The School of the Future

The Role of Digital Technologies, Metacognition and Emotional Intelligence

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Abstract—Technology is developing at a rapid pace, affecting the socioeconomic situation of the planet through innovation and the evolution of applications for easier and faster access to goods and services. The development of new technologies has also affected education. In this paper, the school of the future is presented with regard to emerging or exponential disruptive technologies and the impact of emotional intelligence on those involved in education. The politics of globalization, global perspectives, perceptions, and contemporary social values lead to the education of individuals with accessibility for everyone, from everyone, and from everywhere and at any time in an inclusive world. The school is changing. Research showed that the school of the future reshapes its learning environment to meet the increasing demands of the 21st century which are positively correlated with dynamic, flexible, interactive, creative, and self-directed learning technologies.

Keywords—emerging technologies, interactive technologies, emotional intelligence, metacognition

1 Introduction

As rapid technological breakthroughs and globalisation continue to transform urban surroundings and the workplace, educational institutions are increasingly being removed from the reality and expectations of worldwide economies and cultures. Educational strategies must be changed to provide children with the abilities needed to create a varied, productive environment.

"Schools of the Future: Defining New Models of Education" introduces a new frame-work that supports comprehensive and innovative action to define great education in the current economic and social context [1].

The School of the Future is a school where technology is used as a tool for knowledge access and approach at all times and from any location. Since the school is a place where instructors, trainees/students, parents, and the community (educational and local stakeholders) actively approach knowledge, the school evolves in accordance with the demands of time. To guarantee that everyone participating in the educational process has access, the school of the future will need to use similar tactics, techniques, tools, and policies as the conventional school.

In the school of the future, the teacher will take on the role of partner, companion, and guide instead of playing the desk role and plans, motivates, and develops hands-on activities in accordance with the interests and skills of the students. In the spirit of cooperative learning, students work in groups and actively participate in the learning process by gathering, analysing, and processing information with the goal of gaining experiential knowledge, teaching others how to learn, and approaching knowledge in accordance with their learning profiles.

The educational advancements and pedagogical techniques of the school of the future, support parents and those attempting to educate their children and participate in the educational process. The "electronic bag", which can be a mobile tablet or another device, replaces books and notebooks, and the classroom of the future will make use of cutting-edge applications like IoT, Robotics, Artificial Intelligence, Avatar, Virtual Reality, etc., as well as gamification to add an element of entertainment and interaction to teaching and learning.

The development of emotional intelligence, acceptance, and empathy, as well as the development of cognitive and metacognitive abilities, will be vital guarantees for the fulfilment of the school's goals, but emerging technologies will play a major role in the school of the future: a free, accessible, and everyone-friendly school.

2 Materials and methods

We give a representative and non-exhaustive overview of the studies' literature in this study, concerning Twentieth First Century School Pyramid Models and Strategies and the Twentieth First Century School emerging Technologies.

An established group of articles from significant publications in the subject are used in the manuscript selection process. For this study, Google Scholar, and Science Direct databases were used under the key terms "School of the Future", "Emerging Technologies", "Exponential Disruptive Technologies", "Metacognition", "Emotional Intelligence", "School Pyramid Models" and "School strategies" to provide an overall framework of the trending research. The search strings used were not year-specific to unveil all studies in the domain, as the research issue has been discussed, to our knowledge, for the last few years.

This study aimed to highlight and illustrate emerging technologies associated with the educational domain in relation to cognitive processes and abilities that guide the development of effective educational strategies.

3 Results

3.1 Twentieth first century school pyramid models and strategies

The school is regulated by a set of educational and pedagogical principles for the advancement of knowledge and instruction of students to develop the knowledge, attitudes, and skills necessary to become productive citizens in the future. The proper training of the younger generations must be conducted in a school that is open to everyone seeking information, but with the adoption of effective teaching, well-informed parents, and children who will study in accordance with their learning profiles [2]. The United Nations established objectives for both the level of education and the preparation of educators to deliver high-quality education to all trainees. The organisation adopted the goal of ensuring inclusive, EQUAL, and fair quality education and promoting lifelong learning opportunities for all [3].

