UDC 373.016:81'243]:681.5
DOI: 10.52534/msu-pp1.2023.31

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Major benefits of using smart technologies in education

Article's History:
Received: 24.11.22
Revised: 26.02.23
Accepted: 31.03.23

Suggested Citation:
Nesterenko, I. (2023). Major benefits of using smart technologies in education. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 9(1), 31-38. doi: 10.52534/msu-pp1.2023.31.

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Abstract. This research considers the features of applying smart-learning technologies in education that provide future-qualified specialists with the necessary skills for the implementation of successful professional activities in the conditions of a digital society. The relevance of the study is conditioned upon the need to find the main advantages of smart education in educational institutions. The purpose of the research is to determine the benefits of using smart technologies in education and the abilities that students should master to meet the needs of modern society. The author attempts to use a set of interconnected theoretical research methods to achieve the purpose and present the examined subject comprehensively, including the method of critical analysis of scientific literature, which contributed to the description of the purposes and specifics, the possibility and benefits of using smart-learning technologies and drawing conclusions, and the method of examining and summarising the experiences of other countries, which allowed concluding. It was identified that for various entities and educational situations, the meaning of "smart" has different definitions. It has been established that fundamental content changes are occurring, which makes the modern educational system smart in the majority of countries around the world. It was determined that using smart-learning technologies opens up many new opportunities in education, which improve the concentration of students' attention, accelerate the assimilation of educational material, and, as a result, increase the success rate of each student. Based on research, four levels of abilities in smart education that students should master to meet the needs of modern society have been proposed. The main advantages of using smart learning in the educational process are described. The most common are the continuity of the educational process and the integrity of educational information; mobility; the student's autonomy. The research can be useful for specialists in educational institutions and teachers to improve the professional training of specialists

Keywords: smart education; smart-learning technologies; distance learning; specialists; the main advantages of smart learning; levels of abilities

INTRODUCTION

Modern education, at all levels, is unconstrained by time and location, and learning may occur in both real-world and virtual settings, through a variety of technology and pedagogical tools (Chen *et al.*, 2020). Education must be flexible, as it is constantly transforming due to the introduction of new components, methods, and learning technologies. Based on students' strengths and deficiencies, the present learning environments need to be modified. To perform the demand and fix the flaws in the present education systems and techniques, the smart education vision should be utilised. Smart education implementations require smart education frameworks (Choi & Lee, 2012).

There have been countless new computer technologies developed over the past several decades that have simplified daily living. The result of this expansion in technology is an improvement in human existence. Technology has

improved the quality of our daily lives on an entire new level. Material and technical values, which have not bypassed the educational process, are becoming increasingly popular. Undoubtedly, the advent of the World Wide Web has changed the concept of education. Thus, in the modern educational system of most countries in the world, fundamental content changes are occurring, which makes the system different – a SMART system, the abbreviation of which is interpreted as S – self-directed, M – motivated, A – adapted, R – resourced, and T – technological.

The approach to education with technology in the classroom is inevitably evolving as the Smart society develops. New universities, or "Smart universities", where the Internet and technological advancements can offer a new standard of educational and scientific processes and the outcomes of training, scientific, innovative, educational, and other activities, are responsible for the tasks of preparing new format specialists for successful and competent employees in the smart society (Morze *et al.*, 2021). The smart-education paradigm provides the ability to adapt to students' levels and needs and involves an active exchange of experience and ideas. In addition, smart education is easily managed both from the inside of each educational institution due to the flexibility of the educational process and from the outside. The integration of information and communication technology into the educational process, and using multimedia tools, is going online. The cognitive process is stimulated by electronic learning (e-learning) and multimedia technologies, which offer the chance to visualise educational content.

