Anthony Giddens, an English sociologist renowned for his structuration theory, encapsulates the phenomenon observed in modern society whereby the advent of standardized time, coupled with revolutionary advancements in communication and transportation, increasingly abstracts time and space, leading to a detachment from physical constraints. He articulates this process as the "separation of time and space" [6]. His profound discussion on the relationship between the self and society ultimately seems to bring to light the need to fundamentally question what "here and now" means. Abraham Harold Maslow, an American humanistic psychologist known for his hierarchy of needs theory, has often emphasized the preciousness of "here and now" as the practical essence of self-actualization [7]. However, in this chapter, it is necessary to refine "here and now" not as a practical concept but as an analytical concept that serves as a benchmark for evaluating social and educational phenomena.

The foundational analytical methodology of this chapter is anchored in the notion of "here and now," from which the argument progressively unfolds. In a rigorously logical context, the antithesis of *now* is construed as "not now," while that of *here* is defined as "not here." When abstracted to the highest level and categorized within the framework of spacetime theory, four distinct types can be discerned: "both here and now," "not now, but here," "now, but not here," and "neither here nor now" [8]. Developing the discourse from these categories is deemed more appropriate in the realm of pure theoretical analysis. However, when transitioning this typological theory into a practical application within the concept of living space, it becomes significantly more intuitive and practical to posit *anytime* in opposition to *now*, and *anywhere* against *here*. Therefore, in this theoretical model designed for structuring and comprehending life scenarios, four categorizations are employed: "here and now," "anytime, here," "now, anywhere," and "anytime, anywhere," each offering a more accessible and practical approach to understanding.

4.1 Spatiotemporal impact of communication and replication technologies

Walter Benjamin, a renowned German philosopher, argued that a quintessential aspect of human artistic experience was the ability to engage with the work in its unique presence in time and space, an experience akin to the "here and now" in my framework. He identified this quality as the "Aura" of a work, a unique and irreplaceable essence inherent in original art pieces. Benjamin further noted that the advent of copying technologies in the 1920s, such as photography, film, and phonographs, profoundly eroded this aura, stripping away the singular experience and authenticity of the human esthetic encounter [9]. This significant insight into the loss of aura through technological reproduction offers a paradoxical, yet applicable perspective to this chapter.

In the early twenty-first century, individuals are no longer confined to the constraints of the *here and now*. Spatially, the notion of *here*, once a fixed location, has evolved into an unrestricted space, interchangeable with any place. Temporally, *now*, once a singular moment, has transformed into a flexible concept, allowing for repeated experiences at will. This development leads us to explore the nuances of *spatial transcendence* and *temporal transcendence*, two dimensions that liberate us from the traditional constraints of time and space.

Regarding spatial transcendence, modern communication technologies enable people separated by physical distances to share a unified spatial experience. For instance, smartphones facilitate real-time conversations with distant friends, creating a shared experience of now in a "pseudo-here" environment. However, this virtual connection is predominantly limited to visual and auditory information, falling short in replicating proximal sensations like touch, smell, and taste.

On the other hand, temporal transcendence is achieved through replication technologies that allow ephemeral experiences to be physically preserved and revisited later. Tools such as photography, video, and audio recording enable us to archive specific moments, effectively creating a "pseudo-now" that can be experienced repeatedly in the future. Yet, this archival process is generally restricted to audiovisual elements, leaving tactile, olfactory, and gustatory experiences to the power of imagination.

Additionally, the concept of spatiotemporal multiplication of experiences warrants attention. By combining technologies that transcend both time and space, we can recreate specific experiences anytime, anywhere. This is actualized by sharing these recorded moments through emails or social networks, thereby extending the reach of our personal experiences.

In this way, modern technology not only broadens our experiences across temporal and spatial dimensions but also turns them into enduring, shareable phenomena. Through various media, we can expand *here* to *anywhere* and transform *now* into *anytime*, albeit within the limits of our current technological capabilities. Such structural transformations have become an essential premise in considering the nature of education and learning in a highly advanced information and communication network society.

4.2 Fundamental theory of spatiotemporal typologies in everyday settings

Walter Jackson Ong, an American Jesuit priest and a distinguished professor of English literature, as well as a cultural and religious historian and philosopher, delved into the distinctions between oral (orality) and written (literacy) cultures. He analyzed the impact of these communication forms on human cognition, societal structures, and mnemonic processes [10]. At first glance, contrasting activities conducted through human speech with those mediated by text might seem tangential, yet it provides a profoundly insightful perspective for the realm of psychological, sociological, and educational spaces. Voice, being transient and confined to the immediacy of the *here and now*, vanishes after its initial utterance. Conversely, text, as a physical and enduring entity, facilitates repeated interactions and extends across the bounds of *anytime, anywhere*. This dichotomy mirrors the dynamic between an in-class lecture passionately delivered by a teacher and the homework assignments they instruct students to complete at home.

Traditional educational settings, particularly school classrooms, have predominantly functioned as *closed spaces*, meticulously designed to provide *focused time* for

pedagogical activities. This environment, characterized by its structural and temporal constraints, contrasts starkly with the more fluid and expansive arenas of lifelong learning. In the context of lifelong learning, individuals are not confined to educational pursuits during their formative years in formal institutions. Instead, learning spans a diverse array of living spaces, extending far beyond the traditional classroom. The paradigm of "anytime, anywhere learning" has emerged as a guiding principle in this realm, epitomizing the ethos of lifelong education and learning. When considering the concept of lifelong learning spaces, it is essential to free ourselves from the traditional fixed notions of educational spaces and broaden our perspective to the level of living space theory.

This chapter endeavors to juxtapose the *anytime, anywhere* paradigm against the more traditional *here and now* approach to educational settings. Employing these concepts as a theoretical framework, we propose a novel schema for categorizing life spaces from a viewpoint of education and learning. In general, *anytime* is conceptualized as a temporal diffusion, a state where learning is not confined to a specific moment. This is contrasted with the *now*, where educational activities are temporally concentrated. Similarly, the spatial dimension is explored through the dichotomy of *anywhere* (open spaces) versus *here* (closed spaces), thereby delineating the physical boundaries within which learning occurs.

To visually represent these concepts, we introduce **Figure 2**, which plots these paradigms along temporal and spatial axes. On the temporal axis, *now* is equated with focused or closed timeframes, while *anytime* correlates with diffused or open temporal spans. Correspondingly, on the spatial axis, *here* signifies a focused or closed space, as opposed to *anywhere*, which suggests a diffused or open spatial context.

Building upon this theoretical foundation, we further categorize life spaces based on their spatiotemporal characteristics. This categorization envisages a spectrum ranging from *focused* (now) to *diffused* (anytime) in the temporal domain and from *closed* (here) to *open* (anywhere) in the spatial domain. This analytical approach, applied deductively, results in the identification of four distinct types of life spaces, like **Figure 3**: the Here-Now type, the Here-Anytime type, the Anywhere-Now type, and the Anywhere-Anytime type. Let us delve into this abstract categorization, employing instances from various life scenarios to cultivate a more tangible understanding.

Category / Feature	Time	Space
Focused ↕ **Closed**	Now	Here
Diffused ↕ **Open**	Anytime	Anywhere

Figure 2.
Classification of basic spatiotemporal terms.

Anytime	Here Anytime	Anywhere Anytime
Now	Here Now	Anywhere Now
Time / Space	**Here**	**Anywhere**

Figure 3.
Intersection of temporal and spatial theories.

First, the Here-Now archetype embodies a unique singularity, signifying activities exclusive to the present moment and location. An exemplary scenario is the rare chance to experience a renowned musician's performance in an intimate setting – a near-miraculous, privileged juncture in time and space. Yet, even commonplace interactions, like those in a school classroom, are invaluable intersections of the temporal *now* and spatial *here*, often overlooked in our routine existence.

Second, the Here-Anytime type encompasses life scenes linked with places of semi-permanent existence. Their special value is unlocked only through physical presence. Emblematic of this are historical monuments and famous tourist attractions. Their enduring significance transcends what can be captured in textbook photographs. Cafes, scattered across urban landscapes, exemplify Here-Anytime spaces. They are places where individuals can find solace at any hour of the day, embodying a unique *here* in space, yet *anytime* in their temporal accessibility. They exemplify this category as places that spatially feel uniquely *here* to an individual, yet are temporally diffuse, transcending the constraints of a specific *moment*.

Third, the Anywhere-Now category is characterized by events that take place almost regularly, akin to festivals, and are intensely focused within a specific period. These events represent extraordinary occurrences that stand out from everyday routines. Limited in duration yet concentrated in time, these festivals epitomize the special *now*. They offer opportunities for learning and engagement to individuals and groups, regardless of their location. The term *festivals* aptly captures this essence, symbolizing the *concentrated time, open space*' nature of the *now, anywhere* paradigm.

Lastly, the Anywhere-Anytime group aligns with the most expansive notion of lifelong learning in everyday settings. Unbeknownst to us, we are constantly learning, even in the most ordinary aspects of daily life, without any deliberate effort. This learning occurs not just in moments of diligent work but also in leisurely activities like a routine walk or while idly watching television. These instances represent diffuse time in open space, where *anywhere, anytime* learning is perpetually taking place, subtly woven into the fabric of our everyday existence.

4.3 Spatiotemporal classification of lesson formats

Thanks to the remarkable progress in modern information and communication technology, the dynamic between educators and learners has been transformed, transcending the traditional limits of time and space. This transformation has led to a substantial increase in the diversity of educational methodologies. To effectively navigate this multifaceted environment, the previously established four-model deductive framework is particularly useful. Within the context of a highly sophisticated information network society, these educational approaches can be elegantly categorized as follows: the Here-Now model as the "classroom gathering model," offering a conventional but ever-evolving face-to-face learning experience; the Here-Anytime

	Here	Anywhere
Anytime	Here-Anytime On-site Learning	Anywhere-Anytime Message Leaving
Now	Here-Now Classroom Gathering	Anywhere-Now Live Broadcasting
Time / **Space**	**Here**	**Anywhere**

Figure 4.
Types of classes in spatiotemporal theory.

model as the "on-site learning model," which allows learning at a specific location; the Anywhere-Now model as the "live broadcasting model," harnessing real-time virtual interactions; and the Anywhere-Anytime model as the "message-leaving model," epitomizing asynchronous distance learning. This is illustrated in **Figure 4**.

