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DIGITAL TRANSFORMATION AND NEW EDUCATIONAL PARADIGM

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Abstract: Digital transformation has encompassed all segments of life, including education. In this paper, we examine the necessity of changing the educational paradigm due to the rapid development of communication technologies that have shaped the upbring-ing of young generations over the past decade, their impact on cognitive development, perception, and attention, the swift ad-vancement and efficiency of educational platforms, the increasing use of artificial intelligence, and, finally, the experiences from the COVID crisis period which significantly influenced the habits, expectations, and lifestyles of young generations. Based on the constructivist theoretical approach to the educational process, we propose the concept of a "learning landscape" designed on the principle of "active learning," which places the learner at the center of the educational process. The effectiveness of learning outcomes depends on the functional combination of the traditional "face-to-face" approach and the application of automated digital tools such as digital educational platforms, modules, and artificial intelligence tools (a blended or hybrid approach). We also discuss the new role of educators in this process.

Keywords: digital transformation, hypermedia, learnig landscape, educational platforms, AI, teacher.

Introduction

During and after the COVID crisis, significant changes occurred in the habits, lifestyles, and expectations of all of us, especially among younger generations of students. Considering the rapid expansion of communication technologies, educational platforms, and recently artificial intelligence (AI), it has become evident that conditions are ripe for defining a new educational paradigm and constructing innovative educational models. These models will create opportunities for increased motivation for both students and teachers, ensuring that education aligns with the comprehensive digital transformation of society. It is very obvious, the fact that education models are in a continuous transformation, transformation generated by multiple factors, especially in the context of the digital era, respectively the phenomenon of artificial intelligence (AI), which continues to be very dynamic and which it causes us to adapt permanently to the changes brought by this technology, in all fields of activity (Fokut, Manta & Militaru, 2024).

Digital transformation and new learning landscape

As we progressively deepen our understanding of the learning process, the cognitive architecture of the brain, and the implications of modern technologies on learning processes, a crucial question remains: when and how should technology be integrated into educational design? Technology should enhance learning based on established pedagogical theories, rather than serving as an end in itself.

In the dynamic landscape of education, the fusion of digital learning and traditional instructional methods has ushered in a new era of pedagogical transformation. This convergence, known as blended learning, encapsulates the essential endeavor of seamlessly integrating digital literacy, instructional design, and learner support to create enriched educational experiences (Zhaoxi, W. 2023).

Constructivist theory assumes that learning is a process based on prior knowledge, personal experience, and social interactions. Knowledge is a constant process of construction and deconstruction. The central premise around which pedagogical and didactic elements are further developed is the socalled "learning landscape." In a technologically mediated society, it is essential to incorporate new communication channels arising from the advent of information, multimedia digital technologies, digital platforms, and artificial intelligence as integral parts of this new learning landscape.

A learning landscape encompasses the physical, digital, and social components that together

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create the learning environment. The goal is to create an inclusive, flexible, and technologically supported environment that enables active and engaged learning, tailored to the needs of all students. This can include classrooms, online platforms, interactive spaces, as well as social interactions among students and teachers.

This concept emphasizes the need for flexible educational spaces that can be adapted to different learning styles and student needs. Physical spaces can be redesigned to support collaboration, independent learning, or practical activities. Digital technologies play a crucial role in this concept. This includes the use of educational platforms such as MS Teams and Moodle, as well as artificial intelligence tools for personalized learning and support for teachers in assessment and feedback.

The learning landscape promotes active learning through various methods such as group work, discussions, practical exercises, and research projects. This approach helps students develop critical thinking, problem-solving, and creativity. It is important that such a designed learning landscape is accessible and inclusive, allowing all students, regardless of their abilities or environment, to participate in the educational process.

The constructivist perspective encourages a balanced and thoughtful integration of digital tools, fostering an environment where technology enhances educational outcomes by deepening learning, rather than simplifying existing learning processes. Building on the aforementioned points, teaching should be viewed as a complex design task that organizes contexts conducive to learning. Digital tools, when carefully integrated, can enrich the learning process, empowering teachers to meet the increasingly complex demands and expectations of a generation growing up with new communication technologies that simultaneously redefine students' cognitive architecture and perception.

