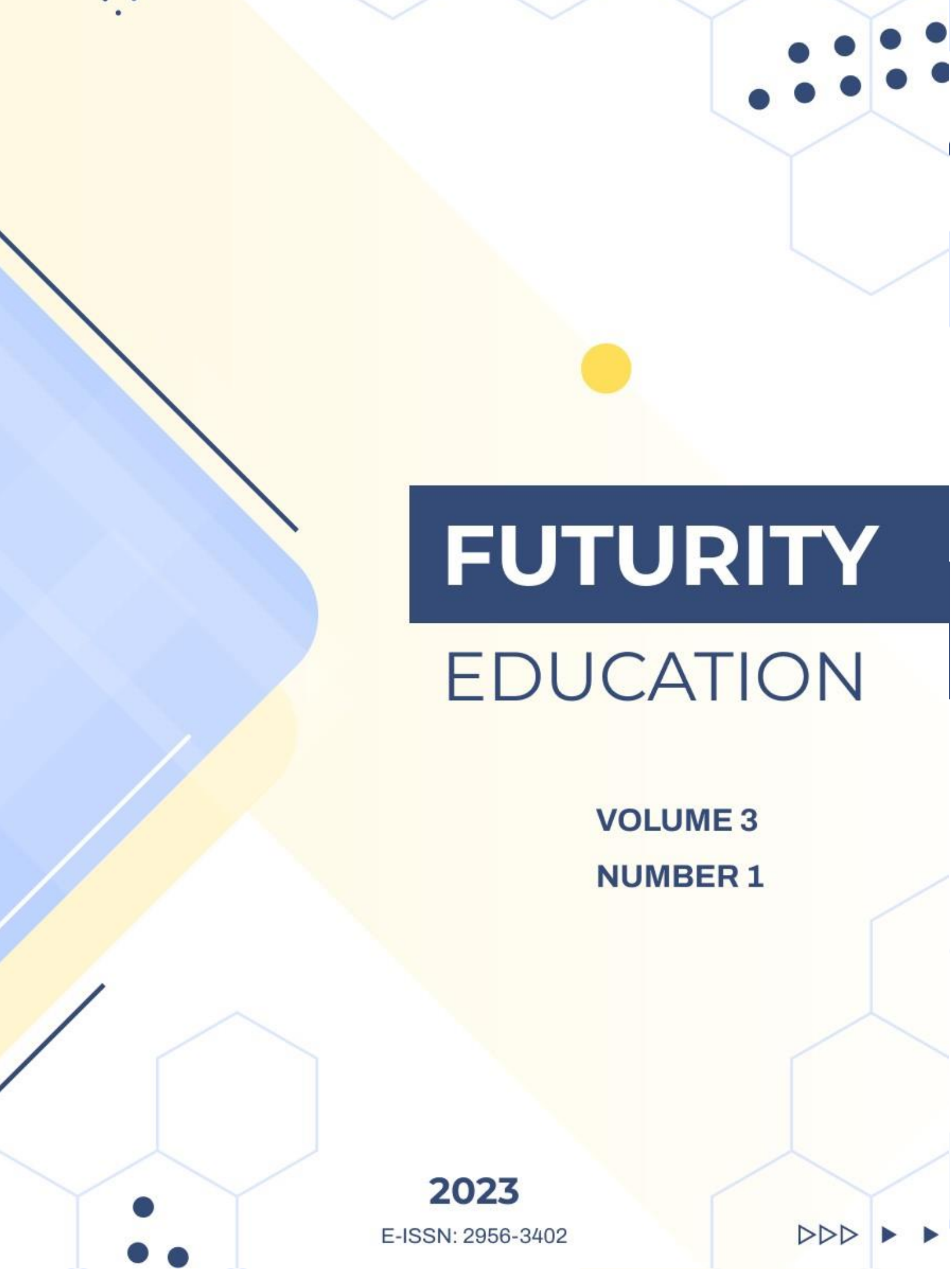




FUTURITY

EDUCATION

VOLUME 3
NUMBER 1

2023

E-ISSN: 2956-3402



Futurity Education

EDITOR IN CHIEF

Yaroslav Tsekhmister

National Academy of Pedagogical Sciences of Ukraine

EDITORIAL BOARD

Maureen Andrade

Utah Valley University, USA

Marion G. Ben-Jacob

Mercy College, USA

Diana Dias

Lusofona University, Lisbon, Portugal

Neil Gordon

University of Hull, UK

Maiga Chang

Athabasca University, Canada

Oriol Borrás-Gene

Universidad Rey Juan Carlos, Spain

Kim Ouwehand

Erasmus University Rotterdam, Netherlands

Hee Jun Choi

Hongik University, South Korea

Maggie Gregson

University of Sunderland, UK

Clara Sabbagh

University of Haifa, Israel

Heather Kanuka

University of Alberta, Canada

Yu-Mei Wang

*The University of Alabama at Birmingham,
USA*

Jose Luis Lopez Bastias

Universidad Rey Juan Carlos, Spain

Olha Prokopenko

*Estonian Entrepreneurship University of
Applied Sciences, Estonia*

Richard C. Larson

Massachusetts Institute of Technology, USA

Mustafa Toprak

American University in Cairo, Egypt

Muchacki Mateusz

Pedagogical University of Krakow, Poland

Olena Stepanenko

*Dnipro Academy of Continuing Education of
Dnipropetrovsk Regional Council, Dnipro,
Ukraine*