In recent years, the active attention of many educators to the process of establishing "smart education" has been observed. Educational projects implemented around the world focus on intellectual education. For example, the concept of "Smart nation" was first encountered in Singapore in 2006. An important part of a "Smart nation" is technological education (Hua, 2012). According to the reforms that are beginning to be implemented, the so-called "schools of the future" (eight pieces) were established, focusing on a variety of learning environments. In South Korea, educators developed the Smart educational project, which was based on the tasks of updating the educational system and modernising the educational infrastructure (Choi & Lee, 2012). In New York, an educational project called "Smart School" gives technology integration a special role in the classroom. Students can improve their academic performance and be effectively prepared for participation in the modern-day economy. In 2011, to promote learning in the 21st century through user-oriented learning solutions, Finland established a smart education initiative. Through user-driven and inspirational learning solutions, the initiative seeks to advance learning for the 21st century (Kankaanranta & Mäkelä, 2014). The smart learning program called "Mohammed Bin Rashid Smart Learning Programme" (United Arab Emirates, UAE) started in 2012. The programme envisages the launch of "smart classes", in which educators must establish a new learning environment and a new culture.

Smart technologies were gradually introduced into the educational process in Ukraine. According to the Order of the Ministry of Education and Science, Youth, and Sports of Ukraine "On the Implementation of the Pilot Project "LearnIn – SMART Learning" (2012) initiative made a great advancement toward bettering Ukraine's educational system and using modern technology. It designed to establish a possible new educational path and improve teaching and learning standards.

In the scientific literature, the concept of intelligent learning environments is becoming more popular. To be considered intelligent and provide effective solutions, a learning environment must enable the identification of learners' characteristics, provide necessary resources and tools, automate learning processes, and evaluate their outcomes (Mogas *et al.*, 2022). While widely researched over the past ten years, the issue of employing new information technologies in the educational process is still very much in force. The characteristics of the application of new information technologies in the educational process have been considered in several research by Ukrainian and foreign specialists (Cebrián *et al.*, 2020; Chen *et al.*, 2020; Cho *et al.*, 2020)

T. Herasymchuk (2015) explores the key concerns surrounding using smart technology, which boosts student motivation and cognitive activity, aids in intensifying and individualising learning, and removes the psychological barrier associated with using a foreign language for communication. Smart learning most effectively leads to creative activity and proper assimilation of the essential content, enabling self-development and identifying the creative potential of the student's personality, according to scholars like A. Uminska (2017) and I. Kovalchuk (2018).

Another scientist, O. Osova (2018), concluded that the strategy of reforming contemporary foreign language education involves updating the subject, instructional formats, and instructional methods through using new technologies. The work by K.C. Li and B.T.-M. Wong (2021) deserves attention among researchers of smart learning. The authors discuss the development of pedagogical methods that successfully use intelligent learning technologies in different learning environments and conduct a detailed examination of how intelligent learning may be adapted to the features of different application areas. An overview of research on intelligent technologies, with a focus on new technologies connected to artificial intelligence, was offered by authors E. Dimitriadou and A. Lanitis (2022) in their study.

The study's purpose is to demonstrate the advantages of using learning tools in the classroom.

MATERIALS AND METHODS

Considering the complexity of the subject, the author comprehensively explores the problem and substantiates and applies a complex of interrelated theoretical research methods: analysis and synthesis, comparison, study and generalisation, systematisation, and scientific sources. The search for sources was performed in databases such as Google Academy, ERIC (ProQuest), Education Database (ProQuest),

APA PsycInfo (EBSCO), ScienceDirect (Elsevier), various English-language electronic resources, etc.

By applying the method of analysis, several studies have been processed to determine the benefits of using smart technologies in education and the abilities that students should master to meet the needs of modern society. Using the synthesis, the specific features of applying smart-learning technologies in education were explored. The comparison served to contrast the researchers' scientific interpretations of the term "smart learning" and to identify key features of the phenomena examined. Systematisation allowed identifying the number of causal connections and the pinpointing of the essential elements of smart teaching in educational institutions.

The research of a particular subject was conducted in stages based on an acknowledged scientific and methodological framework. A theoretical analysis of scientific literature on the examined subject to determine the subject's relevance and identify the main aspects, and determine the characteristics of using smart-learning technologies in education has been included. The processing and analysis of several studies on the characteristics of employing smart technology in education and the skills that students should possess to satisfy the demands of contemporary society. The flexibility of academics' and practitioners' perspectives on how the idea of smart education and the application of smart complexes are compatible with the major global developments in education is often the centre of attention. The study's findings were summarised and relevant observations were made.