First, the "Classroom Gathering Model" represents the conventional approach to education, where learners physically gather in a classroom setting, and the teacher facilitates the learning process. This model is crucial in fostering a sense of community and direct interaction. The physical proximity enables immediate feedback and personal engagement, allowing both teacher and student to build a strong educational rapport. It is particularly effective in facilitating discussions, collaborative projects, and hands-on activities where direct supervision and guidance are beneficial.

Second, the "On-Site Learning Model" extends learning beyond the conventional classroom. It emphasizes learning through direct experience in real-world environments. This model includes field trips, outdoor educational activities, and on-site vocational training, providing learners with practical, hands-on experiences that are difficult to replicate in a traditional classroom setting. By interacting with the environment directly, learners gain valuable insights into real-world applications of their theoretical knowledge. This model encourages active learning and critical thinking, as students are often required to observe, inquire, and engage directly with the subject matter.

Third, the "Live Broadcasting Model" utilizes digital platforms to enable real-time educational experiences from anywhere in the world. This model leverages technologies such as video conferencing tools like Zoom and Skype, allowing educators to deliver live lectures and interactive sessions remotely. It breaks down geographical barriers, offering learners in remote or different locations the opportunity to participate in live, interactive learning sessions. This model is especially beneficial for offering access to specialized courses or experts that may not be available locally and for facilitating global classroom experiences where students from different cultures can interact and learn together. These occurrences might be suitably termed as "mass video phone sessions."

Finally, the "Message-Leaving Model" epitomizes the asynchronous learning approach. This model allows learners to access and engage with educational materials such as PDF file outlines, pre-recorded lectures, digital assignments, and online forums at their own pace and schedule. While there is a risk of delaying the start of their educational endeavors due to the lack of immediate pressure, it also offers them the valuable flexibility to use their time efficiently. These individuals possess the advantage of utilizing their spare time effectively, allowing them the opportunity to revisit and review the same material as often as required. It is very convenient and efficient for learners who need flexible scheduling or those who prefer to take their time to understand and absorb material.

4.4 Enhanced perspectives on teaching in the ICT era

Let us briefly depart from conventional instructional models to examine a paradigm shift, envisioning teachers not just as educators but as conduits and expressers of knowledge. Teaching, often a subconscious act, is inherently an act of expression. This invites us to rethink the essence of teaching, transcending the teacher's self-perception of their role.

In the realm of music, those who predominantly work in recording studios are termed "Studio Musicians." On the other hand, "Stage Musician" is a less common label, underscoring the general expectation for musicians to perform live on stage, where the immediacy and energy of live performance is a fundamental aspect of their profession. Similarly, contrasting "Stage Teacher" and "Studio Teacher" emphasizes the differences in teaching spaces when teachers are in public. The former teaches on the stage of the lectern, while the latter, adapting to the evolving information and communication network society, turns wherever they are, including their home, into a studio for teaching, even when not in a traditional classroom.

The traditional Stage Teacher, who predominantly operates from a lectern, was a given in past educational practices. In Japanese culture, phrases like "standing at the lectern" (giving a class) or "leaving the lectern" (quitting teaching at school) poetically capture these conventional teaching dynamics. However, with the advent of the digital age and the expansion of online, remote learning, there is a notable shift in perception toward the Studio Teacher. This concept, increasingly prevalent, marks a significant evolution in educational nomenclature. It sets apart the Stage Teacher, anchored to the physical space of the lectern, from the Studio Teacher, who embraces the digital era's versatility. The latter effortlessly turns any environment, including their own home, into a vibrant hub for imparting knowledge. This distinction underscores the wide variety of educational environments and methodologies, each uniquely tailored to meet diverse learner needs and preferences.

Expanding our view, we can identify four distinct teacher archetypes, each aligning with different instructional modalities: "Stage Actor," "Film Actor," "Announcer," and "Tour Guide." This is illustrated in **Figure 5**.

The "Stage Actor Teacher" epitomizes the classic, face-to-face classroom instruction. Even teachers who primarily stand at the lectern and monotonously read from the textbook can be seen as stage actors and actresses performing a less-than-impressive dramatic reading. Engaging directly and dynamically with students, they prioritize real-time interaction, treating each lesson as a live performance on the educational stage. In this type of instruction, even in large classes, a two-way interaction between teacher and students is maintained. If the students are engaged, the teacher can lecture more effectively; conversely, poor student response can dampen the teacher's enthusiasm. This model can nurture a deeply personal connection

Time / Space	Here	Anywhere
Anytime	Here-Anytime Tour Guide	Anywhere-Anytime Film Actor
Now	Here-Now Stage Actor	Anywhere-Now Announcer

Figure 5.
Types of teachers in spatiotemporal theory.

between teacher and learner, fostering an environment where immediate feedback and adaptation to student needs are paramount.

The "Film Actor Teacher" aligns with pre-recorded, asynchronous learning sessions. Their focus lies in meticulously crafting educational content, much like a filmmaker crafts a narrative. They produce high-caliber, accessible learning materials, allowing students to engage with lessons flexibly and at their own pace. Emphasizing quality and depth, Film Actor teachers utilize a range of multimedia tools to enhance the learning experience, making education accessible and engaging for a diverse audience. However, lecturing to a camera without live students presents a challenge of one-directional communication, and it often takes practice to overcome the initial awkwardness that many experience.

The "Announcer Teacher" is synonymous with live-streamed educational sessions. Echoing the role of television or radio announcers, these educators deliver content in real-time, fostering a lively, interactive digital classroom. Their approach transforms the learning experience into an engaging live broadcast, reaching students across various geographies. Announcer teachers, akin to mass media broadcasters, can deliver information in a one-way manner. However, modern ICT technologies easily facilitate two-way communication, leveraging technology to bridge distances and create a unified, virtual learning community.

Finally, the "Tour Guide Teacher" is intimately associated with experiential, field-based learning. Venturing beyond conventional classroom walls, they guide learners through tangible, real-world educational experiences. Utilizing more indirect teaching methods, these educators emphasize hands-on learning and on-site exploration, offering students a practical, immersive educational journey. The Tour Guide teacher's role can extend to being a curator and mentor, enriching the learning experience with their expertise and insight.

Each archetype represents a distinct aspect of the evolving educational tapestry, reflecting the diversity of learning styles and environments in the modern world. These roles highlight the multifaceted nature of teaching and learning, emphasizing the importance of adaptability and innovation in education.

5. Understanding of learning environments blending reality and virtuality

Young people today are perpetually connected to the internet, primarily to remain responsive to social media, thereby making a constant online presence their norm. Moreover, the realm of education and learning is undergoing a near-boundless expansion. This growth is fueled by technologies like virtual reality (VR) and the metaverse, which have a profound impact on human cognition, coupled with the rapid strides being made in AI. Given this context, it becomes increasingly crucial to identify and understand the key elements underlying these advancements, at least from a theoretical perspective.

5.1 Redefining learning spaces between the physical and virtual realms

In discussing the fundamental issues surrounding virtual spaces, it is crucial to consider three key dichotomies: offline vs. online, unidirectional vs. bidirectional communication, and real-time vs. time-lagged interactions. By examining these aspects, especially from a learner's perspective in the era of Information and Communication Technology (ICT), we can categorize learning opportunities into three distinct models: "Here Now," "Online Now," and "On Demand." These models serve not only as typologies

for classifying learning environments but also as a framework for understanding their unique characteristics. They demonstrate the feasibility of various learning formats coexisting.

First, Here-Now Learning Opportunities: This model pertains to traditional classroom settings where teachers and learners are present in the same physical space at the same time. It allows for immediate, real-time interaction, fostering an educational process that engages all five senses. For example, in a hands-on science lab, students can directly interact with materials, receive immediate feedback from the teacher, and collaboratively engage with peers. While primarily offline, this model can incorporate online resources or on-demand materials to enhance the learning experience, such as using digital tools for simulations or accessing additional reading materials online.

Second, Online-Now Learning Opportunities: This model represents a real-time virtual learning environment where teachers and students are physically separated. It relies on online connectivity, primarily facilitating the sharing of visual and auditory information. For instance, through video conferencing tools like Zoom or interactive platforms like virtual classrooms, participants can engage in live discussions, presentations, and collaborative projects. However, this format may limit the sharing of tactile and other sensory experiences typically found in physical classrooms. While it cannot replicate the here-now experience simultaneously, it offers significant advantages in bridging geographical distances, making education accessible regardless of location.

Third, On-Demand Learning Opportunities: Characterized by its flexibility, this model allows learners to access educational content as needed, enabling study at any time and place. It does not always necessitate a constant online presence; learners can download resources and engage with them offline. This approach is exemplified by platforms like Coursera or Khan Academy, where learners can view pre-recorded lectures and access learning materials at their convenience. This model empowers learners to study at their own pace, free from the constraints of scheduled class times and locations. However, the ease of access can potentially lead to procrastination, as the abundance of readily available resources might paradoxically result in learners delaying or avoiding engagement with the material.

In summary, these three learning models illustrate the diverse ways in which ICT has transformed educational opportunities. Each model has its unique advantages and potential limitations, reflecting the varied needs and preferences of learners in the digital age. The integration of the Online-Now and On-Demand models presents a compelling synergy in modern education. The Online-Now model, while facilitating real-time, interactive learning experiences, can significantly benefit from incorporating On-Demand resources. For instance, an Online-Now session can be enriched by the use of pre-recorded videos, interactive quizzes, and additional reading materials available on demand. This integration not only supplements live instruction but also caters to diverse learning styles and paces, allowing students to revisit complex topics and reinforce learning outside of the scheduled online sessions.

5.2 Impact of VR and metaverse

In contemplating the lifelong learning environment of the near future, the significance of Virtual Reality (VR) cannot be overlooked. VR creates environments through computers, where humans primarily engage through sight and sound, occasionally experiencing tactile sensations. This adds a sense of reality to these experiences. When VR generates spaces that do not exist in reality, it offers individuals the experience of being in those spaces. This provides a sense of presence, as if they

are physically there, despite their actual absence. This experience surpasses merely viewing a two-dimensional flat surface; it immerses users in a three-dimensional spatial experience. In virtual spaces built on internet servers, manipulating an avatar—essentially a digital self—enables users to live a social life within this virtual realm, interacting with others. This is known as the "metaverse," a concept where humans can effectively live, learn, express, and act in *another world*.

Such metaverses and VR technologies bring about a fundamental revolution in our spatial cognition. They significantly impact the typology of learning spaces, including the Here-Now type (learning in a physical space at a specific time), the Here-Anytime type (learning in a physical space at any time), the Anywhere-Now type (learning in any location but at a specific time), and the Anywhere-Anytime type (learning at any time and place). The metaverse enriches the concept of *here*, transforming a physically *anywhere* state into a cognitively experienced *quasi-here*. This chapter proposes to call this concept "another here" [11].