Snezhanka Ovcharova

Varna Free University, Bulgaria

Almagul Nurgaliyeva

*L.N. Gumilyov Eurasian National University,
Nur-Sultan, Kazakhstan*

Tatiana Voropayeva

*Taras Shevchenko National University of Kyiv,
Ukraine*

Liudmyla Shuba

*Zaporizhzhia Polytechnic National University,
Ukraine*

Oksana Holiuk

*Vinnytsia Mykhailo Kotsiubynskyi State
Pedagogical University, Vinnytsia, Ukraine*

Echbaia Badri

*Batumi Shota Rustaveli State University,
Batumi, Georgia*

Ana Belen Barragan Martin

University of Almería, Spain

Nataliia Ridei

*National Pedagogical Dragomanov University,
Ukraine*

Tatjana Tambovceva

Riga Technical University, Riga, Latvia

Walat Wojciech

University of Rzeszów, Rzeszow, Poland

Volodymyr Saienko

*Academy of Management and Administration,
Opole, Poland*

Lib Waldemar

University of Rzeszów, Rzeszow, Poland

Mykhailo Sherman

Kherson State University, Ukraine

Miroslav Chráska

Palacký University, Czech Republic

Nataliia Tytova

*National Pedagogical Dragomanov University,
Ukraine*

Tamara Gumennykova

*Interregional Academy of Personnel
Management, Ukraine*

Goran Vodicka

Sheffield Hallam University, UK

EDITORIAL ASSISTANT

Inna Vehera

National Pedagogical Dragomanov University, Ukraine

Futurity Education is an international peer-reviewed scientific journal with open access. The journal publishes 4 issues per year (March, June, September, and December). The journal publishes original and review articles in the field of education. We publish articles that are thorough research aimed at offering new innovative solutions and approaches to solve the problems of education of the future

<https://futurity-education.com/index>

Publisher:

Futurity Research Publishing, Poland, Lodz,
STEFANA ŻEROMSKIEGO street 53, 90-625.
info@futurity-publishing.com;
<https://futurity-publishing.com/>

All journal content is licensed under a Creative Commons BY 4.0 International license

Publication schedule

Futurity Education is published four times a year, on March 25, June 25, September 25 and December 25.

Type of publication: electronic

Country of publication: Poland

Number: 2023 March, 25

Korneiko, Y., Tarangul, L., Dovzhuk, V. Traditions and innovations: Two poles of education of the future (Literature review 2012-2022)	5
Kumar, N. Innovative teaching strategies for training of future mathematics in higher education institutions in India	15
Humeniuk, T., Romaniuk, P. On the development of information and communication technologies in education of the future: The possibilities of cloud computing technology	34
Zinchenko, V., Dorosheva, A., Mosiy, I. Innovative and cultural transformations of educational environment of the future: Digitalization, barriers for traditional learning	45
Aliyeva, G. B. Educational trends in the development of philological education in Azerbaijan in the era of digitalisation: A forecast of the future	63
Bukliv, R., Kuchak, A., Vasylyuk-Zaitseva, S. Professional training of future academic staff and digitalization of education: Analysis of mutual influences	76
Sanetra-Półgrabi, S. Features of the organization of distance learning in the process of training specialists in administration and public administration (Polish experience)	86
Aljad, R. R. Methods to improve the effectiveness and quality of teaching the disciplines of the architectural and artistic profile (experience of Libya)	105
Yolida, B., & Marpaung, R. R. T. The media puzzle assisted guided inquiry model: Its use of students' critical thinking skills	128
Ostanina, A., Bazyl, O., Tsviakh, O., Dovzhuk, N. Formation of digital competence in higher education students as a basis for the transformation of education of the future	139
Pinias, C. Gender-related policy guidelines' impact on rural female students' participation in sciences at advanced level	150
Kostenko, L., Ruda, O. Y., Sofilkanych, M., Bokshan, A. Distance learning as an integrative response to contemporary challenges	166

Traditions and Innovations: Two Poles of Education of the Future

Yuliia Korneiko*

PhD in Pedagogy, Pedagogy, Ukrainian and Foreign Philology, Environmental Design, Kharkiv State Academy of Design and Arts, Kharkiv, Ukraine, <https://orcid.org/0000-0003-2169-7778>

Liubov Tarangul

Head of the Chernivtsi branch State Scientific Institution "Institute of Education Content Modernization", Chernivtsi branch, Chernivtsi, Ukraine, 58001, <https://orcid.org/0000-0002-9888-9252>

Viktorina Dovzhuk

PhD in Pharm.D., Associate professor of The Department of Pharmacy Organization and Economics, Faculty of pharmacy, Bogomolets National medical university, Kyiv, Ukraine, <https://orcid.org/0000-0002-3491-018X>

***Correspondence email:** korneiko78@gmail.com.

Received: November 6, 2022| **Accepted:** December 29, 2022 | **Published:** March 25, 2023

Abstract: In this article one made a review of the literature based on the relationship between traditions and innovations in the pedagogical process over the last decade. In the article one summarized domestic and foreign scientists opinions on the topic of combining traditional and innovative forms and methods, their relationship and complementarity; the importance of traditions for the implementation of innovative models of education is considered; it is emphasized that the pedagogical tradition contains many elements, performs various functions and is reflected in a significant number of pedagogical technologies and methods, forms and means.

Based on a full-text analysis of about 16 articles published in well-known databases and scientific journals, the study revealed the support of the vast majority of researchers concerning innovative educational methods. All the cited scientists have the idea that the introduction of innovations renews and strengthens the educational process. They focus readers' attention on the interaction of traditional and innovative teaching methods, since according to the waste majority of scientists, without preserving pedagogical traditions, the modernization of educational systems is unlikely to bring significant positive results.

At the same time, in the entire collection of researched articles, there are several authors who consider traditional education to be more effective than innovative education.