RESULTS AND DISCUSSION

Definition of the term "smart learning"

Despite the fact that today the term "smart learning" is quite common, there is still no clear and unified definition of this interpretation in the educational systems of many countries in the world. Nevertheless, some attempts to delineate the key components have been made. Smart learning, according to foreign scholars (García-Tudela *et al.*, 2022), is ubiquitous, context-aware learning. In addition, other scientists hold the same opinion. For example, Kim *et al.* (2013) confirm that smart learning is an educational paradigm focused on the student and services rather than simply focusing on using devices. In his research, A. Middleton (2015) outlines some aspects of intelligent learning, giving preference to the focus on the student and the results he receives due to the usage of sophisticated technology. The researcher emphasises that personal and intelligent technologies help participants be involved in learning and increase their independence due to a richer personal context in the educational process. In addition, others make an effort to describe the characteristics of smart learning. Presented by the Ministry of Education, Science, and Technology of the Republic of Korea (Lim & Kye, 2019), the features of smart learning include independent, driven, flexible, and resource-enriched, and technological learning. Scientists J. Lee *et al.* (2014) consider "smart learning" to include both official and informal education, social and collaborative learning, and situational and individualised learning. In addition, they emphasised a content focus and application orientation.

In the educational system "smart" means clever, customised, and flexible. Nonetheless, the definition of "smart" has different meanings for different subjects and educational situations. For students, being smart means being able to make the best decisions and judgements possible by utilising your knowledge and expertise. Using educational technologies helps achieve the set purpose effectively and efficiently (Gardner, 2011). The term "smart" for educational technology refers to its ability to successfully do its intended task (Spector, 2014). This type of learning is engaging, intelligent, and scalable in an educational setting. The educational environment that is headed toward smart learning provides tailored and personalised learning services that engage the student in efficient, fruitful, and performing learning.

With the development of such technologies as YouTube, cloud computing, distance learning, Facebook, Twitter, blogs, Google, etc., education is becoming more accessible. Due to the Internet, students can study anywhere in the world and at any time. A person has the opportunity to choose a field of knowledge, including a non-professional one, and immerse himself in it as much as he is interested in it. An important factor is the free availability of many resources.

Other intelligent technologies, such as cloud computing, educational analytics, the Internet of Things (IoT), wearable (portable) gadgets, etc., are connected to smart education. Learning knowledge may be studied and used to improve teaching and learning through using cloud computing and educational analytics (Ţălu, 2020). These adaptable learning technologies allow the learning platform to respond to data specific to each student and modify the learning resource as necessary using cloud computing and learning analytics (Johnson *et al.*, 2015).

Considering the above-mentioned, the author of this research concluded that the purpose of smart education is to provide future-qualified workers with the necessary skills to implement successful professional activities in what a digital society is like. With this type of education, students have the chance to explore utilising smart complexes that contain test materials, readings for the course, activities for independent study, questions for the final examination, etc. in addition to lecture and laboratory-practical materials.

In addition, it should be mentioned that the reform of modern smart education puts forward new requirements for teaching staff. The assignments are accomplished by a teacher who anticipates the results of his actions and models the educational process accordingly. The outcomes of society's socioeconomic and spiritual development are intimately correlated with the professionalism of teachers. The quality of the teaching staff is the most important component of the educational system because all other components must be implemented in concert with the human resources of the educational system. The task of establishing educational programmes for the next generation based on cutting-edge learning technologies has been given to teachers, and they

have been given the specific purpose of teaching and equipping the next generation with someone with contemporary thinking who can successfully realise themselves in life.

Main educational trends

The idea of smart education and the usage of smart complexes are in line with the major global trends in education, where technology has changed how education is given and received in many different ways. The leading educational technology is increasingly distance learning. Video courses on YouTube and iTunes are becoming extremely popular and in high demand. The number of electronic educational materials is growing rapidly. The customisation of education is an alternative to unified educational approaches, which demand the same outcomes from all educational subjects. Individualised educational plans should, therefore, be based on each student's particular psychological characteristics. Gamification, a rewarding technology that uses game elements in non-game contexts, can help raise motivation for learning and boost its quality. By interactive immersion in the virtual environment, learning through video games offers a singular chance to impart information about the actual world. Interactive electronic textbooks should significantly alter how educational content is now presented and interpreted. The multidimensionality of the contemporary educational process, which is supported by multimedia technology, cannot be provided by the linear design of courses and their textual presentation.