The OECD [4] highlights three kinds of skills—critical thinking, creative thinking, learning for learning, and self-regulation— defined by cognitive and metacognitive capacities. a) Technical and interpersonal capabilities. b) Physical and practical abilities; c) socioemotional capabilities.

Educators, parents, students, and community members should be capable of using critical thinking, problem-solving, cooperation, adaptation flexibility, creativity and invention, communication, construction, media and technology skills, social awareness, career orientation, self-management, and leadership skills in the school of the future [5]. The future teacher will be requested to help his students develop the aforementioned talents starting with him, as he is a smoothly operating school of the future school.

Emotional intelligence has been regarded as a highly significant talent for the twenty-first century, since it improves daily living. To achieve emotional self-actualisation, a person must develop a hierarchy of abilities, known as emotional intelligence. Self-Awareness, Recognition, Expression, and Management of Emotions, Empathy, Communication, Cooperation, and Conflict Resolution are the nine pillars that make up the pyramid of emotional intelligence (Figure 1), and they all contribute to the growth and improvement of social skills intended to enhance interpersonal, interpersonal, and professional relationships [6].

Fig. 1. The pyramid of emotional intelligence

There should be ongoing training for teachers in the development of their emotional intelligence, as well as the development of their emotional and psychological stability in the school of the future as well as in the current school [7], [8], as the teacher is a central pillar and a connecting link between students and parents.

Teachers with a high level of emotional intelligence are better able to connect with children and provide a positive learning environment while also promoting their own personal and professional well-being, which has an effect on children's growth. Teachers' emotional intelligence (EI) is crucial because it helps them identify, comprehend, and rate their own emotions, as well as those of their pupils. It promotes the growth of socioemotional intelligence (SEL) in children to be conscious of their feelings, but also to exhibit self-control, empathy, and the ability to handle challenging circumstances. Students should also develop social skills to foster a pleasant "climate" and interactions with other students, teachers, and parents [9].

Utilising appropriate metacognitive and metaemotional techniques and training, they will use this as a trigger to create the environment [10].

The school places more value on academic success and grades than it does on emotional intelligence. However, the key is to strike a balance between intellectual growth and emotional growth. Owing to the rise in mental health issues among children and adolescents, emotional intelligence must be developed.

The process by which all people learn and practice knowledge, skills, and behaviours, such as developing healthy identities, being able to control one's emotions to achieve individual and group goals, feeling and displaying empathy for those around them to create and maintain supportive relationships, and making well-informed and ethical decisions, is known as social-emotional learning (SEL) [11], [12], [13], [14].

According to the CASEL, five core SEL skills are developed through empowerment strategies. Competencies in social-emotional learning are defined as specific skills, routines, and attitudes that fall under the overall category of social-emotional learning. increases one's sense of self-worth, empathy for and sensitivity to others, capacity for making wise choices, self-awareness, self-management, social awareness, and meaningful participation in the educational process.

According to research, raising children's emotional intelligence enhances their academic achievement while also fostering a caring community where children feel respected, cared for, and connected to their peers, instructors, and even the school itself. [15].

According to recent findings in psychological and educational research, there is a need for a transformation in education that focuses as much, if not more, on the social-emotional domain as on the intellectual domain [16]. The foundation of such education is formed by children's emotions, growth and development, expression of creativity, and cultivation of interpersonal relationships. Dewey argued that a democratic society and education strongly depend on children's emotional development [17]. Since emotions influence a person's development in a number of ways, including how they affect learning, how they shape behaviour, how they connect with others, and how they construct their self-images, they have received a lot of attention in today's preschool and school education programs [18].

In recent years, an increasing number of educational programs have focused on the development of pleasant emotional states within the context of a competent pedagogical framework, stressing specific aspects that impact emotional development. Their primary goals are to a) comprehend the child's own emotions, b) focus on the emotional connection between instructor and pupils, and c) choose activities with an awareness of the emotional requirements of children.