According to the scientist's opinion, these two phenomena are not only interconnected and mutually determined, but also do not exist as separate phenomena. In other words, the tradition is an integral part of innovation, and pedagogical innovation always includes traditionally oriented elements.

Keywords: traditions, innovations, education, relationship, experience, traditions and innovations in the pedagogical process, innovative models of education, traditional models of education.

Introduction

The modern education is a meaningful, valuable and culturally creative combination of the past, present and future. It is for this reason that the study of the unity of traditions and innovations, as the two poles of future education, is relevant today (Humeniuk et. al., 2022; Voropayeva, et. al., 2022). Traditions are the stabilizing element of education development, which makes it possible not only to transmit the historical memory and spiritual and cultural energy of the nation, but also the meaningful guidelines for the life-creating activity of each individual. At the same time, the use of traditional forms of education should not interfere with the search for innovative forms and technologies of the educational process, because the creation of an innovative model of education is one of the worldview foundations of the transformation of the educational system.

Research Problem

Traditions and innovations in education remain important areas of research. Pedagogical activity in the current conditions is not possible without the use of pedagogical, scientific and methodical traditions. However, traditional forms and methods of pedagogical activity that have existed for many years must be rethought and adapted to new conditions. Features of science and technology development, high requirements for specialists in any field necessitate the introduction of innovations in the education of the future.

Research Focus

The material was formed on the basis of the analysis of publications of Ukrainian and foreign scientists and reflects the degree of interconnection of traditions and innovations in the educational process in modern conditions.

The object of research is traditions and innovations in education.

Research Aim and Research Questions

The main purpose of this article is to analyze the views of domestic and foreign scientists on the possibility of combining traditional and innovative forms and methods in modern education, on their relationship and complementarity.

To achieve the goal, the following tasks must be solved:

- 1.To consider the interpretation of the concepts of "tradition" and "innovation" in domestic and foreign sources.
- 2.To explore new trends and innovations in education.
- 3.To justify one's own vision regarding the connection between tradition and innovation.

Research Methodology

In the process of this scientific research, such methods of scientific knowledge were used: analysis of scientific and pedagogical literature, study, systematic approach (used when explaining the differences between traditions and innovations).

Research Results

Interpretation of the concepts of "tradition" and "innovation" in domestic and foreign sources

Education plays an important role in the society. This is the most important sphere of social life; the economic, political, intellectual, cultural and moral state of society depends on its functioning.

It is undeniable that the formation of a modern model of education should be oriented towards the interests of the future. But at the same time, the educational paradigm should exist taking into account general traditions. Thus, in his professional activity, the modern teacher is in a contradictory situation, where, on the one hand, he or she must anticipate changes and be an innovator, and on the other hand, he or she must preserve and reproduce existing values. Such a position corresponds to the duality of the educational process itself, which includes both tradition and innovation, preservation and development.

Currently, there are also discussions among researchers about the dominant position in the development of such integral elements as tradition and innovation. There is a constant substantiation of what is considered a fundamental element of educational development: traditional or innovative developments of a pedagogical nature.

Different interpretations of the concepts of tradition and innovation testify to the ambiguity of their meaning for researchers. Reference to the past is made through tradition.

Most often, the tradition is understood only as a backward, obsolete ancient connotation that no one needs, that hinders the development of the legacy of the past, which is senselessly reproduced in the present. From another point of view, traditions in the pedagogy of any nationality have always been the basis for building a national educational system, because only folk traditions that have come out of life and have been tested by life can be axiomatic. Traditions that arose in ancient times play a decisive role in the upbringing and education of new generations.

The tradition appears in the world as a kind of way out of the crisis of life - by creating new forms of ancient canons. The difference between traditional and innovative in society lies mainly in the forms of cultural elements that make up the system, and not in its deep foundations associated with tradition. Social stability is achieved by expanding the boundaries of culture, the basis of which is tradition. It broadcasts positive universal values and stereotypes that are valuable for the successful development of society. Thus, in modern conditions, there is an urgent need to create a cultural foundation and a strong value foundation for the further development of traditions and the spiritual evolution of society.

Therefore, a tradition can be recognized as a stabilizing element in the development of education both at the general social level, where it contributes to the preservation and transmission of «historical memory», the spiritual and cultural energy of the nation, and at the individual level, where tradition is a meaningful justification for further life-creating activities of each individual.

The analysis of publications on the research topic showed that the vast majority of scientists focus on the interaction of traditional and innovative teaching methods. However, there are those who consider traditional education more effective.

For example, according to Liu and Long (2014) “The traditional teaching is the most direct and effective method. Teachers control and inspire students effectively when the students encounter problems or arise conflicts, they take flexible teaching method adjusting the content according to actual requirement under the general teaching arrangement, which is not only conducive to cultivate the basic technique but also for the good habit in forming students’ self-study ability. Teachers’ action and language become the target imitated by learners, whose outlook towards right and wrong, attitude, value orientation and academic level have great impact on students”.

Traditional teaching methods have been used in schools for decades and are still actively used by teachers. Of course, criticizing or, conversely, refuting criticism of traditional teaching methods is currently a controversial issue. After all, there are traditional teaching methods that have passed the test of time and which teachers will be able to apply in practical activities in the coming years in combination with innovative methods. These are such learning technologies as narration, explanation, conversation, educational discussion, work with a textbook, demonstration, exercise, and laboratory, practical and independent work. Like any learning technology, traditional education has its strengths and weaknesses. Among the advantages, the first is the systematic nature of training; orderly, logically correct presentation of the material; organizational clarity; optimal consumption of resources during mass training. The main disadvantage of the traditional education system, according to the vast majority of scientists, is the resulting inability and unwillingness of children to actively study, the unformed value attitude towards their own development, education and society in general. At the end of the 20th century, pedagogy advanced the transition to person-oriented education, as society in general requires school graduates to consciously and responsibly make choices in various life situations. The achievement of such qualities by a person is declared to be the main goal of education and upbringing, in contrast to the formalized transfer of knowledge and social norms to the student inherent in the traditional education system.