By synchronizing our time with avatars within the metaverse, we evoke a feeling similar to having others in close physical proximity, thus enhancing learning in an "another here and now" setting. By doing so, we can advance learning activities in the Another-Here-and-Now with people who are physically distant. On the other hand, manifesting a *here and anytime* condition in educational pursuits is a physical improbability. Nonetheless, Virtual Reality (VR) technology, which primarily engages visual and auditory senses, while not flawlessly perfect, substantially actualizes the "another here and anytime" concept. For example, opportunistically connecting to the internet, employing VR goggles to vividly render a selected landscape right before our eyes, and smoothly melding into that setting for in-depth reflection can be aptly described as participating in Another-Here-and-Anytime learning activities.

VR and the Metaverse redefine our perception of space and interaction, allowing users to experience a parallel reality. This transcends physical limitations and traditional two-dimensional interfaces, expanding the boundaries of experiential and spatial learning. Thus, the Metaverse and VR not only transform our understanding of space and presence but also open up new possibilities for lifelong learning and interaction in virtual environments.

5.3 Impact of AI teachers

In the continuously evolving educational landscape, especially within the realms of self-study and lifelong learning, the growing significance of conversational generative AI, exemplified by ChatGPT, is becoming increasingly evident. This shift in technology is not just transforming the array of learning tools but also significantly altering the traditional role of educators.

Currently, in the metaverse, engaging with AI-powered avatar teachers is a reality. For instance, a Japanese individual seeking to master English can have repeated, adaptive, and practical conversations with an avatar teacher supported by ChatGPT. Students have the flexibility to summon these avatar teachers on-demand from any location at any time, enabling practice sessions that emulate the immediacy of the "here and now." In this virtual space, learners can experience what is effectively "another here and now," accessible whenever and wherever they choose.

At this juncture, the function of human English teachers, traditionally instructing in physical classrooms, is closely paralleled. Direct interactions with human educators, whether face-to-face or online, are confined to a mutual

sense of the present moment. In contrast, AI educators in the metaverse have the capability to meet students at any moment, creating an impression of being physically present as avatars. This feature clearly demonstrates why some learners may prefer the efficiency of studying with a metaverse teacher, who is virtually available at all times, over a human teacher limited by the physical constraints of time and space.

6. Conclusion

In our ongoing journey through an era where the very notion of reality is subject to increasing complexity and continual evolution, it becomes imperative to delve into the exploration of the potential, boundaries, and challenges inherent in the realms of education and learning. This necessity arises from the vital need to comprehend the bigger picture in advance, crafting a strategic blueprint to effectively navigate the uncertain terrain of the future. This chapter has been meticulously composed to contribute to these preliminary discussions, aiming to lay a robust foundation for further scholarly inquiry in this dynamic and evolving landscape.

Author details

Hidekazu Sasaki
The Institute for Social Innovation and Cooperation, Utsunomiya University, Utsunomiya, Tochigi Prefecture, Japan

*Address all correspondence to: sasakih@cc.utsunomiya-u.ac.jp

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Section 6

Needs of Students in Future Education

Chapter 16

Nursing XR Simulator for Diversity, Equity, and Inclusion: A New Purpose of Future Technology Development

Noriyo Colley

Abstract

XR is a term within the spectrum of virtual reality (VR), mixed reality (MR), and augmented reality (AR). In 2015, Endotracheal Suctioning Training Environment SIMulator (ESTE-SIM) project team was established (PI: Noriyo Colley), which consisted of a wide range of disciplines including nursing science, information science, and healthcare engineering to promote the development of a pedagogical environment for quality care through simulation education. Mutual recognition was found that a digital transformation plays an important role to mitigate the risks of global shortages of nurses and healthcare faculty due to pandemic, ultra-aging society, and technology dependent children such as children with home mechanical ventilators. Nursing XR simulators are being developed for Diversity, Equity & Inclusion, which is a new purpose of future technology development.

Keywords: VR/MR/AR/XR, home-ventilator, curriculum evaluation, nursing education, system thinking

1. Introduction

New graduate nurses, to varying degrees, experience the "Theory-practice gap" in their first year after graduation [1–5]. Generally, after obtaining a nursing license, students attend a training course for new nurses run by the nursing manager at their place of employment and begin nursing work through a different type of apprenticeship system, such as a preceptor system [6] or a buddy system [7], acquired through On the Job Training (OJT) [8], continuing education, and postgraduate education.

The skills required are completely different in chronic wards, which mainly require psychological support and health education for patients, and in acute wards, which mainly deal with emergencies, such as perioperative nursing and accepting emergency transport [9]. If there is a large discrepancy between "the expectations of new nurses" and "the practical skills required in the ward," this can lead to burnout syndrome, depression, and early turnover.

Hiraga and Fuse analyzed the constituent factors of reality shock through a questionnaire survey and extracted 8 items: "human relations in the workplace," "nursing practice ability," "physical factors," "mental factors," "busy work and treatment", "worthiness and enjoyment of work," "sense of responsibility toward work," and "response to patient's death" [10]. The results showed that new nurses were especially likely to experience feelings of loneliness and self-doubt due to having few people to consult. They reported that they felt reality shock due to their "mental factors" and their "nursing practical ability," which meant they were unable to respond to critically ill patients or sudden changes and lost their confidence [10].

In contrast to Hiraga and Fuse's analysis of personal impact of reality shock, Labrague (2024) revealed the association between reality shock and missed nursing care from systematic point of view, which indicates that reality shock diminishes quality of care in the hospitals/institutions. A significant contribution of her study is to distinguish reality shock from the newly graduated nurses' attribute as a pedagogical issue with high priority to solve [11].

In recent years, there have been many reports of collaboration efforts between one educational institution and one medical institution since Dean Rozalla Schlotfeldt at the School of Nursing at Case Western Reserve University tested a plan for formal collaboration between education and service with the university hospitals in 1961 [12].

The construction of an inter-organizational system called unification has been standardized since the 1980s to resolve the gap in consciousness caused by differences in positions. Unification is a system for educating nursing students and new nurses through collaboration between educational institutions and institutions that accept clinical training. In the United States, unification is a system that fosters the professional awareness and autonomy of nurses. Reported benefits include promotion, opportunities to demonstrate professional abilities, promotion of joint research at universities, and effective continuing education [13]. Additionally, Lambert et al. pointed out the benefits of unification: (1) guarantee practical opportunities for faculty, (2) develop organizational mechanisms for clinical practice, clinical research, and clinical supervision by faculty, and (3) encourage faculty to promote the integration of practice and research, (4) building financial support and mechanisms to promote unification, and (5) providing opportunities to support teachers in acquiring new roles [13]. Nowadays, the unification system has developed to involve multiple educational institutions [14].

Although the unification system varies, clinical practicum in undergraduate nursing education is basically an important opportunity for nursing students to apply the knowledge and skills they have acquired on campus to nursing practice in actual clinical settings, and while it has the meaning of alleviating reality shock for new nurses, rather than opportunity to enhance collaboration between education and service. There is also a clinical ladder system as a countermeasure for clinical wards accepting newly licensed nurses [15], but in this chapter, we focus on the side of undergraduate nursing education to reduce reality shock also known as Theory-practice gap.

To reduce the "Theory-practice gap", one characteristic of Japanese regulation needs to be addressed. The Article 17 of the Medical Practitioners Act states that "no one who is not a medical doctor may practice medicine." Even if it is a skill that is required to be performed after obtaining a nursing license under the direction of a doctor, such as endotracheal suction, if the skill is classified as an invasive medical procedure, nursing students are allowed to "only observe" during the practical training [16].

Although approximately 30 years have passed since home ventilator management fees were included in medical reimbursement in 1990 [17], ventilator care, such as endotracheal suctioning and tube feeding is still being conducted regarding the skills

that parents of children with home ventilators can perform as part of "medical care", not "medicine". The situation continues where nursing students are only allowed to observe during their clinical practicum, and if this is left unchecked or excluded from the development of healthcare system, it will not only maintain a social structure in which the care needs of children with disabilities and their parents are not met in the context of home care or special needs schools. It is not hard to imagine that the shortage of nurses who can handle ventilators will be repeated due to the international spread of coronavirus infection from 2019 to 2022.

Therefore, this chapter aims to reflect on the three years of the COVID-19 pandemic in preparation for the future and to examine the "Theory-practice gap" in nursing education from the perspective of the SDGs and curriculum development that complies with international standards.

2. Methodology

In this chapter, we are going to discuss (1) the formal-educationalized process of technological innovation and new technology, (2) understanding learners' needs to include learners' voices, (3) global standardization of nursing education for a sustainable society, and (4) Endotracheal Suctioning Training Environment SIMulator (ESTE-SIM) project, which integrates Digital transformation (DX) into nursing education to reduce the Theory-practice gap.

3. The formal-educationalized process of technological innovation and new technology

To obtain a medical practitioner's license in Japan, it is necessary to have practical experience in medical treatment under the guidance of an appropriate instructor during clinical training during the fourth to sixth years of medical school. Article 17 of the Medical Practitioners Act mentioned above also applies to medical students, and the guidelines for medical acts that medical students can perform during clinical training are based on the "Clinical Practice" compiled by the Health Policy Bureau of the Ministry of Health and Welfare (at the time) in 1991. The basis for this has been the Final Report of the Practical Training Review Committee (Maekawa Report) [18].

However, as medical technology and medical practices have made dramatic advances that medical students should experience and acquire have diversified. In 2018, the Ministry of Health, Labor and Welfare's Medical Ethics Council Physician Subcommittee decided to "The range of medical activities (required and recommended items) that can be performed in clinical training at medical schools" [18]. In addition, in consideration of the lack of practicality of pre-graduation education, the duplication of pre-graduation and post-graduation education, and the lack of a continuous education environment for pre-graduation and post-graduation, a revised medical education model core curriculum applies from 2024 new students.

The Japanese Society of Medical Education took the lead in considering the revised plan, and creative ideas such as adding study strategies and evaluations, and digitization were implemented. This is revolutionary in that it allows medical students who pass the exam to legally practice medicine through participatory clinical training [18].