Do a) individual differences and b) sex affect the development of the brain and central nervous system? Different settings have an impact on how emotions are expressed; thus, there are several factors to consider: c) aberrant developmental circumstances, d) other areas of development, e) family environment and intra-family connections, and h) socio-cultural background.

Teachers are efficient and enjoyable socialisation facilitators because they teach children new skills, watch their play, and form strong bonds with them. Both directly and implicitly, they offer vital indications of the emotional atmosphere [19]. According to [20], respect, empathy, and honesty are three crucial elements of good communication. "Students will learn more if their professors treat them with greater empathy, candor, and respect." Respected individuals are given time, space, and full attention. They are also questioned without bias, and the discourse is not interrupted.

Students seldom express their opinions or ideas in class according to the study; rather, they listen more frequently than they talk. The most important part of a conversation is often what the other person has to say. Children lack the capacity to listen carefully. This method may be applied to family members, coworkers, and students in the class-room as well as between teachers and pupils [21].

It is crucial to move toward meta-learning, with the school taking the lead and future teachers acting as metacognitive role models [23] based on thinking and awareness of learning processes or metacognition [24], which requires metacognitive skills of planning, self-monitoring, self-observation, and self-reflection. The philosophy of lifelong learning and deep understanding presupposes learning strategies such as organising, processing, and metacognitive monitoring [22].

By developing their metacognitive abilities to pass on to their pupils, future educators can raise their degrees of emotional, intellectual, spiritual, and physical intelligence.

According to [27] and [28], the eight pillars of metacognition (Figure 2) might be a very useful framework for the development of metacognitive abilities in students as well as future instructors. These pillars are useful instruments for self-learning, self-growth, self-healing, and self-consciousness; they establish the abilities of awareness and self-awareness, the development of intelligence in all areas, and the appropriate functioning of cognitive and psychophysiological systems. To achieve the highest levels of self-organisation, intelligence, and consciousness, each pillar uses a variety of methods to help students develop and improve specific metacognitive skills and characteristics. During the learning process, teachers pass on these skills to their students through self-regulation techniques [29]. Students also acquire, develop, and enhance metacognitive skills through anti-aging, stress-reduction, neuroplasticity, brain rewiring, and hormonal balance mindfulness training [30].

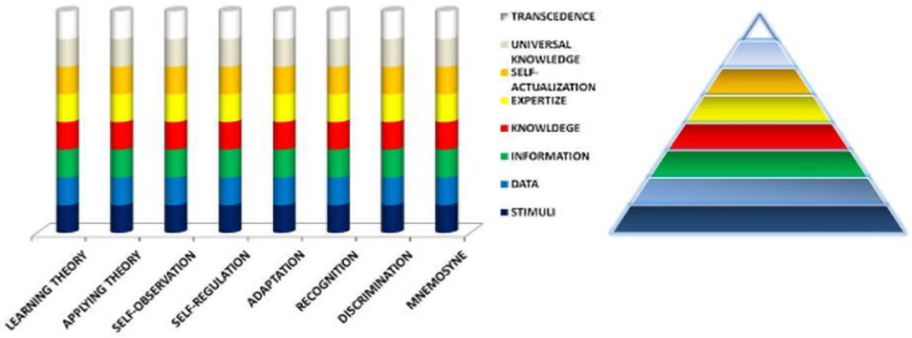

Fig. 2. The eight pillars of metacognition

The process of acquiring knowledge is thought to greatly benefit from the development of metacognition. The pyramid of knowledge eight strata corresponds to the eight stages that one must pass through to reach transcendence [31]. Reaching the upper level to finish the process of "building" the pyramid of knowledge (Figure 3), teachers should reach the upper level of transmission to their students, improving their observational control skills and altering their cognitive processes by gaining awareness: the capacity to carefully observe thoughts, feelings, even artificially induced emotions, and at the same time awareness to better our lives.