A well-designed learning landscape should:

- Be a space for experience and experimentation,
- Serve individual acquisition and construction of knowledge,
- Ensure consideration of individual learning styles, rhythms, and timings,
- Enable the discovery, evaluation, and processing of information,
- Ensure learning from experience,
- Practice the ability to act in different social contexts,
- Stimulate systematic thinking and learning how to learn,
- Sharpen reasoning abilities, cognitive skills, and the ability to distinguish,
- Support the construction of one's biography,
- Accompany young people in their self-discovery,
- Enable learning relationships (listening, understanding, empathizing...),
- Practice handling one's own freedom and responsibility,
- Guarantee cultural techniques and the acquisition of competencies (personal, communicative, professional, methodological, team competencies).

The new educational paradigm aims to find the most efficient way from the transmission to the transformation of knowledge, in a manner appropriate for modern times, new technologies, and a globally networked society. This requires personal cognitive engagement and active learning, where the student gives a personal touch and identity to the knowledge they acquire. Only such acquired knowledge remains in permanent possession as a new quality.

In this context, the cognitive process includes:

- Locating/recognizing information
- Selection/choosing information
- Integration/synthesis of information
- Creation/new information, new knowledge, deepened knowledge
- Interaction/applying the acquired knowledge through a learning/knowledge community - the real world
- Evaluation/argumentation, critical thinking, reassessment
- Recreation/new synthesis, new quality

Active learning is a key strategy for modernizing the educational process and adapting to the needs of contemporary students, enabling them to become active participants in their education and develop the skills necessary for success in a dynamic world. Active learning is a pedagogical approach that places students at the center of the educational process, encouraging them to actively participate in their learning through various activities that develop their critical thinking, problem-solving, and collaboration skills.

Unlike traditional passive learning, where students primarily listen to lectures and take notes, active learning involves the direct engagement of students in the educational process. The key components of active learning are:

Discussions and Collaboration:

• Students participate in group discussions that help them deeply understand the material and exchange ideas with their peers. Teamwork on projects or tasks allows students to solve problems together and share different perspectives.

Laboratory Exercises and Case Studies:

• Experiments and practical work enable students to apply theoretical knowledge in real situations, while analyzing specific examples from practice helps them apply theoretical concepts to real-world problems.

Research Projects and Self-Evaluation:

• Students research a particular topic, collect data, and present their findings. Reflecting on their own learning and progress allows students to recognize their strengths and weaknesses.

Technological Tools and Gamification:

• The use of advanced information technologies, educational platforms, online simulations and tutorials, modules, and artificial intelligence tools encourages students to actively participate in learning. Introducing games and competitions into the educational process can increase student motivation and engagement.

Communication and Feedback:

• Regular feedback helps students understand their mistakes and improve their skills. Students also provide feedback to each other, which encourages collaborative learning and reflection.

Advantages of Active Learning:

• I**ncreased Engagement:** Active learning leads to greater student motivation and interest in learning.

• **Deeper Understanding:** It fosters a deeper comprehension of the material and the development of critical thinking.

• **Skill Development:** It helps in developing skills such as problem-solving, collaboration, communication, and the practical application of theoretical concepts in real-world settings.

Cyber Space - Hypermedia Environment and New Information Architecture

Since the very beginning of the development of digital technologies, intelligent systems, and the Internet, research has been conducted aimed at offering students a personalized and unique online experience, with the ultimate goal of maximizing learning outcomes. Intelligent Tutoring Systems (ITS) have aimed from the start to emulate human teaching capabilities in an automated and computer-based manner, while the field of research known as Adaptive Hypermedia has focused on providing web users with relevant and personalized content according to their profiles, interests, knowledge, etc. This led to the emergence of the term Adaptive e-learning. It is based on the principle that each student is unique and has different backgrounds, educational needs, learning styles, etc. Numerous studies have confirmed that there are significant differences in learning efficiency, satisfaction, and motivation when students use the Adaptive e-learning module compared to the standard e-learning module (Ristić, I. et al., 2023).

To achieve the benefits of this learning approach, it is necessary to attain a high level of digital literacy among all participants in the educational process. Technology (ICT) tools and technologies, in conjunction with the Internet, are essential in this period of exponential technological prominence and acceptance. Digital literacy refers to this new human quality. To survive and prosper in today's digital world, digital literacy is a necessary component of everyone's personal and professional lives. The responsibility for promoting digital literacy globally rests with higher education institutions. These institutions are essential in helping the younger generation become digitally literate so they can successfully contribute to the advancement and development of individuals, society, and the country (Reddy, et al., 2022). Research has shown that higher levels of digital literacy positively affect the high output of learning outcomes on the academic performance of students (Yustika, G.P., Iswati, S., 2020).