Innovative learning is an educational and educational activity oriented to dynamic changes in the surrounding world, which is based on the development of various forms of thinking, creative abilities, and high social and adaptive capabilities of the individual. Such training stimulates innovative changes in culture, social environment; focused on the formation of individual readiness for dynamic changes in

society due to the development of creative abilities, various forms of logical and imaginative thinking, as well as the ability to cooperate with other people.

Innovative pedagogical activity, based on the understanding of advanced practical experience, is focused on the change and development of the educational process with the aim of achieving higher results, forming a qualitatively different pedagogical practice.

In the pedagogical interpretation, «innovation» should be considered as a special form of pedagogical activity and thinking aimed at organizing innovations in the educational space, or as a process of creating, implementing and spreading new things in education.

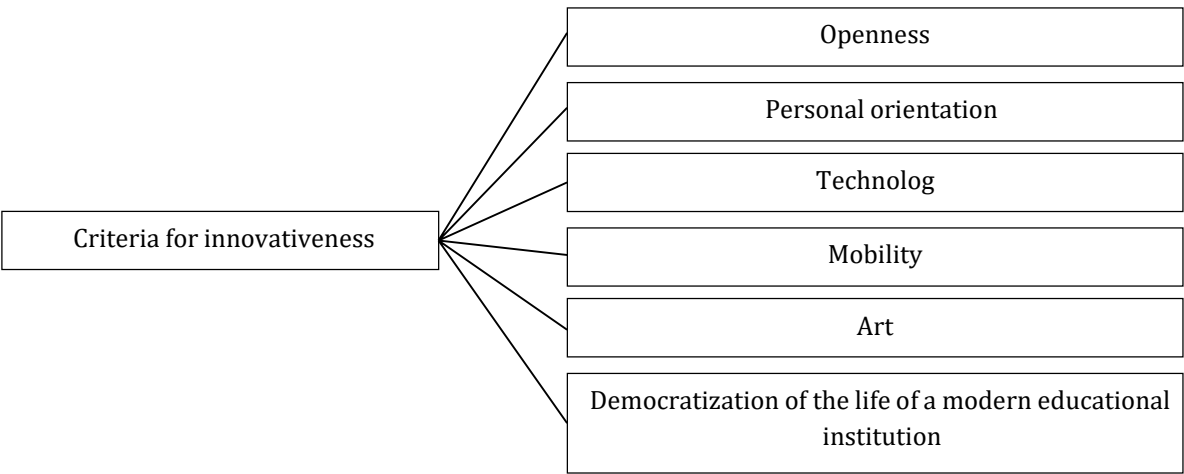
Innovation in education is the process of creating, implementing and spreading new ideas, methods, pedagogical and management technologies, as a result of which the level of achievements of the structural elements of education increases, the system transitions to a qualitatively new state.

Another definition of innovation in education is the concept. According to Findikoglu and İlhan (2016) «innovation is a concept that connected societies and future economics. It is a way of finding the best alternative ways of changing individual behaviors in the individual when the existing ways such as learning theories, learning tasks, teaching methods, and learning approaches are not working effectively» (Findikoglu & İlhan, 2016). The innovative process in education is a series of consistent, purposeful actions aimed at its renewal, modification of the purpose, content, organization, forms and methods of education and training, adaptation of the educational process to new socio-historical conditions of education. Innovation in education is a sign of modernity. However, as noted, Zolotukhina et al. (2021) «innovation should not be understood only as the introduction of the latest forms and methods of teacher work. It includes the intensification of the creative process of teaching, the accumulation of experience in individual creative and collective creative activities, the change of relations between the subjects of the pedagogical process, the improvement of the system of independent work, the control of the increase in the level of methodical and technological culture of teachers».

Pedagogical literature contains clearly defined criteria for innovativeness (Fig. 1.)

Figure 1

Criteria for Innovativeness



Source: development of the authors (Zolotukhina et al., 2022).

Scientists have also determined the functioning of pedagogical innovations stages: familiarizing the teacher with pedagogical innovations; appearance of interest, assessment, approval, intuitive perception. Innovative pedagogical activity is such an activity, in the process of which a new original product is created. It is manifested in the values, qualities, attitudes, needs, abilities formation of the future specialist, meeting modern requirements and allows them to fully function in the modern educational space (Shatunova & Shabalin, 2014).

Serdyukov (2017) believes that «all innovations are ultimately directed at changing qualitative and/or quantitative factors of learning outcomes:

- qualitative: better knowledge, more effective skills, important competencies, character development, values, dispositions, effective job placement, and job performance;

- quantitative: improved learning parameters such as test results, volume of learned information, amount of developed skills or competencies, college enrollment numbers, measured student performance, retention, attrition, graduation rate, number of students in class, cost, and time efficiency» (Serdyukov, 2017).

Trends and Innovations in Education

New trends and innovations in education are of great interest among the scientists. One of the most extensive lists of trends and innovations in education that can pave the way to a better future was presented in Bisht and Dept's (2022) work Table 1. Note that the innovative process in education may involve innovations in methods, forms, techniques, means, in the content of education or its goals, conditions, etc.