Fig. 3. The pyramid of knowledge

The pyramid model of giftedness (Figure 4) illustrates several abilities that are classified in a hierarchy proportional to their difficulty of acquisition and their importance in multilevel cognitive experiences [32], which will help the future teacher as much for their well-being and effectiveness as the students, since the teacher will pass the torch. Additionally, cognitive, metacognitive, emotional, and other skills will lead future teachers to develop their giftedness.

Fig. 4. The pyramid model of giftedness

Additionally, by mastering the methods for developing a feeling of responsibility, the teacher should be able to plan didactic learning processes to provide students with proper and essential cognitive and professional qualities to attain goals in their social and personal lives [33].

A key component of psychological school readiness is understanding the special role that education plays in society and parenting in the next generation [34].

Future educators must lay the groundwork for their students' full development, taking into account factors such as children's mental health and talents, age-related maturity, intellectual needs, and living conditions (family life and general health of the community) [33]. They must also work with students as partners in skill development and instill human values, such as empathy, cultural respect, respect for ethnic and gender identities, and human values.

A centre for education in creativity, emotional intelligence, analytical critical thinking, growth-mindset active learning, judgment and decision-making, interpersonal communication, leadership, diversity and cultural intelligence, technology, and the pursuit and acceptance of change.

3.2 Twentieth first century school technologies

Virtually every business, if not all human activities, will be transformed by artificial intelligence (AI), which is perhaps the technological force that shaped the first half of this century. Numerous start-ups are receiving billions of dollars in funding, and businesses and governments around the world are investing significant quantities of money in a huge variety of implementations. By the early 2020s, AI should be moving towards a more advanced level of self-learning, and by the early 2030s, it should be able to help, collaborate, coach, and mediate disputes. The world of education has quietly welcomed artificial intelligence. Whether desired or not, so-called intelligent, adaptive,

or personalised learning systems are increasingly being implemented in schools and universities all over the world, gathering and analysing vast quantities of student big data, and having a significant impact on the lives of students and educators. Moreover, AI is being developed to enhance online tutoring, incorporated into some traditional schools as a stand-alone curriculum, and is being investigated as a way to improve teacher preparation. In summary, the use of AI in educational settings is anticipated to reach a market value of over $6 billion by 2024 due to its exponential growth. AI is also being developed to enhance online tutoring and is being investigated as a way to improve teacher preparation. In the mean-while, some mainstream schools are introducing it as a stand-alone curriculum. To put it briefly, the use of AI in educational settings is anticipated to reach a market value of over $6 billion by 2024. Artificial Intelligence in Education (AIED) encompasses a wide range of technologies, from AI-driven, step-by-step personally tailored educational and communication systems to AI-supported exploratory learning, the analysis of writing skills, intelligent agents in game-based contexts, and virtual assistants for student support. It also includes AI-facilitated student/tutor pairing that firmly places students in control of their learning. Additionally, it incorporates whole-school strategies, students utilizing smartphones outside of the classroom, one-to-one computer interactions with kids, and many others. Additionally, AIED can shed light on teaching and learning procedures [35].

Artificial intelligence is defined as the capacity of robots to solve problems, respond to queries, devise strategies, adapt to novel conditions, and carry out a variety of other tasks that call for a level of intelligence generally present in humans. Computers can now execute functions that are almost or exactly like those performed by humans thanks to artificial intelligence, which is the result of breakthroughs in computers, computer-related technologies, machinery, and information communication technology. Artificial intelligence has also been heavily utilised in the education sector through the adoption and application of new technology in education. Several sections of the academic system or the education sector have incorporated artificial intelligence [36]. As artificial intelligence continues to advance, new educational applications become possible. The use of artificial intelligence in education has had a significant impact, leading to improvements in efficiency, global learning, individualised learning, better materials, and efficiency and effectiveness in education administration, among other things [37]. Knowledge discovery, the process of interpreting based on sample datasets known as "training data," is the heart of machine learning. This creates significant patterns and a structured knowledge. For example, machine learning can support the creation of recommendations for students when they choose courses or even colleges. It makes use of student choices, goals, and success data to "match-make" them with the schools where their potential is most realised. Additionally, this technology can assist teachers in comprehending how each topic is absorbed by children [38]. As a result of the AI's ability to personalise and customise learning materials to suit each student's requirements and abilities, students now have a better educational experience. In general, artificial intelligence (AI) has had a significant impact on education, notably the administration, teaching, and learning aspects of the education sector or within the setting of specific educational institutions [36].