The freedom enabled by hypermedia environments and adaptive e-learning in selecting forms and flows of information, through the creation of a specific information architecture, results in a variety of hypermedia educational tools and methods of presenting educational content, best suited to potential users. Hypermedia expands the virtual space - cyber space, where information moves in countless directions (Bajac, M. et al., 2011). One of these tools is digital educational platforms.

Digital Learning Platforms

Educational digital platforms such as Microsoft Teams and Moodle play a crucial role in the learning process by providing a range of tools and functionalities that support various aspects of education.

Facilitating Communication and Collaboration:

• These platforms enable students and teachers to communicate through chats, voice, and video calls, facilitating the quick exchange of information. They allow the creation of teams for different courses or projects and channels for specific topics or tasks, enabling organized and targeted communication. Real-time collaboration is supported as students can work together on documents, presentations, and other materials using integrated tools like Microsoft Word, Excel, and PowerPoint.

Access to Learning Materials:

• Teachers can easily share resources, lessons, presentations, videos, and other educational materials with students. Students can access all learning materials outside the classroom at any time and from any place, allowing flexible learning and review of materials at their convenience.

Task Management and Evaluation:

• Teachers can create, assign, and track tasks, as well as set deadlines, facilitating the management of students' academic obligations. Integrated grading tools enable teachers to quickly provide feedback on assignments and grades, with students being able to see their results and feedback in one place.

Conducting Online Classes:

• MS Teams supports online classes in virtual classrooms via video conferencing, which is particularly useful when physical presence is not possible due to distance, commitments, and varying lifestyles of students. Additionally, teachers can record lectures, allowing students to review sessions later and revisit the material. Modern educational platforms have mobile applications that enable students to access content, participate in discussions, and submit assignments from their mobile devices.

Integration with Other Tools:

• Digital educational platforms are often easily integrated with other educational tools and platforms, as well as various e-learning applications. This integration allows the platform to be tailored to the specific needs of the curriculum and teachers.

Support for Active Learning:

• Teachers can use interactive tools such as polls, quizzes, and discussion forums to encourage active learning and student engagement. They enable the division of students into smaller groups for discussions and team projects during online classes.

Progress Tracking and Analytics:

• Platforms provide tools for analyzing student activities and progress, generating reports on attendance, student engagement, and participation in tasks, allowing teachers to identify areas where additional support or resources are needed.

Security and Privacy:

• Platforms enable detailed control over access to resources and functions, ensuring that only authorized users can access certain content. They support security standards and practices for data protection, including encryption and backups.

Support for Multiple Languages and Global Use:

• Most platforms support multiple languages, allowing use in various cultural and linguistic environments. They have a large global community of users and developers who continuously contribute to the improvement of the platform.

By leveraging these capabilities, digital learning platforms significantly enhance the educational experience, making it more interactive, flexible, and inclusive.

Artificial Intelligence in Education (AI)

There is an accepted division of the evolution of artificial intelligence into Narrow AI, General AI, and Super AI. Narrow AI refers to AI systems designed to perform specific tasks or a set of tasks. They excel at what they are trained to do but lack general understanding or consciousness. General AI, also known as Artificial General Intelligence (AGI), refers to systems that can understand, learn, and apply their knowledge across various domains, similar to human intelligence. Super AI refers to hypothetical systems that would surpass human intelligence in all aspects—creativity, problem-solving, social skills, etc.

Today's AI systems, despite the (over)emphasis on their significance and capabilities, are not autonomous, rational, or capable of discerning anything without extensive, computationally intensive training with large datasets, predefined rules, and numerous other resources necessary for their design

(Bajac & Bjelajac, 2022). AI plays an increasingly significant role in the modern educational process, thanks to its rapid development and wide range of applications. AI technologies provide various tools and solutions that help teachers, students, and educational institutions enhance the learning process. This includes:

Adaptive Learning:

• AI can analyze the individual needs and learning styles of each student and tailor educational content to better suit their needs. This includes personalized lessons, assignments, and learning recommendations.