The efforts of numerous organisations involved in defining the necessary competencies for the 21st century serve as evidence of the importance of the subject of "smart learning". The Organisation for Economic Cooperation and Development (OECD) has established ten fundamental requirements and divided them into four categories: modes of thought, modes of activity, modes of operation, and modes of living in the world (Ananiadou & Claro, 2009). The work being done by the national Partnership for 21st Century Skills group (Johnson *et al.*, 2015), which was established in 2002 by educators, businesspeople, and politicians to define the skills required for the future generation, is not any less significant. Critical thinking, communication, problem-solving, learning, innovation, life and career skills, media and information literacy are a few examples of key talents. In addition, the main subjects through which students can acquire these skills were determined: English, reading, writing, world languages, art, mathematics, and economics. The North Central Regional Educational Laboratory (NREL) has published a list of 21st-century skills that includes digital literacy, creative thinking, effective communication, and high productivity (Burkhardt *et al.*, 2003).

As follows, the identified trends serve as the foundation for changes in smart education development strategies. With numerous benefits to offer, using smart technologies in education has become a crucial component of the educational system. Information and communication technology enhances student-centered engagement and digital learning in many ways. Education trends shaped schools and universities to implement cutting-edge educational technology help enhance the process of teaching and learning.

Levels of smart education abilities

Four levels of abilities in smart education – basic knowledge and basic skills, comprehensive abilities, personalised expertise, and collective intelligence – that students must acquire to meet the needs of modern society are proposed based on the activities of the organisations listed above and several studies.

Reading, writing, and other fundamental skills are examples of *basic knowledge and abilities*, whose mastery is important for the student's success and for mastering the next levels of abilities (Partnership for 21st Century Learning, 2015). According to H. Jenkins (2009), it is basic knowledge that is the main ability of the 21st century.

Comprehensive abilities are needed for critical thinking and the ability to solve the problems of the modern world. Having acquired comprehensive abilities, the student is able to reason correctly, think comprehensively, analyse, and make the right decisions in various difficult situations (Alajmi *et al.*, 2017).

Abilities like *personalised expertise* are quite important for future specialists as they involve the mastery of information and technological literacy, creativity, and innovative skills. The development of students' information and technological literacy involves mastering ICT skills, which include using various ICT applications and a combination of cognitive abilities or thinking skills (Alajmi *et al.*, 2017). Creative and innovative skills require thinking and working creatively with others, implementing creative ideas.

No less important is *collective intelligence*. These are important ways of working, the positive result of which is achieved through participants' communication and collaboration in the educational process. The work algorithm is that after receiving information, students need to think about ways of sharing and transmitting the results to other people (Ananiadou & Claro, 2009). Therefore, the student is required to be active in communicating with others. In addition, collaboration requires students to work effectively in a team setting.

Smart-guiding education's concepts include the following:

- utilisation of up-to-date material from the curriculum to address academic issues. The world's information flow is accelerating in both volume and speed, as is professional activity. Before working in a real environment, educational materials need to be supplemented with information from the present;
- independent project, research, and cognitive activity of an organisation;
- the application of the educational process in a dispersed learning environment and the preparation of specialists to find innovative solutions to real-world problems depend on this notion.

Some of the primary advantages of smart education include providing students with a high-quality learning experience through using technology (Smart classrooms…,

2022). Scientists stress the significance of developing a smart education system that makes use of smart technologies, which have a variety of benefits, including fostering the growth of professional knowledge and creative abilities, developing critical thinking, ensuring equal learning opportunities, and facilitating access to educational resources, the potential for their application in the instruction of a variety of disciplines, the high effectiveness of knowledge acquisition, the increase in learning interest among students, the sophistication of technologies and students' comprehension and perception of them, etc. (Alajmi *et al.*, 2017). The main benefits of smart education are presented in Table 1.