Regarding nursing education, the number of universities increased from 11 in 1991 to 303 in 2022 in Japan [19], making universities the largest number of nurse training

schools for the first time. Recent changes in educational content include the growing need for appropriate healthcare provision systems such as regional comprehensive care systems and remote nursing due to the declining birthrate and aging population, and the introduction of information science technologies such as AI (Artificial Intelligence) and machine learning. As the field of nursing is rapidly progressing and the field of activity for nurses is expanding, the ability to deal with the diversity and complexity of the subjects is now required.

The Ministry of Health, Labor and Welfare has compiled reports on curriculum revision proposals 10 times since 2018, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has held a "Study meeting about the nursing undergraduate education system and human resources". In response to these trends, a report was compiled in December 2019 on issues and countermeasures regarding the application of the regulations for designation of public health nurse midwives and nurse school training centers [20].

According to a survey on the impact of the coronavirus pandemic on training conducted by the Japan Association of Nursing Programs in Universities (JANPU), among 247 schools out of 287 member schools (response rate 86.1%) of JANPU as of October 2020, more than 70% of nursing universities have canceled practical training or switched to on-campus training [21].

Based on the results, a team was formed to create a plan for (1) Organizing the current issues in nursing clinical training and creating a new clinical practicum framework proposal, (2) Organizing the issues related to digitalization in nursing education, and framework for nursing education in the DX (Digital Transformation) era. 14). In August 2020, the Ministry of Education, Culture, Sports, Science and Technology's "Leading University Reform Promotion Commission Project" for the revision of the nursing education model core curriculum in 2020 was announced [22]. In response to this research, JANPU conducted an AI chat survey in 2023 regarding the nursing education model core curriculum. The aim is to create a revised proposal for the next "Nursing Education Model Core Curriculum" by clarifying "competencies and the educational content necessary to achieve them". The result is going to be reported in February 2024 [23].

4. Understanding learner needs

4.1 Expansion of opportunities for nurses and required education

With the expansion of home-based services in the ultra-aging population and technological development, an increasing number of nurses are working in a variety of settings other than medical service facilities, such as visiting nursing stations, nursing care facilities, and special needs schools. For this reason, nurses are expected to collaborate with other professions expanding their roles, and the designated regulations that have been in effect since April 1, 2020, stipulate that 3-year nursing courses, including those at universities, require "the structure of the human body." The number of credits for "Functions" and "Promotion of disease development and recovery" will be increased by 1 unit from 15 credits to 16 credits, and the name of "Home Nursing Theory" will be changed to "Community/Home Nursing Theory", the total number of credits increased by 5 credits to 102 credits, including an increase of 2 credits from 4 credits to 6 credits [24].

Some universities include a public health nurse or midwife course during the four-year period, and students are required to earn 31 credits in each course in addition

to the nurse course. In the 5-year high school nursing department qualify to take the national nursing exam which is the earliest course to become a registered nurse. Some courses qualify students to take the national teacher's exam and gain clinical experience after obtaining an enrolled nursing license and earning credits through correspondence education [24]. While the existence of a variety of courses increases the number of options for students in difficult economic situations, there is a negative side in that enrolled nurses are treated differently than registered nurses and the principle of equal pay for equal work is not observed. A nursing education system that allows motivated individuals to receive fair economic evaluation is desired. Uchiyama et al. note that the number of students applying to nursing universities is increasing due to the tendency to place more emphasis on obtaining qualifications and finding employment, but it is not always the case that students are applying to nursing universities based on their own intentions, in this case, the ratio of drop out and transfers are increased [25].

4.2 Chronic and sudden nursing shortages and their effects

Shortage of nurses increases the need to expand the scope of practice for individual nurses no matter how they want or not. Looking at the chronic shortage of nurses, the most significant change has been the partial revision of the Social Workers and Care Workers Act in 2011. One example of this is that endotracheal suction and tube feeding ("medical care") have been designated as actions that can be performed by those who have completed training [26]. Medical care, which until then had been limited to doctors and nurses' license holders and their families due to the theory of illegality, can now be provided by training such as phlegm suction provided by a registered organization, allowing advanced medical care to be provided at home. Accessibility to healthcare services for people who require medical care e.g., home-ventilators, have increased.

Acquired the knowledge and skills necessary to perform sputum aspiration (intraoral, intranasal, and tracheostomy suction) and tube feeding (tube feeding through gastric or intestinal fistula, nasal tube feeding), home care workers (including certified care workers) will be able to perform sputum suction and tube feeding under certain conditions, and it has been favorably approved as it will expand the scope of practice for care workers, etc. On the other hand, there are cases where the increase in responsibility resulting from the training is viewed negatively, as there has been no change in economic evaluation. This system plays a role in maintaining the quality of life of elderly people and children with disabilities who have been unable to receive enough services due to uneven distribution of doctors and a shortage of nurses. Sputum aspiration and tube feeding were added to the university curriculum for training certified care workers for students enrolled in April 2015 [26].

On the other hand, a specific training system for nurses was launched in 2015 to counter the shortage of doctors and improve accessibility to care services. This system allows nurses to change ventilator settings, replace tracheostomy tubes, operate, and manage percutaneous cardiopulmonary support devices, etc. based on comprehensive instructions from doctors in advance, and as of September 2021, 4393 nurses completed the course [27].

From 2024, the upper limit on working hours for medical practitioners will be 960 hours per year, and the trend toward task shifting and sharing in medical practice will have a major impact on the scope of practice of nurses and other medical professionals. Clinical engineers are responsible for connecting infusion pumps or

syringe pumps to intravenous routes, operating the infusion pumps or syringe pumps for administering drugs, and removing needles, hemostasis, and endoscopy after administration of the drug is completed, and the operation of a mirror video camera was added [28]. Clinical laboratory technicians use a medical suction device to collect sputum from the nasal cavity, oral cavity, or tracheal cannula and use endoscopic biopsy forceps to collect a portion of tissue from a lesion in the gastrointestinal tract were added [29]. Other approaches are being attempted to promote automation, such as health management devices using wearable sensors, defibrillators such as AEDs that do not require medical qualifications, automation of diagnosis using machine learning, and surgical support robots for remote medical services. Although there are some opinions against automation, it is considered necessary to make constant efforts to introduce new technologies into clinical settings, the research ability to keep updating service, and IT literacy to build a new medical care delivery system through automation and mechanization.

One example of a sudden shortage of nurses is the shortage of nurses due to the coronavirus pandemic from December 2019 to May 2022. The duties required of nurses have increased, including mechanical ventilator management in ICUs, care for patients on ECMO, response at cluster outbreak facilities, infection control duties such as zoning, vaccination duties, and care of patients receiving home care [30].

The Japanese Nursing Association (JNA) states that the reason why it has been difficult to secure nurses in hospitals, etc. is due to the small number of nurses in normal times. When dealing with a patient on a ventilator, there needs at least 1 nurse to 1 patient, when dealing with a patient on ECMO, there is at least 1:2 nurse, and when dealing with a patient on ECMO, there is a need to change positions although six or more nurses are required to perform the procedure including prone positioning. The number of nursing staff per bed is 4.1 in the United States, 3.1 in the United Kingdom, and 3.9 in Canada, while the number of nurses in Japan is as low as 0.9, ranking 30th out of 35 OECD member countries as of fiscal 2017 [30]. JNA believes that there is a need to develop nursing professionals who can care for patients on ventilators and manage infection and proposed the creation of a nurse support dispatch system in the event of a cluster outbreak [30].

As of November 2023, the Ministry of Education, Culture, Sports, Science and Technology's budget request for fiscal year 2024 is expected to call for public applications for "nursing training projects that can respond to social demands. [Theme 1: The training of nurses to take leadership positions in supporting technology-dependent children in the community and special schools], and [Theme 2: The training of nurses who can handle critically ill patients (including OJT)]. The target projects are to train nurses who can use mechanical ventilators and ECMO in hospital wards [31]. In particular, [Theme 1] includes educational content for nursing undergraduate students to carry out practical training to support technology-dependent children and includes enrichment of pre-practical OSCE and simulation education for nursing undergraduate students. Careful consideration is required to build a curriculum and secure instructor nurses for training sites.

4.3 Ethical considerations in nursing education

Curriculum development based on the social demand for care as described above is based on educators' reflections, including regional characteristics such as accessibility to services, prevalence rates, and aging rates in the achievement level

at graduation. While this is possible, there is a risk that it will result in a curriculum that emphasizes cramming education and immediate skills for care service consumers. Reducing the "Theory-practice gap" and creating a curriculum that guarantees students' independent learning opportunities, rather than unilateral guidance by educators, and respecting students' dignity as mature individuals are urgent tasks.

5. Global standardization of nursing education

5.1 The PEPPA framework

The shortage of doctors and nurses is a common issue both domestically and internationally. In addition to the unpredictable restrictions on educational opportunities caused by the coronavirus pandemic, the lack of services due to the super-aging population is also becoming a global health issue. Internationally, an increasing number of universities are using the Participatory, Evidence-based, Patient-focused Process, for Advanced practice nursing (PEPPA) framework as a reference for curriculum development. The PEPPA framework was developed through participatory action research and was published by Bryant-Lukosius D and Dicenso A in 2004 [32]. The usage method is as follows.

1. Defining the patient population and describing the current care model

2. Identifying stakeholders and recruiting participants

3. Determining the need for a new care model

4. Setting priority issues and goals to improve care models

5. Defining new care models and the role of advanced practice nurses

6. Formulation of plan implementation strategy

7. Start of introduction plan for advanced practice nurses

8. Evaluation of the role of advanced practice nurses

9. Long-term evaluation of the role of advanced practice nurses and care models

The roles expected of nurses differ greatly depending on whether the patient group is a single surgical ward, an isolation ward with coronavirus-affected patients, or a local special needs school. The PEPPA framework includes a process that incorporates the opinions of stakeholders such as patients/children and families to reach consensus on the role expectations of nurses.

It is conceivable that on-the-job training for nurses may be necessary to implement a new care model. Boman et al. used the PEPPA framework to examine the practical skills required of nurses working in emergency departments in Norway [33]. It is impossible to include all the knowledge and skills needed in all practical settings in undergraduate formal education, and it was considered necessary to connect and maintain continuity between undergraduate and post-graduate education.