It is quite important to note that scientists develop different classifications of innovations. So, for example, according to the degree of novelty, such types of innovations are distinguished as:

- Retro-innovative: comprises the transfer into modern practice of a phenomenon known in the past in a modified form, which due to certain historical circumstances has ceased to be used;
- Modified innovative: allows using a known approach with its partial modification;
- Combinatory-innovative: characterizes the result of combining several well-known blocks and creating a qualitatively new product;
- Author's innovative: involves the creation of a truly new creative product.

In this study, one only touched the benefits of innovative education of the future. However, according to some scientists, such education has certain disadvantages:

1. Inconsistency of educational material with modern achievements of science and technology. Due to the rapid development of the latest technologies, textbooks and lecture material may lag behind each other significantly.

2. Changing the existing structure of the education system. By this time, many online schools are registered - and over time, their number will increase. It is quite possible that soon education will have a radically different aspect.

3. The lack of live communication between the student and the teacher. During online courses or distance learning, the student does not have enough time to discuss the work, story, task, etc. This interferes with the development of an expression of one's own opinion, a view of the situation, because the computer will not become an interlocutor, as well as will not understand the depth of the student's thoughts.

Table 1

New Trends and Innovations in Education

Trends and innovations	Characteristics
1. Virtual learning	Using technology as a tool always expands the learning process potential
2. Concept based continuous learning	This type of learning not only prepares students for a better future, but also improves their understanding
3. Assessment of students by using artificial intelligence AI	This type of learning not only prepares students for a better future, but also improves their understanding
4. Gamification and self-analysis	Gamification is a learning technique that transfers game mechanics to the educational environment in order to achieve better learning results, change participants' attitudes towards the learning process, develop knowledge and student skills.
5. Experiential learning	This is learning through reflection on action. It is a process of learning through experience
6. Purposeful learning	Students need to know why and what they are studying
7. Student voice is important	Students have their own and unique perspectives on teaching, learning and education
8. ICT enabled tool for effective TL process	Incorporating ICT tools is very important for effective teacher training
9. Cooperative, collaborative and team teaching	By using cooperative learning in the classroom, we can engage students with different abilities to work together
10. Reflective teaching and reflective teacher education	Reflective learning is self-evaluation of self-learning
11. Constructivism	It involves the active participation of students in any activity. This improves learners' ability to actively solve problems and think critically
12. Flipping the classrooms	The flipped classroom (FC) is a pedagogical approach to blended learning whereby the traditional process of classroom content being normally delivered first, followed by homework, is reversed and is often supplemented by instructional videos. Flipped learning is an approach to teaching where direct instruction moves outside of class, and class time is used for active and engaging activities and providing individualized support.
13. Peer instruction/ tutoring	The method of mutual learning refers to a method in which students help each other in learning
14. Blended learning	It is also called hybrid learning, which combines online and face-to-face learning experiences with teachers acting as learning facilitators
15. Soft skills	In the modern world special importance is given to so-called soft skills – “flexible skills.” Some of these skills include: English language proficiency, as foreign communication skills are required in customer relations and communication with an international development team; team skills in project execution; effective communication skills throughout project execution, starting from the first communication with the customer to presentation of ready-made solution skills.
16. Personalized and paced learning	Personalized learning means providing a learning experience tailored to the learner's needs, his or her relationship to special skills, preferences, and experiences

17. Global and multicultural education	A multicultural/global education is an education that seeks to prepare students for «leadership, membership, and followership» in their community, state, nation, and world
18. Enquiry based instruction	This type of learning enhances students' problem-solving skills
19. Time management	The implementation of innovative strategies requires adequate time, and sometimes the lack of time management works as a factor that resists innovation
20. Mentor issue	Mentoring in mentoring is also very important for innovation and best practices. Lack of good mentoring is a critical issue that resists innovation and best practices
21. Lack of fund	Lack of funds is the main obstacle to using a new technology or technique

Source: development of the authors (Bisht & Dept, 2022; Dalbani, et. al., 2022; Glazunova et.al., 2022; Pacheco et al., 2020).

Own Vision Regarding the Connection Between Tradition and Innovation

The world is rapidly changing. But unfortunately, education remains one of the most conservative sectors in it. To keep up with the digital world, it has to reinvent itself.

The modern system of domestic education is in a protracted reform. Like many years ago, the dispute continues between the traditions that are the legacy of the Soviet Union and innovations that are oriented to world educational standards.

One tried to summarize the fundamental differences between traditional and innovative approaches to education.

Table 2

Traditions and Innovations: Two Poles of Future Education

Educational process components	Traditions	Innovations
<i>Goal</i>	1. Transfer of knowledge. 2. Acquaintance with culture. 3. Assimilation of social experience	Promotion of self-realization and self-affirmation of the individual
<i>Contents</i>	1. Knowledge 2. Proficiency. 3. Skills.	1. Knowledge 2. Values 3. Competencies
<i>Forms of work</i>	1. Individual. 2. Frontal	Various forms of joint activity, independent work, productive and creative search
<i>Methods of work</i>	1. Reproductive 2. Explanatory 3. Illustrative	Research methods
<i>Management style</i>	Authoritarian	Democratic
<i>Interaction of the participants</i>	An education seeker is an object of all kinds of educational influences; a teacher is an employee, a translator of knowledge	The learner is the subject of learning, the teacher is a friend and assistant
<i>Control</i>	External	Internal
<i>Learning outcome</i>	An uninitiated person who does not adapt well to the realities and changes in life, with isolated fragments of knowledge	An initiative, developed and self-confident person who is able to navigate in the conditions of a changing world

One emphasizes that traditions are not only protected, preserved and transmitted knowledges and experiences. The tradition has the right to life only if it is of a creative nature that meets the requirements of modernity. This implies following both traditions and innovations as a socio-cultural phenomenon of pedagogy, which ensures a sustainable and dynamic development path that maintains a balance of traditions and innovations in education (Ellis et al., 2019). In order to successfully accomplish educational tasks solutions and learning requirements, it is necessary to constantly correlate the activities carried out in the classroom with the planned educational activities, the methods of their implementation, interconnect with the obtained results, and determine their compliance with the conditions.