Table 1. The benefits of smart education

The principal benefits of smart education		
guaranteeing that software established for different operating systems works seamlessly together, allowing for the execution of the continuity of the educational process and the integrity of educational content	mobility, ubiquity, continuity, and ease of access to educational resources without regard to location or time	providing equal learning opportunities regardless of the devices used

Sourse: developed by the author of this study

The confirmation of the relevance, and the importance of the issue that author of this research considers in her research is the results of scientific forums and conferences. It testifies to the trend of the electronic society transition to the knowledge society or "smart society". For example, several nations and international organisations have launched digital development strategies to support a thorough digital transformation in education. During the inaugural International Conference on Artificial Intelligence and Education, UNESCO published the Beijing Consensus to help with the execution of the Education 2030 Agenda. Seventeen of the member nations of the Organisation for Economic Co-operation and Development (OECD) produced digital education-related strategies between 2015 and 2019 according to the study on digital strategies in education across OECD countries. In addition, two major subjects are highlighted in the European Union's Digital Education Action Plan (2021-2027), namely "Fostering the Development of a High-Performant Digital Education Ecosystem" and "Enhancing Digital Skills and Competencies for the Digital Transformation" (European Commission, 2020).

The Chinese government has recently put forth several strategies and policies designed to encourage the systematic fusion of intelligent technology and education even more. The New Generation Artificial Intelligence Development Plan, Education Informatisation 2.0 Action Plan, and China's Education Modernisation 2035 Plan are a few of these. In addition, the Ministry of Education of the People's Republic of China emphasised the significance of putting the strategic action of digitalising education into practice and speeding up the process of digital transformation and intelligent upgrading of education (Global Smart Education Conference, 2021). Two Global Smart Education (GSE) Conferences and four US-China Smart Education Conferences (UCSEC) in a row since 2016 have been hosted. These conferences have been organised in collaboration with universities and international organisations throughout the world. The gathering was attended by thousands of specialists and academics in the fields of education and technology from more than 50 nations and international organisations, including UNESCO and the OECD.

Questions and discussions, that are of great value for this research, caught the author's attention at these conferences. The main idea focused on cutting-edge subjects and trending subjects such as K-12 education, higher education, vocational education, transforming education via intelligent technology, artificial intelligence, future education, smart learning, and educational futures. The Horizon Project Regional Report, the White Paper on the Building of Smart Education Pilot Zones, the Joint Project of Rethinking and Redesigning the National Smart Education Plan, and other projects and research findings were presented at the conferences.

In summing up it was stated that based on digitisation and digitalisation, digital transformation in the field of education is dedicated to:

1) strengthening the digital foundation;

2) establishing smart learning environments;

3) fostering the co-establishing and co-sharing of high-quality digital educational resources;

4) exploring customised models for developing students and training teachers;

5) enhancing digital literacy and skills of teachers and students;

6) enhancing digital awareness, thinness, and vigilance.

Notably, the final theses about the benefits of using smart learning announced at the conferences completely coincide with opinions presented in this study. As follows, smart education makes use of contemporary science and technology to provide students, instructors, parents, and other participants in the learning and teaching processes with a variety of supports and on-demand services. It helps to improve the quality and equality of education. According to this standpoint, smart education will have a great chance to be a breakthrough that unifies intelligent technology with future education. It is the dominant paradigm that designed to use intelligent technology to enhance human activities in all sectors and provide a new standard of

living. One might refer to the development of a smart society as a worldwide trend.

As the educational process has been transferred to the electronic world, utilising smart technology is intended to maximise learning effectiveness. By using this strategy, it will be feasible to duplicate the teacher's knowledge and provide everyone access to it. Students who receive a smart education can develop fresh knowledge and the traits of a clever person, who is well equipped with information and computer technologies for seeking, analysing, and coming up with innovations. It is especially demonstrated by how this approach has been implemented and developed in the many countries throughout the world that were already considered above.

While putting in place a smart school system might be exciting, there are obstacles to overcome. To meet the evolving demands of both staff and students, smart schools must adapt. In addition, they need to be able to put various solutions into practice to make sure the classroom runs smoothly. Smart schools are a real thing that plays a significant role in teaching our future leaders..