5.2 Swift development of DX in healthcare delivery and nursing education

Due to the global pandemic of coronavirus, development of DX in nursing education is also actively underway. As it reduces risks for both patients and nursing students, the efficacy of XR simulators has obtained international consensus. We are now in an era where students wearing VR goggles can talk to virtual patients as an alternative/supporting material before clinical practicum. Unfortunately, in the nursing VR platform, there are skills that are considered duties of nurses overseas that cannot be performed in Japan. In Sweden, there is a system called the Personal Assistant system that allows people with disabilities to directly hire care providers, and the content of care and remuneration are decided between the care service user and the provider. In April 2010 the Personal Assistant system was introduced in Sapporo City in Hokkaido prefecture in Japan, but unlike the Swedish system, it remains an unfair distribution of healthcare in terms of related laws and regulations [34].

The nurse practitioner, which has been introduced in countries such as the United States and Australia, is a professional who can prescribe, diagnose, refer to other departments, and claim medical remuneration, and who can perform a part of medical treatment independently without medical practitioners' direct/indirect supervision, the name is exclusive under related laws and regulations [35].

The flexibility of the healthcare delivery system provides opportunities to improve the quality of life of patients/children and their families by expanding the scope of practice and the capabilities and sense of control of care providers, including patients, people with disabilities, parents, special-need-school teachers, and nurses. As we have seen, in Japan, the formal educationalizing process for new technologies accompanying technological development is a strict system that requires legal revision, but flexible working between medical professions is possible in the event of an emergency such as a pandemic. The time has come to consider building a flexible system that will prepare for future shortage of nurses, and the time has come to promote it as a concrete example of social capital. DX could be a primary solution for this issue.

Professor Andrew Cashin at Southern Cross University in Australia, a Nurse Practitioner specialized in autism, commenced a project to increase awareness of RNs toward care for children with autism spectrum disorders in 2023 [36]. Using IT technology to disseminate professional knowledge and attitudes, Australian RN license holders can update their provision of care anywhere and anytime even living in Japan. His project is a valuable contribution that serves as a typical touchstone for the international standardization of nursing continuous education as well as increasing quality of care for children and their families internationally through empowering Australian nurses.

Mutual recognition between information technology and healthcare technology was found that digital transformation plays an important role in mitigating the risks of global shortages of nurses and healthcare faculty due to the pandemic, ultra-aging society, and technology-dependent children such as children with home mechanical ventilators.

6. ESTE-SIM project

Nursing XR simulators have been developed to popularize the concept of Diversity, Equity & Inclusion, which is a new purpose of future technology development. In 2006, the pros and cons of having helpers perform endotracheal suction for

children with tracheostomies attending nursery schools and for ALS patients living at home were questioned. Approximately 30 years have passed since home ventilator management fees were included in medical reimbursement in 1990 in Japan, what we have experienced was sudden unexpected shortages of nurses during COVID-19 global pandemic. To secure each child's right to receive education by increasing the number of people who can provide home-ventilator care, the Endotracheal Suctioning Training Environment SIMulator: ESTE-SIM project has started with the agreement of Professor Shinji Ninomiya at Hiroshima International University in Japan in 2015 [37], with a belief that care providers who have received a certain level of nursing education based on social demand of care should be increased, not limited to conventional healthcare education to contribute as social capital for everyone who has disease/disability or not (see supporting materials).

6.1 ESTE-SIM

The ESTE-SIM (**Figure 1**), which enables realistic training of endotracheal suctioning, can measure the movements of the suction catheter inserted in the artificial trachea. The load sensors surrounding the artificial trachea send information on pressure by the tip of suctioning catheter is used to estimate the progress of the nursing maneuver, which is then used to reproduce vital reactions on a display as a simulated pulse oximeter, and virtual facial expression changes on a patient facial mask based on dynamic projection mapping technology [38, 39]. This is the first case of nurse-initiated simulator development for endotracheal suctioning in Japan, protecting patients and nursing students from risks of tracheal injuries and accidents. Repetitive practice with prompt realistic biological reactions allows nursing students to increase their motivation and confidence to provide care [40].

While the size of the trachea varies across different age groups, the artificial trachea model in the simulation system had only one fixed model. The development
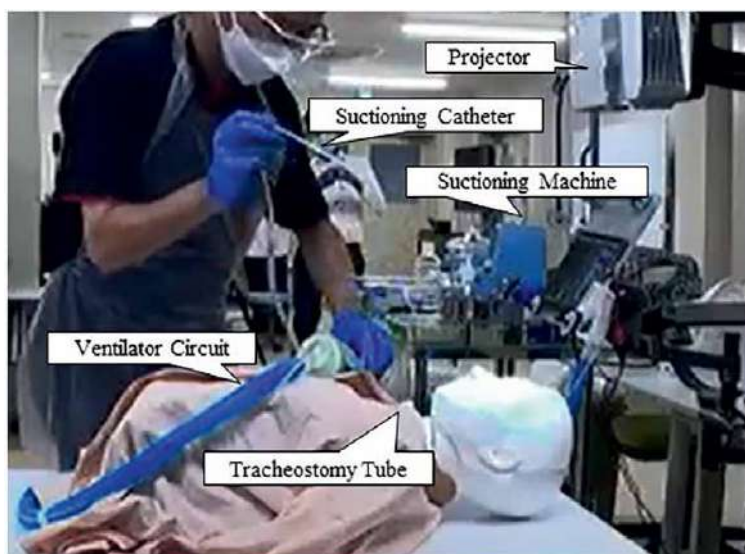

Figure 1.
ESTE-SIM.

of the artificial trachea was supported by a Radiologist, Assistant Professor Takaaki Yoshimura. To construct the artificial trachea model for three age groups (children, adolescents and young adults, and adults), we analyzed the three-dimensional coordinates of the entire trachea, tracheal carina, and the end of the main bronchus from the treatment planning computed tomography (CT) image data [41].

6.2 ESTE-mobile

Endotracheal suctioning is considered a procedure that should not be performed without licenses, including medical and nursing students before they obtain their license. Because of its invasive characteristics, opportunities to observe suctioning procedures are limited during practicum. Therefore, we developed Two-Dimensional (2D) video and Three-Dimensional Computer Graphics (3DCG) videos (**Figure 2**) to provide educational means and opportunities for more people, including family caregivers to access knowledge for safe endotracheal suctioning [42]. Improvement of user-friendliness of the video for the instruction of operation method and adding explanations in the 3D video are needed. Both 2D and 3DCG videos seemed effective according to the questionnaire, future challenge is to measure the influence of learners' eye movement analysis by calculating dynamic velocity frequency analysis for learning effectiveness.

This enhances the opportunity to access education materials for family caregivers of children with home mechanical ventilators as well. Including family caregivers' experience in developing the simulator is another challenge that respect their opinion. The experience will spread and shared among family caregivers and become foundation of social networks.

Figure 2.
ESTE-mobile.

6.3 ESTE-Holo

Nursing Educators must know effective maneuvers of suctioning catheters to teach students. There is a need to develop a suction simulator that can quantitatively assess the techniques of suction catheter manipulation. we developed a tracheal model with measurement functions: the measurement of the pushing force of the catheter on the bronchial bifurcation wall by the force sensor and the detection of the catheter tip trajectory history by the camera implemented [43]. Sensor data was then sent to change facial expression through Microsoft HoloLens 2 with a pupil eye tracker (**Figure 3**). This research topic expanded to compare five catheter maneuvers for the most effective suctioning phlegm within 10 seconds duration on the artificial tracheal membrane [44].

6.4 ESTE-360

To reflect students' and special needs school nurses' opinions on the development process of educational materials, the 360-degree panorama video (**Figure 4**) was created. A 360-degree video at a special need school was developed after permission from the students, their families, teachers, and the president of the school, then Adobe Premiere Pro was used to blur the face to make the individual unidentifiable. Insta 360 ONE was used to record and PICO G2 4K was used to view the video. Original questionnaire was created by Google Forms using 4 Likert scale to ask if the video was handy, real, motive, enough time, good balance of time and contents, adequate for third graders, and adequate for fourth graders. The result indicated that B3 is appropriate to start learning a lecture with a 360-degree video, and 4th grade would be the best to learn HV care at practicum [45].

A student with her home mechanical ventilator cooperated to develop the 360 videos. She showed her school life while she was studying by a tablet or with speech therapists. Different from suctioning for an unconscious patient in an Intensive Care Unit, her tracheal suctioning procedure was special and the timing was eye contact between her and a nurse. She removes the artificial air filter on her tracheal tube
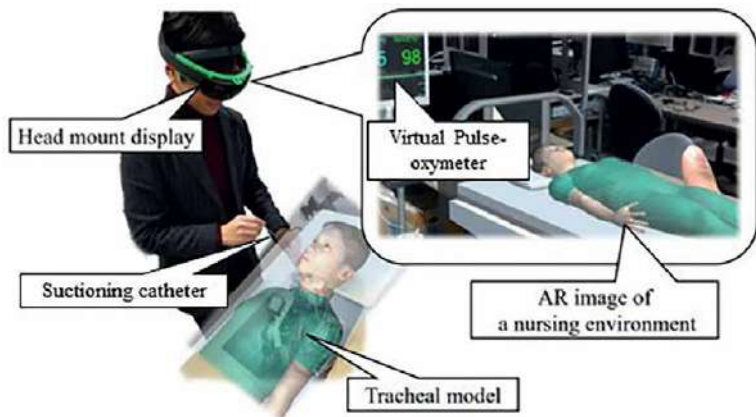

Figure 3.
ESTE-Holo.

Figure 4.
ESTE-360.

before suctioning, then the nurse inserts the suctioning catheter to suction, and then she returns the artificial air filter back to her tracheal tube.

Suction is not just the act of sucking sputum with a suction catheter. The timing of catheter insertion is important because breathing is not possible during suction. It could be a non-verbal communication to build trust relationship between children with tracheostomy. It was effective in informing students the realm of suctioning in a special-needs school setting, in addition, to ask participants' opinion about the appropriate time to start studying endotracheal suctioning and home-mechanical ventilator at special-needs schools. The accumulation of these careful nursing actions protects her livelihood, guarantees her the opportunity to receive an education, and opens the door to her future participation in society.

7. Conclusion

Society requires individual nurses to provide safe nursing techniques and expects nursing educators to construct an educational system to achieve this. The PEPPA framework makes it possible to define the role of nurses and care models for targeted populations. There is a potential to be applied as formal nursing curriculum evaluation criteria to satisfy social care demand which contributes social inclusion of children with home-ventilators. In medical education, a system has been established for medical students to acquire skills during practical training, such as legal modification of medical practice through a participatory clinical training system. By creating a similar system, we can assure nursing students to reduce the "Theory-practice gap".