The education of the future is built on the best traditions of domestic pedagogy and the search for new forms, methods and content of education. A necessary condition for the further development and further self-improvement of the domestic education system is a relying on the best created in the domestic and world educational space.

One believes that the traditions heredity as well as the desire for innovations should also be embedded in the very content of the educational activity of each educational process subject. This enrichment of the content of education will ensure not only the systematic development and modernization of the educational complex, but also contribute to the integrity of the education in general and educational life-creating strategy of any individual who will study throughout his life, combining already acquired knowledge with their own innovative and creative orientations

Conclusions and Implications

The pedagogical tradition contains a significant innovative potential; its usage carries out further development in the space and time of its culture. Indeed, what was once an innovation in education, having gone through a long process, has turned into tradition.

The teacher can use any pedagogical methods, both traditional and innovative. But at the same time, he or she must constantly work on himself, improving his teaching skills every day. A teacher should set a good example for students not only as a representative of his profession, but also as an interesting personality capable of involving students in the learning process.

According to modern authors, traditions, transmitting what has already developed in the theory and practice of education, turn out to be a mechanism for transmitting experience from generation to generation, that is, a mechanism that ensures pedagogical continuity. Innovations, on the contrary, provide an update of what is in pedagogy at the moment.

One believes that traditional and innovative teaching methods should be in constant relationship and complement each other. Today, these two concepts should exist in synergy.

References

Bisht, B., & Dept, E. (2022). Emerging trends and innovations in teacher education: Classroom of the future. *International Journal of Creative Research Thoughts (IJCRT)*, 10(5), 436–444. <https://ijcrt.org/papers/IJCRT2205049.pdf>

Dalbani, H., Eissa, S., Syed-Ahmad, S. F., & Almusharraf, N. (2022). Transitioning to flipped classrooms: Instructors' perspectives. *Sustainability*, 14, Article 13426. <https://doi.org/10.3390/su142013426>

Ellis, V., Souto-Manning, M., & Turvey, K. (2019). Innovation in teacher education: Towards a critical re-examination. *Journal of Education for Teaching International Research and Pedagogy*, 45(1), 2–14. <https://doi.org/10.1080/02607476.2019.1550602>

Findikoglu, F., & İlhan, D. (2016). Realization of a desired future: Innovation in education. *Universal Journal of Educational Research*, 4(11), 2574–2580. <https://eric.ed.gov/?id=EJ1118708>

Glazunova, O. G., Korolchuk, V. I., Voloshyna, T. V., & Vakaliuk, T. A. (2022). Development of soft skill in computer science bachelor in the project learning process. *Information Technologies and Learning Tools*, 92(6), 111–123. <https://doi.org/10.33407/itlt.v92i6.5076>

Humeniuk, I., Humeniuk, O., Matienko, O., Manzhos, E., & Malyshev, K. (2022). Challenges and innovation of management in higher education: Ukrainian dimension. *Independent Journal of Management & Production*, 13(3), 329–346. <https://doi.org/10.14807/ijmp.v13i3.1984>

Liu, C., & Long, F. (2014). The discussion of traditional teaching and multimedia teaching approach in college English teaching. In J. Zhao (Ed.), *2014 International Conference on Management, Education and Social Science* (pp. 31–33). Atlantis Press. <https://doi.org/10.2991/icmess-14.2014.9>

Pacheco, E., Palma, J., Salinas, D., & Arana, I. (2020). Gamification and self-directed learning. In *ECGBL 2020 14th European conference on game-based learning* (pp. 417–424). Academic Conferences Limited.

Serdyukov, P. (2017). Innovation in education: What works, what doesn't, and what to do about it?. *Journal of Research in Innovative Teaching & Learning*, 10(1), 4–33. <https://doi.org/10.1108/jrit-10-2016-0007>

Shatunova, O. V., & Shabalin S. V., (2014). Innovative training forms of pre-service teachers of technology for the teaching the basics of entrepreneurship. *World Applied Sciences Journal*, 29(4), 1818–4952. [http://www.idosi.org/wasj/wasj29\(4\)14/21.pdf](http://www.idosi.org/wasj/wasj29(4)14/21.pdf)

Voropayeva, T., Järvis, M., Boiko, S., Tolchieva, H., & Statsenko, N. (2022). European experience in implementing innovative educational technologies in the training of management specialists: Current problems and prospects for improvement. *International Journal of Computer Science and Network Security*, 22(7), 294–300. <https://doi.org/10.22937/IJCSNS.2022.22.7.35>

Zolotukhina, S., Fazan, V., & Makarenko, V. (2021) Traditions and innovations in pedagogical activity. *Theory and Methods of Teaching and Education*, (50), 65–74. <https://doi.org/10.34142/23128046.2021.50.06>

DOI: <https://doi.org/10.57125/FED.2023.25.03.02>

How to cite: Kumar, N. (2023). Innovative Teaching Strategies for Training of Future Mathematics in Higher Education Institutions in India. *Futurity Education*, 3(1), 15–33.
<https://doi.org/10.57125/FED.2023.25.03.02>

Innovative Teaching Strategies for Training of Future Mathematics in Higher Education Institutions in India