A distributed computing paradigm is known as "cloud computing" makes it possible to access resources such as computers, networks, storage, development platforms, or

applications that have been virtualised. The user can request, provide, and configure these resources independently and with little assistance from the cloud provider. Additionally, resources are easily scaled up and down quickly to meet user needs, giving the appearance that an infinite number of resources are always available. Cloud computing is rapidly gaining traction across a variety of industries because of the support of significant industry players such as Google, Amazon, and Microsoft. Cloud services such as Google Mail and Dropbox have become everyday utilities for millions of individuals. Many firms presently use cloud-based apps, and small and major businesses are adopting a virtual infrastructure. Other cloud computing benefits might lead to novel learning situations where accessibility, cutting-edge online tools, and cooperation mesh produce ground-breaking learning opportunities. Cloud computing, on the other hand, compared to the traditional IT model, introduces additional concerns that must now be taken into accounts, such as security, efficiency, and interoperability. Utilising various cloud applications in an educational setting can help institutions save money. Because many cloud tools, such as Google Docs, Dropbox, and YouTube, are free, institutions do not have to deploy or pay for them to create their education information systems [39].

The cloud also offers free software development kits that can be used for academic reasons, particularly in computer science. Cloud-based applications can offer free or in-expensive substitutes for price and proprietary productivity tools for teachers and students. Providing services, data storage, and computing power to an increasing number of Internet users without spending money on physical computers that need to be upgraded and maintained on-site is a challenge that many institutions can afford to solve with the help of cloud computing [40].

Today's computers are regarded as electronic hubs that manage incoming information via cable and fiber-optic links. They manage Internet-based electronic mail and conduct worldwide searches for text, audio, visual, and video materials that users may require. A glass fiber that is slightly thicker than human hair is used in transmission technology, known as fiber optics, to carry light from a laser source. Fiber optic networks have made it possible for networks that use video teleconferencing to benefit from high-quality transmission [41]. The potential of computer-mediated communication and conferencing-free training from time and location restrictions is one of the biggest advantages. Many students and teachers can better manage their travel, employment, and family obligations because of the ease of access from home, school, or office [42].

The fifth – and sixth – generation (5G and 6G, respectively) communication systems are anticipated to make significant improvements over the fourth-generation communication system currently in use. By 2020, 5G communications are anticipated to be available. Following that, the debut of 6G connectivity is anticipated to occur between 2027 and 2030. It is difficult to realise the objectives of 5G/6G and IoT on the foundation of the touch Internet. The supply of large capacity, enormous connections, low latency, high security, low energy consumption, high quality of experience, and highly reliable connectivity for 5GB communication systems are the most crucial and difficult problems [43].

Systems for activity recognition use data from sensors in wearable, mobile, and ambient gadgets, which are always on hand for users. The modeling and identification of human physical, cognitive, and social activities, patterns, and talents is a major research field within intelligent systems. Because human behaviour is diverse, interconnected,

and dynamic, they frequently rely on supervised machine learning techniques, which have a significant cost of data collection and labelling. Transfer learning is a strategy in which previously acquired knowledge is used to simulate a brand new, yet connected environment. As an illustration, previously acquired information can be used to identify actions taken by various user types, utilising various sensor technologies and in various environmental settings. More difficult behaviour identification tasks are being undertaken as the use of Internet of Things devices spreads, making mobile and wearable sensing wide-spread [44].

Due to significant technological advancements in sensing, processing, and numerous user scenarios that are centered on the needs of humans, human activity recognition (HAR) has received a great deal of attention in recent years. The efficiency and reliability of HAR functions have significantly increased owing to the rapid advancements in hard-ware design and machine learning, which have also made it possible to use the technology close to the body at the far edge [45].