With the development of information science and technology, skills such as learning programming and understanding and utilizing AI are also required. Programming learning begins in elementary school, so students with such skills will enter nursing universities in near the future. It is also important to ensure opportunities for teachers to improve their skills. If we utilize a new technology carefully, DX might improve the efficiency of unification to bridge the Theory-practice gap and accessibility of education for children.

In 2006, the pros and cons of having helpers perform endotracheal suction for children with tracheostomies attending nursery schools and for ALS patients living at home were questioned, but now nurses are assigned to special needs schools. By having a teacher accompany the student to receive training such as sputum suction, it has become possible to reduce the time required for family members to accompany the student while their students are studying at school. Although some degree of negative impact on quality of life is unavoidable depending on the individual's health level, such as the presence or absence of congenital diseases or disabilities, burnout among family caregivers, and decline in self-esteem among ventilator recipients are avoidable. It can be reconsidered as an event that can be predicted or prevented by improving systems and providing sufficient services.

It is necessary to further consider the development of flexible and timely formal educationalization procedures for new healthcare technologies, the avoidance of cramming by understanding the needs of learners, and curriculum development and evaluation methods in accordance with international standards. When we open our eyes to the issues, concrete solutions will appear in front of us. Restricting nursing skills by laws and regulations widens the scope of practice of the nurse and results in the quality of care for the patient/children and their families.

Acknowledgements

Author details

Noriyo Colley
Hokkaido University, Sapporo, Japan

*Address all correspondence to: noriyo@med.hokudai.ac.jp

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Chapter 17

Advantages of Evaluating Students by Means of Escape Rooms

Pedro Juan Roig, Salvador Alcaraz, Katja Gilly,
Cristina Bernad and Carlos Juiz

Abstract

Traditionally, a wide range of evaluation systems has been used to assess students in academic contexts. However, the adoption of an active learning paradigm allows to employ alternative tools to carry out evaluations, where educational escape rooms take a prominent place. In fact, such escape rooms engage students in a game-like environment where they get embedded. This way, they are faced with a series of tests in order to advance through the path within the escape room so as to finish the escape room as soon as possible with the aim of getting higher marks than their peers.

Keywords: escape room, active learning, gamification, innovative education, engagement

1. Introduction

Back in 2019, the European Commission released a document called "Key competences for lifelong learning," where a recommendation on eight key competencies for lifelong learning was proposed [1]. Those key competencies were to be acquired through a combination of knowledge, skills, and attitudes and were identified as literacy, multilingual, STEM (composed of science, technology, engineering, and mathematics), digital, learning to learn, social and civic, sense of initiative and entrepreneurship, cultural awareness, and expression [2].

However, that document was based on previous works on key competencies for lifelong learning being developed in the last decades from not only the European Commission but also in the research literature. In this sense, it is to be mentioned that, back in 2002, Candy prepared a document for UNESCO called "Lifelong learning and information literacy," where he exposed a weakness in information literacy development, which ought to be tackled by different organizations altogether [3]. Likewise, back in 2006, Lau provided a document for IFLA called "Guidelines on information literacy for lifelong learning," where he outlined a pragmatic framework for kicking up an information literacy program, which presents information competencies as key factors in lifelong learning [4].

Anyway, information literacy may be observed from different points of view, although it is commonly seen as the ability to access, evaluate, and use information [5]. Furthermore, some researchers like Johnston and Webber consider

information literacy as a soft discipline, which needs to be distinguished from information science, because the former is grounded on social sciences like sociology and psychology, whilst the latter is based on scientific and technical sciences like mathematics and engineering [6]. On the other hand, Basili proposed different perspectives to analyze information literacy discourse, such as disciplinary perspective, social/political, and cognitive, in order to study the culture of information, information literacy, and information skills, respectively [7].

Information literacy is considered the basis for lifelong learning, as the ability to collect and use information in an effective fashion may be seen as a critical skill because it supports decision-making and problem-solving, as well as knowing how to learn [8]. In other words, information literacy is key when it comes to developing lifelong learning competence, which includes both designing a learning plan and transferring the outcome to other competence areas [9].

In order to measure elements related to lifelong learning, different scales have been designed. In this sense, Uzunboylu and Hürsen developed a specific tool called Lifelong Learning Competence Scale (LLLCS), following European Commission recommendations on this issue, with the aim of assessing lifelong learning competence, where such a tool is composed of six subdimensions, which are made of 51 items overall [10]. Alternatively, Sahin et al. developed another specific tool called Scale of Key Competences for Lifelong Learning (SKCLLL), following also European Commission recommendations on this matter, targeting the same competence set, where that tool is composed of eight subdimensions, which are made of 23 elements overall [11]. In all those cases, the score of each item is five point Likert-type, meaning two utmost poles at the ends, a neutral answer along with intermediate options, where typical answers fully disagree, which is associated with 1 point, disagree with 2 points, neither agree nor disagree with 3 points, agree with 4 points, and fully agree with 5 points. It is to be noted that the reliability of the scales used has been calculated through the Cronbach alpha reliability coefficient, resulting in high enough values in all cases, thus revealing the internal consistency of the items in the scale.

Anyway, it is considered that the key element for developing lifelong learning competences is the teachers, as they can better guide their students to become lifelong learners [12]. Different features may induce lifelong learning competences in a teacher, although studies point out that the best regression models consider that some characteristics are critical, such as teaching experience, perception of lifelong learning, and learning strategies [13]. Likewise, other features seem to be relevant as well, such as their academic background [14], as well as their attitude toward information literacy skills [15].

On the other hand, information-seeking behavior of students is geared toward three targets, such as scoring higher marks, being informed about what is going on with their studies, and interacting with people near and far [16]. Focusing on acquiring better information literacy skills, some useful tips for students to get it done are task breakdown, guided repetition and ordering activities based on their difficulty level [17], as well as taking lessons on learning strategies and techniques [18]. Also, the improvement of information literacy increases the readiness for self-directed learning, along with the readiness to overcome any kind of deterrents to their participation [19]. Furthermore, other important skills will also be empowered by information literacy, such as critical thinking, informed decision-making, and independent, self-directed lifelong learning [20].

Special attention should be devoted to prospective teachers, as they will have to induce lifelong learning competence into their future learners in order for them to

have them ready for a future characterized by change, which they need to face with a certain degree of self-confidence and self-efficacy [21]. However, information literacy and lifelong learning ought to be encouraged not only in teachers and students but also in other layers of society as creativity and work performance will also be enhanced [22].

One way of getting into information literacy is to adopt new teaching paradigms such as active learning, which is characterized by the interaction of teachers and learners. This concept is opposed to passive learning, where traditionally teachers took full responsibility for the learning process of students [23]. However, active learning puts the focus on students to acquire their own education, thus assigning them the active role in their own education, whilst letting the teachers embrace a new secondary role as kind of dynamizers of the whole learning process. In other words, the new role of a teacher turns from knowledge provider to learning facilitator [24].

One of the most popular tools of active learning is educative escape rooms, derived from a mixture of serious educational games and recreational escape rooms, where students are faced with an escape room whose theme is related to a given educational subject [25]. An escape room is composed of a series of puzzles that they need to solve, where the solution of a puzzle may contain a clue about how to resolve the next puzzle. Each solved puzzle leads the way to eventually reaching the final puzzle, which provides the solution to the escape room [26].

Puzzles contained in an escape room could be organized in different ways, forming basic and complex layouts. Regarding the former, there are some instances such as an open structure, where all puzzles could be solved in any order before getting to the last one, and a sequential structure, where puzzles must be solved one after the next until getting to the metapuzzle, or a path-based structure, where different paths of puzzles are available to get to the final puzzle. With respect to the latter, any hybrid structure could be achieved, where some of the former layouts can be combined [27].

The incorporation of the active learning paradigm into the education realm propitiates an alternative perspective on how students and teachers relate to each other, where the former play the active role. This approach could also be moved into the evaluation tasks, thus allowing the use of solutions where students get a more active position than in traditional evaluation exams. Basically, the term evaluation may be viewed as the verification and validation of the teaching-learning process in order to check whether students master the learning objectives in a sufficient manner, which may be carried out through different domains, such as knowledge, attitudes, skills, and habits [28].

Hence, the change in the learning paradigm may well lead to adapting the assessment system so as to properly evaluate the subject competencies. For instance, Alonso-Núñez et al. propose the use of project-based learning (PBL) as a convenient assessment method for active learning, as students must work in collaborative groups so as to develop a project [29]. On the other hand, Molina-Torres et al. propose the use of escape rooms as a method of evaluation for active learning, which offers similar results as traditional evaluation, even though the levels of anxiety and perceived stress are significantly decreased in the latter [30].

Focusing on the proposal of using escape rooms as evaluation tools, in this paper, we propose a scheme to design educational escape rooms in order to evaluate learners within the active learning paradigm. In order to do so, we propose a generic design of an escape room for evaluation purposes, whose size could be adapted according to the needs of the teacher and the curriculum to be evaluated.

The organization of the rest of the paper is the following: first of all, Section 2 reviews the methodology, then, Section 3 displays the escape room design, after that, Section 4 presents the discussion, and finally, Section 5 draws the final conclusions.

2. Methodology

We are teaching computer science-related subjects at college level in the current academic course and we decided to migrate from traditional learning to active learning in an introductory subject for one of our courses. Basically, we adopted the paradigm of flipped classes, where video recordings have been prepared for learners to watch before each session in order for them to dedicate such onsite sessions to resolve doubts, problem-solving, or group work.

On the other hand, we also wanted to apply the active learning paradigm to evaluation, so we planned on reserving a session at the end of each didactic unit in order to undertake its corresponding evaluation, where two different evaluation activities were to be held. To start with, in the first half an hour, we planned to carry out an individual test exam related to the contents acquired during the teaching unit. Such an exam would be a computer-based test containing thirty test questions out of a pool of more than a hundred, which would be randomly presented to each student and whose answers would be randomly shown as well to each test taker.

Afterward, in the rest of the session, we planned to undertake an escape room organized as a sequential path to be taken in groups, where each puzzle would consist of a random exam of ten questions similar to the one exposed above, which could be repeated over and over again. Hence, according to the grades obtained by a group in each attempt at the exam, then the group would either move to a number of puzzles ahead if they pass the exam, or otherwise remain at the same puzzle if they fail it. In those circumstances, the escape room would then be considered as a competition among all groups, where the one reaching the end of the escape room in the shortest time would win the escape room, thus all its members get top marks in this activity.