Intelligent Tutors:

• AI tutors provide real-time support to students, answering questions, explaining concepts, and helping solve problems. These tutors can adjust the pace and content of learning to match the student's abilities.

Automated Grading:

• AI tools can automatically grade tests, assignments, and essays, reducing the burden on teachers and allowing them to focus on more creative and interactive work with students.

Course Management:

• AI can assist in managing courses, tracking attendance, handling assignments, and analyzing student progress, providing teachers with detailed reports and analytics.

Simulations and Virtual Laboratories:

• AI enables the creation of interactive simulations and virtual laboratories where students can practically apply their knowledge and skills in a controlled environment.

Collaborative Tools:

• AI tools support collaboration among students, allowing them to work together on projects, share resources, and communicate in real time.

Progress Tracking:

• AI analytics can monitor student progress, identify areas of difficulty, and provide personalized recommendations for improvement.

Predictive Analytics:

• AI can predict students' academic success based on their past performance and provide interventions to improve their outcomes.

Accessible Learning:

• AI technologies enable the creation of accessible educational materials for students with special needs, including text transcripts, translations, and assistive technologies.

Multilingual Support:

• AI can provide support to students in different languages, allowing them to access educational resources in their native language.

Professional Development for Teachers:

• AI can offer personalized recommendations for teachers' professional development, identifying areas for skill improvement and suggesting relevant courses and resources.

Content Creation:

• AI tools can assist teachers in creating educational materials, automating lesson preparation, and generating quizzes and tests.

In summary, AI technologies are transforming education by providing personalized learning experiences, automating administrative tasks, and supporting both students and teachers in the learning process. These advancements are paving the way for a more efficient, engaging, and inclusive educational environment.

AI Tools – ChatGPT

The emergence of chatbots like ChatGPT has stirred public interest, particularly among participants in the educational process at all levels, from elementary to university. ChatGPT falls under Narrow AI. Although it is highly advanced in natural language processing and can generate coherent and useful responses to a wide range of questions, its intelligence is specifically limited to text generation tasks based on input data. It lacks general understanding or consciousness. However, despite these limitations, it is a powerful tool that can significantly enhance active learning, enabling students to be active participants in their education while also facilitating the work of teachers and increasing the efficiency of the educational process.

To effectively use AI as a sparring partner, students must have good professional digital competence

(Norhagen et al., 2024) to utilize this opportunity. Therefore, it is increasingly important that students understand what artificial intelligence is and master the development of "chain of thought-prompting," scripts, etc., when writing their bachelor's or master's theses (Krumsvik, J.R., 2024).

Training students to use ChatGPT effectively for learning is crucial to maximize the benefits this tool provides. This training should cover several aspects, with an emphasis on how to ask questions and how to interpret responses. Asking clear and precise questions is essential for obtaining relevant answers, while interpreting and evaluating those answers is equally important for critical thinking and information reliability. Comprehensive training that integrates these elements can significantly improve the effectiveness of using ChatGPT in the educational process.

How to Ask Questions?

Students need to learn how to ask clear and precise questions while avoiding ambiguous expressions to receive relevant and useful answers. Providing sufficient context in the questions can help ChatGPT give more accurate responses. Students should be trained to add key information when asking questions and develop skills for asking follow-up questions to clarify unclear answers or deepen their understanding of the topic.

How to Interpret Responses?

Students need to learn how to critically evaluate the answers they receive, recognizing potential errors or biases. Training can include analyzing examples where ChatGPT provides correct answers and where it might make mistakes, helping students identify reliable information. Encouraging students to use ChatGPT as a starting point for further research and verification from other sources, such as scientific articles, books, and other reliable resources, is essential.

Addressing the Limitations of ChatGPT

When designing a learning landscape, it is crucial to consider the limitations of ChatGPT and compensate for them with appropriate methods, tools, and behaviors. When discussing the lack of human interaction, we primarily refer to the potential for reduced socialization among students and teachers (Stošić & Janković, 2023). Additionally, we can identify other limitations of ChatGPT in the educational process, such as incomplete accuracy of responses, lack of creativity, absence of human reaction, limited understanding capability, potential for misuse, dependency on technology, and inability/weakness in plagiarism detection (Stošić & Janković, 2023).