It is argued that this is a crucial time to think extensively about teaching robotics. Computers are becoming increasingly capable of interacting with the physical world, owing to the computing revolution. From the mainframes to PCs, laptops, and widespread computing through networking, we observed a development. Robotics is an ideal educational resource for exposing students to embedded systems, computation for inter-facing with real environments, and building intelligent autonomous devices. Several universities have already started offering robotic-specific special courses. Robotics offers an intriguing viewpoint in computer science teaching because it naturally combines continuous and discrete computation, and gives students a chance to reason about mistakes and uncertainty, a crucial new subject in the study of computation at the undergraduate level [46].

Teachers and researchers have shown a keen interest in robotics as a useful tool for helping children from preschool through high school develop their cognitive and social abilities, as well as to enhance learning in science, mathematics, technology, informatics, and other academic topics, as well as interdisciplinary learning activities. Constructivist and constructionist ideologies are fundamental driving forces behind educational robotics. According to Piaget, handling objects helps toddlers build their knowledge [47]. Whether it is a sand castle on the beach or a technological artefact, Papert argued that knowledge construction occurs most efficiently when a learner is actively engaged in creating a public entity [48]. In this regard, educational robotics can be a useful tool for children to have constructivist learning experience. Educational robotics establishes an environment in which children can engage with their environment and work with real-world challenges. Robotics may have an impact on students' learning in a variety of academic areas (including physics, math, engineering, informatics, and more), as well as on their personal development, including their development of cognitive, metacognitive, and social skills. These include abilities to conduct research, think creatively, make decisions, solve problems, work in teams, and communicate effectively. All these abilities are crucial in the workplace of the twenty-first century [49].

Various aspects of personal appearance were considered during the classroom engagement. The focus is on knowledge and wisdom, although educators are trying to clarify this. Students who can communicate with one another face-to-face are frequently involved in discussions on topics related to their outwards manifestations.

However, the use of digital media in the classroom and for online training is opening up new possibilities for modifying people's digitised visuals, as well as their distinctive vocal and movement patterns. A new range of representational options is made available by the growing use of avatars in schooling (in places such as Second Life). It is possible to interpret encouraging the creation of altered pictures and avatars for educational interaction as an effort to "erase" stigma and, in doing so, effectively disempower people, particularly those with disabilities. Faculty and staff can demonstrate how to employ digital images and avatar technology in a creative and empowering way while still appreciating (and not eliminating) their unique personal traits [50].

With fewer hours spent at the university in the actual lab, virtual labs have the opportunity to save time and money for both the students and the university. For community learners, virtual experiments offer adaptable learning options that can overcome the limitations related to time, pace, and location. They also offer a way to maintain the physical separation required during the pandemic's emergency conditions. Virtual experiments in a general physics laboratory are at least as efficient as face-to-face theoretical training. Students who used virtual components gained stronger comprehension of physics ideas and were better equipped to conduct actual experiments. Students' time was saved, and they had a more flexible and rich learning environment thanks to watching films online [51].

Virtual and augmented reality can help students and trainees improve their educational realism-based practices and increase their motivation to study. Despite extensive study over the past 20 years, integrating augmented reality (AR) into learning and training remains difficult due to expenses associated with developing and maintaining the AR system, as well as a general aversion to new technology. Moreover, due to advancements in computer and information technology, it is thought that AR in education and training will have a more consistent approach that will have wider user acceptance than ever before. This is because AR has the potential to attract and inspire learners by allowing them to explore and control materials from a range of different viewpoints that have not been taken into account in real life. Researchers and educators have worked to include augmented reality (AR) in augmented books and school guides, as well as classroom-based learning in disciplines including chemistry, mathematics, biology, physics, astronomy, and other K–12 education or higher [52].