This way, we implement a kind of a blended evaluation system, where learners first undertake a traditional computer-based test exam being carried out on an individual basis, whereas they in turn carry out a gamified evaluation involving an escape room to be held in groups, where they have to take multiple computer-based test exams being undertaken on a group basis.

This setup allows for a key advantage from the point of view of student's motivation because learners are usually more fond of taking the escape room than the individual exam, but as they want to perform well in the former, they know that the best way to do it is to study more the didactic unit in order to advance faster in the escape room, which also implies that they will eventually get more prepared to the latter, which in turn will allow them to get better performance overall. Hence, it seems that allocating the escape room right after the individual test exam is a win-win situation, as the motivation of competing in the escape room leads them to study more to get more chances to win, thus getting them more prepared to face the individual exam, which will eventually get them to achieve better marks in both tasks.

In order to better clarify the methodology used herein, it is to be noted that we applied the active learning paradigm in a subject called Introduction to Computer Science within an engineering degree at College in the current academic year, namely 2023–2024, where we had 63 students registered. The course contained five didactic

units, so we implemented an escape room with the same structure but different content at the end of each didactic unit in order to evaluate the knowledge, skills, and attitudes acquired by the learners.

On the other hand, we applied the traditional learning paradigm during the previous academic year, namely 2022–2023, in the same subject, where a similar number of students were enrolled, namely 61. Hence, in the former academic year, the students were instructed by means of frontal classes and they were assessed with written exams, as opposed to the current academic year, where students were taught by means of flipped classrooms and were evaluated through escape rooms along with computer-based exams.

Therefore, the purpose of this study is to compare the results obtained when students face traditional lessons and assessments, namely pen and paper exams, with the outcome attained when they carry out escape rooms and computer-based tests as an evaluation method. In this sense, we are going to confront two parameters in both academic years in the same subject, such as the variation in academic performance and the variation in the success rate.

The former is to be checked out by comparing the results achieved by the students in each of the evaluations, related to the five didactic units, in both academic years. On the other hand, the latter is to be assessed by confronting the number of students passing the subject in both academic years.

Additionally, a third parameter is going to be studied, which is the level of engagement achieved by the students in the subject due to the escape rooms. This measurement will be done through the ISA engagement scale, which presents three dimensions, with three questions per dimension, in order for students to express their degree of engagement from different points of view. However, the measurement of engagement will be only related to this current academic year because we do not have such a value referred to the previous academic year.

3. Escape room design

As stated above, the structure of the escape room proposed is a sequential path, where a string of puzzles is located in a daisy chain manner from its initial point to its end point. In a way, each of those puzzles is considered as stages making the way toward the end of the race. Nonetheless, the structure proposed is not purely linear, but it is divided into different levels, where each of which is composed of a string of stages distributed in a daisy chain fashion [31]. Hence, each level must be certainly completed in order to get into the next one. Also, the escape room proposed is intended to be faced in teams of a certain number of students to fit the active learning evaluation method described above. However, in order to stay generic, we will describe the actions within the escape room for a generic player, who may be an individual or a group formed by a bunch of players.

Initially, all players taking part in the escape room are located at the starting point of the first level. Additionally, each level has a starting point where players must be located when clearing the previous level and they have to begin moving within such a level. In fact, all stages within a level have a direct path to the starting point of the next level, which is available in case they complete the run through the current level they are in. Furthermore, it is to be noted that there is silent transition, represented by τ, between any starting point in a given level and its very first stage, thus turning the starting point into virtual spot just for organization purposes, as it does not affect in

any way the movements through the escape room because reaching the starting point effectively means getting into the first stage of a given level.

As we pointed out above, the way to move through the puzzles of the escape room proposed is by taking test exams with a number of questions, where the marks obtained will result in the magnitude of the movement they will make within the current level at that time. In order to better illustrate this, let us consider a grading system where the top grade of an exam is β, whereas the passing grade is α, whilst the minimum grade is considered to be 0. This way, the escape room proposed makes use of a generic grading system, which may be adapted to the marking systems being used in any particular country.

On the other hand, the number of stages in each level is given by $\sigma = \beta - \alpha + 1$, such that the first stage in any level is labeled as stage α, the second one is branded as $\alpha + 1$, and so on, until reaching the last one, which is referred to as σ. However, we could tune up the number of stages within a level to a particular number in order to control the number of stages so as to make the escape room faster or longer, even though this action would force us to apply a normalization factor δ to the outcome of the test exams, such that the term +1 would really mean +δ.

Therefore, after applying the normalization factor δ, if it is necessary, if the score resulting out of one attempt of the exam test, namely γ, does not reach the lowest passing grade, namely α, then the player will remain in the same stage until the next test exam is taken. This condition is mathematically represented by $\gamma \in$ and is displayed as a loop. On the other hand, if the score is equal to or higher than α, but at the same time, it is lower than $\alpha + 1$, then the player will move one stage ahead. This condition is mathematically represented by $\gamma \in$ and is displayed as a directed edge to the following stage ahead. Likewise, if the score is equal to or higher than $\alpha + 1$, but at the same time, it is lower than $\alpha + 2$, then the player will move two stages ahead. That condition is mathematically represented by $\gamma \in$ and is displayed as a directed edge two stages ahead. And the remaining marks are dealt with analogously. Furthermore, each time an exam test is completed, a mark is obtained from it, so the player will be able to move through its current level according to that mark. Hence, the faster an exam test is taken, the more often the player will be able to move through a level, and obviously, the faster will run through all levels.

It is important to reiterate that each level must be completed on its own, so the fact that overpassing the last stage of the current level implies the movement to the starting point of the next level, which in turn implies moving on to the first stage of such a level, regardless of the grades obtained when overpassing the last stage stated. Moreover, after overpassing the last stage in a particular level, then the player is moved to the starting point of the next level, which applies a silent transition to move ahead to get to the first stage of such a level, as stated above. Eventually, when a player is located in the last level, namely ρ, the conclusion of the escape room is attained when clearing that level.

Figure 1 exhibits the escape room proposed, where the features exposed above are shown, although only some of the movements are displayed for clarification purposes, because if all arrows are depicted, then the figure would be illegible due to the number of arrows portrayed. Furthermore, a cup is exposed after the final stage in order to state the end of the escape room. The nomenclature of this picture contains a collection of levels represented by p_i, such that $i \in [0, \rho]$, thus resulting in $\rho + 1$ levels overall. Moreover, each level contains a string of stages s_j^i, where i represents the level where the stage is located and j indicates the order of that particular stage within its level, such that the order is established as $j \in [\alpha, \sigma]$, which is equivalent to
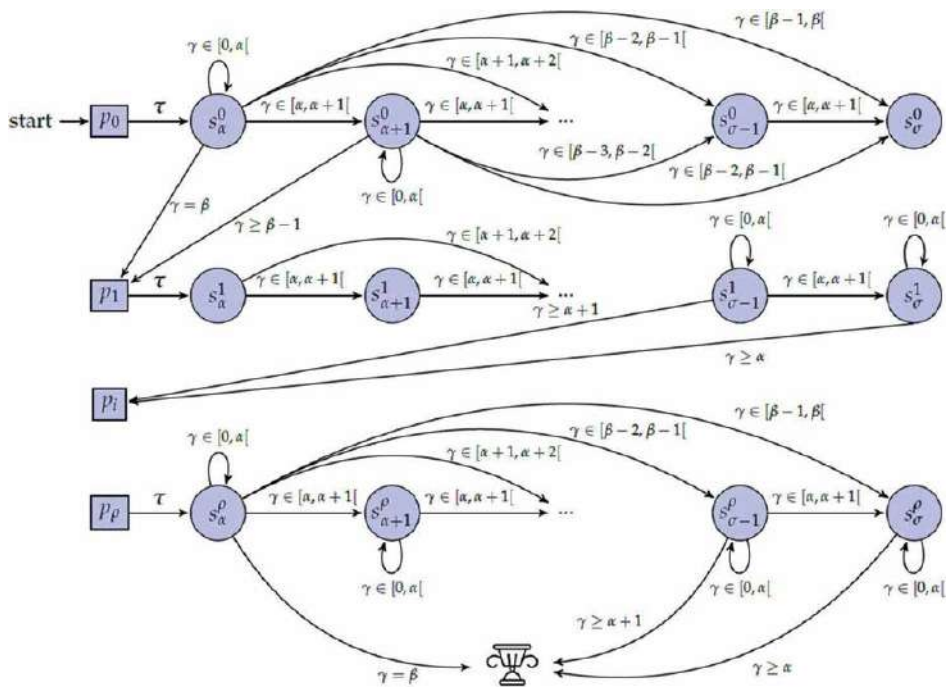
Figure 1.
Generic layout of the escape room proposed.

$j \in [\alpha, \beta - \alpha + 1]$ if no normalization factor has been applied to the outcome of the test exams taken during the escape room.

This type of design facilitates the implementation of strategies when taking the test exams because if the player is at the initial stage of a level, it is obvious that the best target is to try and achieve the highest possible grade. However, getting higher marks may imply spending more time to take a test exam, as questions usually need to be thought over. Hence, if the player is located near the end of a level, it might be a good idea to try to just pass an exam test instead of achieving higher marks, as the outcome, in any case, would lead to the same place, which is the beginning of the following level.

Therefore, it could be more convenient to take the exam quicker in this case by just answering the necessary questions, which obviously would not take as much time as getting the exam done by answering all of the questions. At the end of the day, the faster a test exam is completed, the faster a movement is made in the escape room if the marks overcome the passing grade, and the main mission in the escape room is to arrive at the end of it in the shortest possible time. However, taking an exam with the minimum necessary amount of questions to get to the following level in the shortest possible time might end up backfiring as if one single question is not answered correctly, then the player will not be able to reach the end of the level with the marks corresponding to that exam, so another exam will need to be taken to clear that level.

Regarding the evaluation system considered for this escape room, the player reaching the end in the first position will get top marks, whereas the second one will get a lower mark, and so on. We consider that all players finishing the escape room within the allocated time slot deserve to pass, whilst the players not finishing it will get penalized for failing this activity, although such a time slot must be long enough

for all of them to finish on time. This way, all the players are motivated in order to get better performance when facing the escape room, as part of their evaluation for a particular didactic unit depends on how well they deliver on it.

4. Discussion

As stated above, at the end of each didactic unit, students must take two activities to evaluate what they learned about it. On the one hand, the first task is a computer-based exam test composed of 30 questions to be undertaken on an individual basis, whose content is related to the corresponding didactic unit. On the other hand, the second task is an escape room where students are organized in groups in order to take a series of computer-based exam tests composed of 10 questions each to be carried out on a group basis, whose target is to advance as fast as possible through the escape room in order to reach the end of it in the shortest time interval.