The so-called virtual communication through social networks like Facebook, Instagram, and educational platforms as a form of educational social network without direct social contacts can eventually lead to a lack of empathy. Since the emergence of new social media and virtual communication not based on face-to-face relationships, conclusions about the negative impact of this type of communication on the socialization and empathy of generations growing up with these media have started to appear. Such conclusions are based on the basic lack of communication on social networks, namely the absence of non-verbal communication and the inability to develop the affective component of empathy (Filipović, Bajac & Spaić, 2022).

Ethical and Responsible Integration of AI in Education

Although the integration of Artificial Intelligence (AI) brings significant benefits to education, it requires a responsible and ethical approach. Safeguarding students' personal data and ensuring the elimination of discrimination are crucial aspects in the development and implementation of AI systems. While the integration of AI brings substantial benefits to education, it demands a responsible and ethical approach. Safeguarding students' personal data and ensuring the elimination of discrimination are crucial aspects in the development and implementation of AI systems (Fokut, Manta & Militaru, 2024).

The New Role of Teachers

What is the role of educators/teachers in this context? In the new circumstances, a successful educator/teacher is a thought leader, a professional consultant, and a partner in a joint task. Today, young people are exposed to an enormous amount of information from various sources. What purpose does a teacher serve under these conditions? The essence of the change in their role is that they need to provide less ready-made knowledge and more assistance in accepting and selecting information that comes to young people from various sources. Young people spend time on computers, the internet, chatting with artificial intelligence, and gathering information. This is the psychological backdrop of the information civilization to which young people now belong. Being competent now means not only possessing knowledge but also knowing how to access information and how to select relevant information.

Human resources in science and technology are a key element of success because the development of this field, despite numerous technological advances, especially in artificial intelligence,

cannot be achieved without the participation of people as carriers of "natural human intelligence" and as creators of change (Milutinović O., et al., 2024). Therefore, it is particularly important to emphasize that information technology does not exclude or diminish the role of teachers in the educational process but rather gives them a more sophisticated role. This role reduces the time spent on delivering content that students can read on their own, leaving more time for developing creative potentials, critical thinking, and understanding the principles of problem-solving. This represents a shift from a "culture of answers" to a "culture of questions." Here, the teacher observes, listens, and shifts their focus from testing to inquiry, listening, and better understanding. Their efforts are directed towards actively monitoring their students to observe individual differences in thinking, feeling, learning, to recognize communication deficits, and to provide appropriate assistance.

For learning technology to be effective and appropriate, teachers must adequately integrate digital tools to enhance learning outcomes, not merely replace conventional teaching with technology-mediated instruction while simultaneously reducing social interactions. Teachers play a critical role as designers of education in effectively integrating digital tools so that educational technology can be used to enhance learning rather than hinder it. To achieve this, teachers must continually improve themselves, both pedagogically and technologically.

The problem of education, development, and self-realization in the era of digitalization has become relevant with the development of modern digital technologies. Digital competence is, on the one hand, lifelong learning, where end users must constantly learn to implement innovative methods, using new digital tools to improve their work and, above all, the educational process. Today, for teachers to become digitally competent, they must apply a lifelong learning strategy because modern information technologies are developing every day, and the knowledge gained becomes partially outdated after some time. This means that once acquired digital competencies do not guarantee their relevance in a few years (Stošić & Mikhailova, 2023).

Conclusions

There is broad consensus on the necessity of changing the educational paradigm in line with new social, technological, and economic circumstances worldwide. Discussions about the potential of new educational technologies and the need for new pedagogical concepts have been ongoing for some time. However, these discussions have intensified during and after the COVID crisis, resulting in numerous theoretical works on this topic. On the other hand, under the same imperative, educational institutions have embarked on changes independently, instinctively, and haphazardly, relying on learning from experience and mistakes. In this case, theory often followed practice.

Technological development will continue as always, but it is essential in the future to scientifically research and develop relevant, fact-based concepts on the impact of new technologies on cognitive processes and the perception of new generations growing up with them. This includes their effectiveness on learning processes and the long-term acquisition of knowledge, the development of sociability, ethics, and empathy. Ultimately, providing educational institutions and teachers with a reliable theoretical and scientific basis for implementing the new educational paradigm in practice is crucial.

Conflict of interests

The authors declare no conflict of interest.

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