The literature reports encouraging findings that VR/AR environments enhance learning outcomes and offer multiple benefits for allocating time and money in K–12, higher, and tertiary educational settings. Virtual reality and augmented reality (VR/AR) technologies help people develop digital literacy, creative thinking, communication, teamwork, and problem-solving skills that make up the so-called twenty-first-century talent needed to create knowledge rather than merely consume it. Traditional curricula have been improved by VR/AR to better meet the different learning demands of pupils. To create immersive three-dimensional spatial experiences that address novel forms of human-computer interaction, research, and development, VR/AR technology is concentrated on the entire ecosystem around smartphones, including applications and educational content, games, and social networks [53].

Performance enhancement is one of the significant problems that computer-supported cooperative work (CSCW) and human-computer interface (HCI) scientists hope to address through community-oriented software architecture. The same is true for virtual

classrooms. The COVID-19 pandemic has enhanced the relevance and significance of technology in education, and the proliferation of online virtual learning environments and virtual conference apps has heightened the need to investigate variables that affect social and academic efficacy in these settings. Group efficacy is positively correlated with a sense of social presence, and the adjustment effect of social presence has a large beneficial impact on group cohesion and effectiveness [54].

Widely used devices are now included in their schooling. Different mobile devices can communicate over long, medium, or short distances via various network connections, including cellular, Wi-Fi, Bluetooth, and NFC. Nowadays, due to the rapid advancement of technology, it is difficult to classify mobile devices because the technology of one gadget is sometimes included in a new version of another product. Modern mobile phones and smartphones are widely available and reachable; they have become ubiquitous. The "moving gears" from e-learning to m-learning require three prerequisites: teacher knowledge of opportunities, educator familiarity with new mobile devices and software applications, and institutional commitment and support. Interactive whiteboards are used in classrooms to provide multimedia teaching and allow for electronic ink writing. Teleconference sessions are held using modern technology, including big screens, sophisticated computer methods, and private and secure communication. Telepresence is utilised for remote learning, such as in cooperative master's degree programs run by two different nations but held in one country. The management of integrated systems (IS), which include components that are all interlinked and interconnected, will be the foundation of future classrooms. All learning formats, including classroom and online courses, ubiquitous learning spaces based on ubiquitous technologies, m-learning, blended learning, and learning before, during, and after the class, will be supported by key components of IS. Online and real-time content handling can place [55].

Students appreciate and find the whiteboard engaging since they can readily participate and work together to solve an issue. The effectiveness of IWB has been demonstrated, either directly or indirectly, by several advantages perceived for teaching, such as efficiency, versatility, multimodal presentation, and interactivity. These advantages are intended to be translated into advantages for learning, such as engaging less able students, extending their attention span, improving their focus, visual and dynamic representations, motivation, pace, and flow [56].

The widespread use of the internet has led to the application of big data and artificial intelligence in the context of education. Everyone develops into a distinct learning organism, with equal access to educational resources. Large-scale, low-cost, and individualised education is currently popular. In the era of co-education between humans and computers, one of the main goals of education is to prepare learners to analyse the core literacy and abilities that cannot be held by several machines, such as speculative ability, practical ability, cooperative communication ability, etc., to motivate curiosity and foster a sense of continuous learning rather than just memorising facts [57].

Education 4.0, which is characterised as a dynamic, flexible, interactive, creative, and self-directed learning environment, fosters innovation and anticipates the arrival

of change-driven education. The fundamental components of Education 4.0 include the blending and integration of different digital and mobile technologies, flipped classrooms, massive open online courses (MOOCs), social network-based learning, smart campuses, seamless learning environments, open educational resources (OERs), open and distance learning, accessible, continuous learning, application-oriented learning, adaptive learning, personalised learning, and self-paced learning. The same related and leading technologies attributed to the Fourth Industrial Revolution (4IR) also inform and support education 4.0. Autonomous robotics, AI, cloud computing, quantum computing, big data, smart sensors, augmented reality, the Internet of Things (IoT), or Industrial Internet of Things (IIoT), simulations, additive manufacturing, 3d printers, holography, and drones are a few of these technologies [58].