Narendra Kumar

*Doctor of Mathematics and CSE, Professor of Mathematics Department, NIMS University, Jaipur, India,
<https://orcid.org/0000-0001-9167-7604>*

***Correspondence email:** drnk.cse@gmail.com.

Received: November 24, 2022 | **Accepted:** January 11, 2023 | **Published:** March 25, 2023

Abstract: The purpose of the article is to analyze teaching strategies used during the future mathematicians training in India and to select the most effective ones. The objectives include: to carry out a close-open survey in order to distinguish the teaching strategies used in mathematics education; to establish traditional and innovative teaching strategies and describe the difficulties; to assess plausibility of hypothesis and to outline the most efficient teaching strategies. Within the framework of research 28 works published from 2018 to 2022 and devoted to the problems of mathematics education in Indian higher educational institutions were analyzed. A number of legislative documents and teachers' guidelines were studied in order to outline the government policy on education modernization and the principles of organization of educational process in India. The deductive approach to apply theoretical methods like literature review and analysis of research results was used. Empirical research methods included a close survey, mathematical analysis and statutory interpretation of answers. The numerical data contributed to the assessment of plausibility of hypothesis and proved that innovative teaching strategies make the educational process more effective. The close survey was conducted during 2022- 2023 academic year. It includes three stages: preparatory, experiment and final. The close survey involved 216 mathematics teachers from different higher educational institutions throughout India. The

results show that traditional teaching strategies are still widely used in Indian educational institutions. Nevertheless innovations are essential to present qualitative changes in the system of education. The following innovative teaching strategies were used: bilingual education, inter-subject links, mobile learning, microteaching, gamification, ICT, flipped classroom, personalized learning. These strategies improve learning outcomes among students, increase the creativity, communication skills, decision-making, and professional flexibility, enhance motivation, increase interest to professional activity, provide better understanding of materials, form professional competency, and contribute to decision-making skills formation.

Keywords: mathematics education, future mathematicians, innovative teaching strategy, traditional teaching-learning model.

Introduction

The main strategic task for modern society and education development is closely connected with the process of development of human intellectual and cultural potential. Obviously, there is a need to create all the favourable conditions that could facilitate the fulfillment of this task and provide highly qualified pedagogical support. Formal education interprets mathematics as one of the most important fields studied by students as they are expected to apply mathematics thought patterns and rules of logics, mathematics skills in everyday life. Moreover, mathematics contributes to the effective formation of learning skills, critical thinking, information literacy, assessment skills, metacognition ability, problem solving, and decision making.

Mathematics originates from the Vedic period (Chand & Das, 2022a; Chorlay et al., 2022) and is still very popular in India. According to All India Survey on Higher Education 2019-20 (Government of India, 2020a), in 2019 143116 students enrolled in mathematics which is the highest among all the science streams. In 2020 the total enrolment in mathematics was 104269 students nevertheless the specialization took the second place among the youth after chemistry. Also, mathematics in one of the popular science streams for Ph.D. enrolment being number three after chemistry and physics (Government of India, 2021).

BSc Maths can apply for a job as a data analyst, teacher, investment analyst, and accountant or machine learning engineer. Students can also apply for further programs like MSc Maths, MSc Financial Mathematics and Computation, MBA in Finance, Chartered Financial Analyst, and Financial Risk Management. Mathematicians have the possibility to work in banking, accountancy, financial management, public administration, computing and IT, space science, military command, engineering, stock exchange, universities or consultancy centers, government sector.

This scope shows that mathematics education and the training of future mathematicians is a very urgent problem in India and requires a deep analysis of traditional and innovative approaches in order to choose the most effective ones.

Research Problem

According to Satapathy and Malhotra (2020), teaching strategies used in order to train future specialist must be supportive and oriented towards the achievement of pedagogical intention. Other scientists insist that sustainable innovations implemented towards teaching-learning model may significantly improve the learning outcomes and prepare students to act efficiently in future (Dimple,

2018). Obviously, education must accept changes occurring in the society and maintain improvement in productivity, efficiency, and quality forming professional competency among students.

Therefore, the problem of the most efficient methods selection in mathematics education is especially acute as it may contribute to improvement of future mathematicians training and, as a result, provide economics with highly-qualified specialists who have sufficient mathematics skills and are ready to work in the surrounding changing.

Research Focus

The world is undergoing rapid changes and employing a number of intense scientific and technological advances including the rise of big data, machine learning, and artificial intelligence. As a result, the Indian society demand skilled workforce with high level of mathematics competency (Government of India, 2020b). The process of future mathematicians training at the educational establishments concerns teaching theoretical knowledge to students and formation of practical skills that will help to solve mathematical tasks in the future professional activities.

The methodology deals with the goal-oriented organization of educational process and appropriate selection of teaching strategies in accordance with the learning objectives, students' needs, content of learning, and components of future professional activity (Munna & Kalam, 2021; Nishitha, 2019). Otherwise, methodology is teacher's mastery in student's learning activity to organising and encouragement to knowledge acquisition. In the context of mathematics education, methodology is a multi-aspect phenomenon, independent, dynamic and complex system of teaching strategies influencing the level of mathematics knowledge and skills as well as sufficient level of professional-mathematics skills.

Findings show that traditional teaching strategies are still widely used in Indian educational institutions. The main reason is that traditional education is to transfer the values, moral and social skills adopted in the society to the youth. Traditional teaching strategies mainly refer to oral forms of instruction like lectures and demonstration (Sethi, 2021). The analysis of scientific sources (Abd Algani & Eshan, 2023; Nishitha, 2019; Puranik, 2022; Sethi, 2021) and teachers' guidelines or other educational materials published by some Indian educational institutions (Castelino & Hegde, 2020) show that traditional strategies are the following: exercise and practice, home assignments, analysis and correction of home assignments, oral lectures, written tasks, group work, self-study, supervised study, review, problem solving, chalk and talk method, real time example.