We put all this scheme into practice in the current semester in a subject related to Introduction to Computer Science, where 63 learners are registered. So the procedure was to implement the aforesaid scheme of evaluation activities at the end of each didactic unit, such that students faced an individual exam and an escape room in the sessions allocated at the end of each of the 5 didactic units being part of the course. Therefore, the sample is composed of 63 students, who will be taking up to five escape rooms during the semester.

The objectives of setting up this scheme are threefold, such as getting better marks for the students as an average regarding the subject, as well as getting more students passing the subject, and also getting the students more engaged in the subject because of the implementation of the educational escape rooms. The tools employed are just providing each student with a computer and a learning platform to implement the computer-based exams.

According to the literature, the introduction of escape rooms as an evaluation tool for STEM courses raises the students' academic performance by around 15% [32]. This result is somewhat coherent with those obtained in our course, as the increments in the grades for the subject selected in the current academic year compared to those reported last academic year for each of the five didactic units are 12.1%, 20%, 18%, 25%, and 22%, respectively, thus leading to an average of 19.4%.

Getting deeper into the rise related to academic performance, **Table 1** exhibits the average grades and the corresponding increases obtained in the results of the subject

Didactic unit	Average score in 2022–2023	Average score in 2023–2024	Variation rate	Increase in %
1	6.45	7.23	1.1209	12.1%
2	6.22	7.46	1.1994	19.9%
3	6.14	7.27	1.1840	18.4%
4	6.03	7.53	1.2488	24.9%
5	6.31	7.72	1.2234	22.3%
Overall	6.23	7.44	1.1942	19.4%

Table 1.
Average rise in academic performance.

during both the current and the previous academic year. These results show a clear growth in the grades achieved for all five didactic units, ranging from roughly 12% to nearly 25%.

Looking at those percentages in more detail, it may appear that they might be classified into three groups containing sort of similar values, as the rise in didactic unit 1 is the lowest, then the increase in didactic units 2 and 3 are higher, and in turn the growth in didactic units 4 and 5 are even higher.

This point suggests that students in the current year got better grades as the course went through compared to their peers in the last year. In fact, the overall average may well be fitted into the intermediate interval, which reinforces the hypothesis of an increasing interest in the subject as the course goes by because the results in the first didactic units are below average and those in the last ones are above average. It is quite likely that such a rise in academic performance is directly related to the introduction of escape rooms as evaluation tools, as scholars work harder in order to get more prepared for it and be able to beat their colleagues.

Likewise, the literature establishes a rise in the success rate for STEM courses when introducing escape rooms of around 20% [33]. This outcome is kind of coherent with that obtained in our course, as the success rate for the subject chosen in the current academic year compared to that reported last academic year regarding the final grades rose by 17.4%, as we passed from 46 to 54 successful students.

Going deeper into the rise referred to success rate, **Table 2** displays the success rate corresponding to the subject during the current academic year and the previous one. Those results expose a definite increase in the amount of students passing the subject. This growth in the success rate confirms the higher interest for the subject in the students during the current academic year compared to the previous one. Likewise, the increase in the success rate may well be related to the introduction of escape rooms, as stated before for the academic performance.

On the other hand, the level of engagement of the learners has been measured by using the ISA engagement scale, which associates engagement with a state of mind regarding three dimensions, such as intellectual, social, and affective. The ISA scale presents three standard questions for each dimension, whose results altogether offer the overall level of engagement of each individual [34].

Each question provides a score of 7 point Likert-type, where the lowest value refers to a total disagreement and the highest one does to a total agreement, whilst the intermediate values cover the range of options in between. Besides, it is to be noted that the average of the three items for each dimension yields the average score of the corresponding dimension, whereas the average score of those three dimensions accounts for the overall score average. The expected score for each dimension and overall is above 6 in order for the engagement to be high, thus leading to significant results.

Focusing on the three dimensions, intellectual engagement is related to how much the learners are intellectually absorbed when undertaking a given task, social engagement is related to how much the students feel socially connected while carrying out a given task, and affective engagement is related to how much the pupils experience positive feelings whilst working in a given task.

Success rate in 2022–2023	Success rate in 2023–2024	Variation rate	Increase in %
46	54	1.1739	17.4%

Table 2.
Increase in success rate.

In summary, the ISA engagement scale is composed of a set of three dimensions, where each of those is assigned to a subset of three standard questions, accounting for nine questions overall, as is exhibited in **Table 3** [35].

The average results obtained in our subject for the different dimensions are 6.1 for the intellectual one, 6.4 for the social one, and 6.5 for the affective one, leading to an overall score of 6.33, which is considered as high engagement by the learners. **Table 4** summarizes the outcome achieved in each dimension of the ISA engagement scale, as well as the overall result, obtained as the average value of all dimensions.

This outcome reinforces the feedback we obtained during the escape room sessions, where students felt sort of excited about the competition and in good mood, which makes a difference when it comes to the anxiety and tension they usually face with traditional exams. Therefore, it seems clear that escape rooms offer multiple advantages when being used as evaluation tools as opposed to traditional exams, as performance is increased because learners work harder to get better results, and engagement is risen because they feel embedded into the gaming experience.

Digging deeper into the results related to engagement, it seems that the intellectual dimension got the lowest figure, whereas the other two facets got pretty similar values. This outcome may be explained through the fact that escape rooms get scholars more motivated due to their competence with their colleagues and the gaming environment, whereas the cognitive motivation may not be as high.

Furthermore, the affective dimension is a bit higher than the social one, which may be explained by the fact that the gaming environment inherent to escape rooms gets learners slightly more motivated than the competence of their colleagues. Nonetheless, the values obtained in all three dimensions are above six, and so is the overall score, hence the motivation level is considered high, which may well be a key factor to explain the results obtained in both academic performance and success rate, as exposed above.

Dimensions	Questions
Intellectual engagement	I focus hard on my work.
	I concentrate on my work.
	I pay a lot of attention to my work.
Social engagement	I share the same work values as my colleagues.
	I share the same work goals as my colleagues.
	I share the same work attitudes as my colleagues.
Affective engagement	I feel positive about my work.
	I feel energetic about my work.
	I am enthusiastic in my work.

Table 3.
The ISA engagement scale.

Intellectual engagement	Social engagement	Affective engagement	Overall engagement
6.1	6.4	6.5	6.33

Table 4.
Results obtained in the ISA engagement scale.

5. Conclusions

In this paper, we exposed the advantages of employing escape rooms as evaluation tools as opposed to traditional exams. To start with, the concepts of information literacy and lifelong learning have been introduced as they are already part of teaching competences necessary to confront the current ever-changing world, where people need to be ready to adapt the mutable circumstances in all aspects of their lives, including the working field.

Then, we talked about the active learning paradigm as a new reality in the education field, which is already substituting the traditional learning approach. In this new paradigm, teachers took the whole responsibility in the education process, thus leading them to act more as facilitators for students to get the responsibility for their own education. In that context, gamification is one of the driving forces of active learning, where educational escape rooms may play a relevant part in both learning and evaluating.

Focusing on the evaluation process, we exposed a use case where we implemented an evaluation process where escape rooms were used for the different didactic units within a given course of introduction to computer science. Positive conclusions have been drawn from this experience of implementing educational escape rooms as evaluation tools, as we obtained advantages in three directions.

First of all, students achieved a rise in the average performance of 19.4% in the subject taught in the current academic year with respect to the same subject taught the last academic year, where traditional evaluation tools were used, meaning a traditional exam. Basically, it means that the grades obtained by the students for the same subject were 19.4% higher in this current year due to the use of escape rooms than in the previous year without the escape rooms.

Getting deeper into the growth in academic performance, it happens that the results obtained for the five didactic units within the subject could be classified into three groups. This way, the first group gets a rise of around 12%, which is only the case of the first didactic unit. Besides, the second group gets a rise between 18% and 20%, which is the case of the second and third didactic units. Moreover, the third group gets a rise between 22% and 25%, which is the case for the fourth and fifth didactic units.

Hence, it seems that students in the current year got better grades as the course went through. Regarding the cause of this increase in academic performance, it appears to be directly related to the use of escape rooms as evaluation tools, as students seem to work harder so as to get more ready to face them.

Also, students attained an increment in success rate of 17.4% in the subject taught in the current academic year with respect to the same subject taught in the last academic year. Basically, it results in having a percentage of 17.4% increase for the students who passed the subject in this current year than in the previous year.

Going deeper into the increase in the success rate, the outcome exhibits a clear growth in the number of students passing the subject. This rise related to the success rate indicates a higher interest in the scholars for the subject during the current year compared to the last one. This growth referred to the success rate seems to be closely related to the use of escape rooms as evaluation tools, as exposed for the improvement in academic performance.

Eventually, escape rooms provide a high rise from the point of view of engagement owing to two main factors. The first one is due to learners working harder because of the competition spirit to perform better in the escape room, which permits them to go to the evaluation with more confidence.

The second one is due to the good mood and excitement brought by the competition spirit, which may lead some students to overperform because they want to overcome their colleagues, as opposed to the anxiety and tension related to traditional exams, which may lead some students to underperform because they do not concentrate properly during the examination process.

The ISA Engagement Scale has been used to measure the level of engagement overall, as well as in the intellectual, social, and affective dimensions. The scores obtained have been greater than six in all cases, which reflects a high engagement for the learners when they take part in the escape rooms.

Digging deeper into the outcome related to engagement, it appears that the value obtained for the intellectual dimension is lower than the values attained for the rest of dimensions, which may indicate that the cognitive motivation gets overcome by the affective and social counterparts. Additionally, the former is slightly greater than the latter, which may indicate that the gaming environment gets students a bit more motivated than the competence of their peers.

Anyway, the results obtained in all cases overcome the boundary to consider the motivation level as high. Therefore, this high degree of motivation seems to be the key factor in order to explain the increase achieved in both academic performance and success rate in the subject during the current academic year with respect to the previous one.

Conflict of interest

The authors declare no conflict of interest.

Author details

Pedro Juan Roig[1]*, Salvador Alcaraz[1], Katja Gilly[1], Cristina Bernad[1] and Carlos Juiz[2]

1 Computer Engineering Department, Miguel Hernández University, Elche, Spain

2 Mathematics and Computer Science Department, University of the Balearic Islands, Palma de Mallorca, Spain

*Address all correspondence to: proig@umh.es

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