CONCLUSIONS

During the research of this issue, the target was attained; in particular, the idea of "smart" was examined, the key benefits of utilising smart technology in education were identified, and the skills that students should have to satisfy the demands of contemporary society were determined.

Smart education, as a fresh phase of development of modern education, plays an important role in the process of learning. The emphasis on smart education and its advancements has emerged as a fresh fashion in the world of education. There is a need to move toward smart education as at the current stage of educational growth, there are growing needs that cannot be addressed by either conventional educational technology or e-learning technologies.

It has been proven that smart technologies are signposts for the emergence of a new educational paradigm, which will enable the implementation of the trend of include activities for the development of a free creative personality in the educational process. Students' cognitive and creative activity is successfully stimulated by the employment of contemporary smart technology in the learning process. It is smart technologies that allow the development of revolutionary educational and methodical materials, and the development of individual teaching methods for students.

Considering this, the main useful purposes of using smart education have been identified. The most obvious are: continuity of the educational process and ease of access to educational information; independence from time and place; mobility; and autonomy of the pedagogical worker and student. As a result of achieving these objectives, students now have four levels of abilities to master to meet the requirements of contemporary society. These talents are divided into four categories: knowledge, skills, attitudes, and values. Exploring the efficiency of educational technology in the process of learning a foreign language is a potential area for future research.

The research's scientific originality lies in the identification of the key benefits of utilising "smart learning" in the educational process and the regularities that ensure future qualified specialists with the abilities to conduct successful professional activities in the context of a digital society. The author's personal contribution consists in setting the problem, determining the purpose and methods of research, and finding and analysing literary sources on the subject of the research.

ACKNOWLEDGEMENTS

None.

CONFLICT OF INTEREST

None.

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Основні переваги використання smart-технологій в освіті

Анотація. Актуальність дослідження зумовлено необхідністю наукового пошуку щодо з'ясування основних переваг smart-освіти в навчальних закладах, що передбачає забезпечення майбутніх кваліфікованих спеціалістів необхідними навичками для реалізації успішної професійної діяльності в умовах цифрового суспільства. Мета роботи – визначити переваги використання смарт-технологій в освіті, а також здібності, якими повинні володіти студенти, щоб задовольнити потреби сучасного суспільства. Задля досягнення мети й усебічного представлення досліджуваної тематики застосовано комплекс взаємопов'язаних наукових теоретичних методів дослідження, серед яких: метод критичного аналізу наукової літератури, який дав змогу описати цілі та специфіку, можливість та користь застосування технологій smart-навчання, сформулювати висновки; метод вивчення та узагальнення досвіду інших держав, який допоміг з'ясувати етапи реалізації освітніх проєктів, спрямованих на «розумну освіту» в багатьох країнах світу в останні роки, а також метод порівняння та систематизації, який дав змогу визначити деякі ключові компоненти «smart-навчання». З'ясовано, що для різних суб'єктів та освітніх ситуацій поняття «розумний» має різні визначення. Констатовано, що в сучасній освітній системі більшості країн світу відбуваються докорінні змістові зміни, що роблять систему інакшою – smart-освітою. Визначено, що використання технологій smart-навчання відкриває багато нових можливостей у навчанні, які покращують концентрацію уваги учнів, прискорюють засвоєння навчального матеріалу і, як наслідок, підвищують успішність кожного учня. На основі досліджень запропоновано чотири рівні здібностей, якими мають оволодіти студенти, щоб задовольнити потреби сучасного суспільства. Охарактеризовано основні переваги «розумного навчання» в освітньому процесі, найпоширеніші серед яких: безперервність навчального процесу й цілісність навчальної інформації, мобільність (незалежність від часу та місця навчання), автономність педагогічного працівника студента. Стаття має практичне значення для фахівців освітніх установ, педагогів, оскільки вміщений у ній матеріал сприятиме покращенню професійної підготовки спеціалістів, а також для учених та студенті під час пошуку способів удосконалення нових складників, методик та технологій навчання

Ключові слова: smart-освіта; smart-технології; дистанційне навчання; спеціаліст; основні переваги smart-навчання; рівні здібностей