4 Discussion

In the information society, individuals have switched from using paper to utilising technology, entirely changing the workplace culture in a relatively short amount of time. The drive for paperless workplaces and the use of information technology has an impact on the social development of both businesses and education.

The use of e-learning environments in teaching has increased, but until now, they have mainly consisted of information repositories, applications for finishing textbook tasks or simple exercises, and chat environments. This embraces the future of new technologies, both reshaping the role of the school, the teacher, and the student to meet the increasing demands of the 21st century.

The school of the future will be technologically advanced, functional, and focused on the student. It will also employ technology to disseminate knowledge and information. The classrooms in the schools of the future will be practical, equipped with the necessary supervision tools, and suitable for a range of activities, giving students the freedom to express their creativity, cultivate their imaginations, and approach knowledge through entertainment, their interests, and their learning profiles.

The best facilities are those for children with exceptional needs, because they allow students with special needs to access information while also developing social and emotional skills via interaction with their peers.

Due to the Internet and globalisation, learning environments will be modernised, specialised spaces will be developed, and new approaches to differentiated teaching will enable children to learn on their own terms, creating various training scenarios. These spaces will not have walls, which will encourage collaboration and interaction.

Converting the traditional classroom into a virtual environment, emerging technologies will play a significant role in defining the educational reality focused on students and the learning process. The best elements of e-learning can be coupled with virtual 3D operational environments (Figure 5) [59].

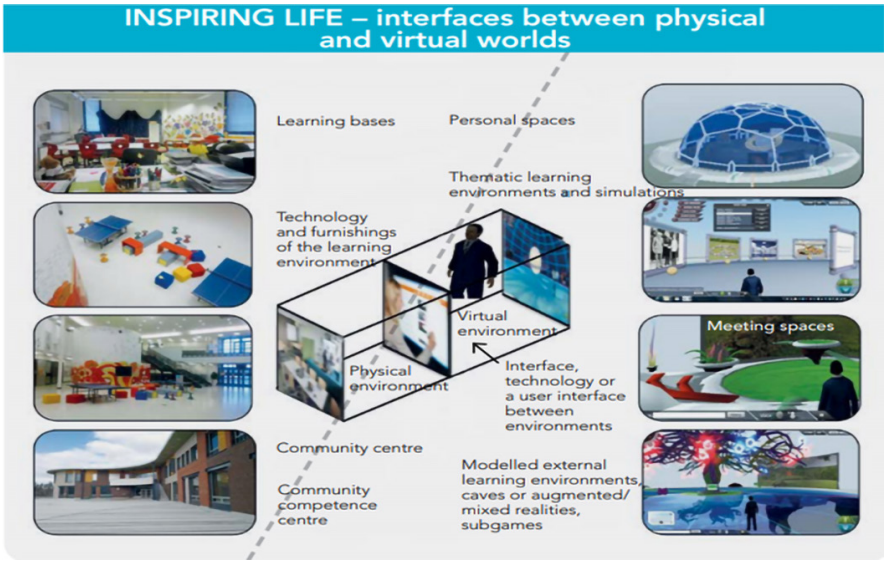

Fig. 5. Combining physical and virtual learning spaces

As education aligns with future demands and needs, curriculum teaching and learning will take place outside the classroom. The e-teacher's role is to empower students through personalised learning. They also serve as data gatherers, analysts, designers, collaborators, curriculum specialists, problem solvers, and researchers.

To accomplish its objectives, the school of the future should have access to the following material and human resources: sufficient vital infrastructure, the required technical equipment, online accessibility, fast Internet, and appropriately informed educational personnel.

Finally, we have to underline the role of digital technologies in the education domain that are very productive and successful, facilitate and improve assessment, intervention, and educational procedures via Mobiles [60–68], various ICTs applications [56], [69–93], AI and STEM [94–103], and games [104–107]. Additionally, the combination of ICTs with theories and models of metacognition, mindfulness, meditation, and emotional intelligence cultivation [25], [26], [27], [28], [31], [108–120] accelerates and improves more over educational practices and results.

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