However currently traditional teaching strategies show less efficiency and there are requirements to modernize the educational process (Naga Subramani & Iyappan, 2018; Puranik, 2022). Education thus, must move towards formation of creative and innovative specialists being ready to act in changing field. Obviously, the quality of training significantly depends on methodology as it influences the not only students' learning outcomes but increases their motivation to gain future specialization, adaptability qualities, and self-education skills. Methodology must make education more experiential, integrated, discovery-oriented, learner-centered, discussion-based, gamified, flexible, and interesting (Government of India, 2020b).

This need stems from a number of difficulties or educational deviations caused by the wide use of traditional strategies. Table 1 shows the analysis of educational deviations on the basis of Indian scientific literature review.

Table 1*Difficulties Caused by the Wide Usage of Traditional Strategies*

Difficulties in traditional teaching	Authors
Applying a single method	Borikar and Seikdar (2019), Sethi (2021).
Preparing a poor lesson plan	Sethi (2021).
Lack of advanced training for teachers	Borikar and Seikdar (2019), Sethi (2021).
Lack of mathematics kits at the educational institution or use of outdated educational materials	Puranik (2022), Sethi (2021).
Different students' abilities and difficulties to assess all the learners	Das (2019d), Naga Subramani and Iyappan (2018), Sethi (2021), Verma (2019).
Shortage of computer hardware	Das (2021), Sethi (2021).
High student/teacher ratio	Chand and Das (2022a), Das (2019a), Sethi (2021).
Lack of information and communication technologies (ICT) skills among students and teachers	Das (2019b), Das (2019d), Sethi (2021), Umamet al. (2019)
Inability to integrate ICT to pedagogy	Das (2019c), Das (2021), Sethi (2021).
Lack of interest or motivation among students	Das (2019d), Sethi (2021).
Difficulties in adopting a new strategy in the classroom	Das (2021), Sethi (2021),.
Lack of interactive methods	Borikar and Seikdar (2019), Das (2019d), Das (2021), Sethi (2021), Verma (2019).
Necessity to incorporate game-based approach and play-way learning	Aggarwal (2022), Das (2021), Verma (2019).
Individual students' characteristics like self-assessment, self-education	Das (2019d).
Poor planning or inadequate curriculum	Das (2019d).
Inadequate content materials	Borikar and Seikdar (2019), Das (2019d).
Irrelevant features of learning environment and requirement to maintain more balanced classroom environment	Borikar and Seikdar (2019), Das (2019d), Das (2021).
Poor inter-subject links	Das (2019a), Das (2019d), Das et al. (2019).
Requirement to use ICT and digital technologies more extensively	Albina (2018), Das (2019a), Das (2019c), Das (2021), Mondal and Roy (2021), Umam et al. (2019).
Change of learning styles	Aggarwal (2022), Das (2021).
Mathematics phobia	Das (2021), Das and Gupta (2020).
Necessity to create encouraging materials for advanced learning	Das (2019a), Das (2019b), Albina(2018).
Use of realistic mathematics exercises	Das (2021), Das (2019a).
Low support of government	Das (2021).
Teaching through Internet	Albina (2018), Das (2021).
Lack of adequate skills of teachers to create effective and creative learning environment	Das (2019a), Das (2021), Verma (2019).
Use of different languages by learners like mother tongue, regional language, official language of the union, associate official language	Das (2019a), Dimple (2018), Sethi (2021).

Source: based on literature review.

A number of faced difficulties while teaching mathematics at the higher educational institutions in India affirm the necessity to focus upon employment of innovative teaching strategies as well to make

the educational process more efficient. This fact is also confirmed by Indian educators and scholars (Aggarwal, 2022; Das, 2019c; Nishitha, 2019; Puranik, 2022) who consider innovations are essential to present qualitative changes in the system of education.

The main purpose of innovative teaching strategies is to make teaching mathematics more interactive as well as effective (Sethi, 2021). In addition, innovations improve methodological approaches, teaching methods or tools, facilitates the educational process (Bhinder, 2018). According to Puranik (2022) traditional teaching methodology is outdated and innovative methods are to be identified in order to enhance pedagogical competency of teachers as well as learning outcomes of students. Obviously, there is a strong need to change pedagogy from fact-based and oral lecturing to interactive teaching.

Acharya and Johny (2020) insist that traditional teaching methods oriented towards learning through memorization and recitation techniques must be changed into innovative strategies that induce critical thinking and problem-solving methods. At the same time, education, particularly mathematics teaching, is affected by technology-based innovations that create flexible and appropriate educational environment. As a result, some scholars (Aggarwal, 2022; Albina, 2018; Das, 2019c) claim that ICT is a necessary component of innovative teaching strategies and while teaching mathematics educators must focus on using multimedia, digital tools, e-learning applications, and mobile devices to make learning more interesting and comfortable. These changes were accelerated by government initiatives towards creation of distance education support during the COVID-19 pandemic (Das, 2021; Mondal & Roy, 2021).

Therefore, the application of efficient teaching strategies, traditional or innovative, in mathematics education is a necessary condition in order to enhance the professional competency of future mathematicians' level. Moreover, efficient educational environment prepares students to act under changing conditions and apply mathematics skills properly.

Research Aim and Research Questions

The purpose of the article is to analyze teaching strategies used for training of future mathematicians in India and to reveal the most effective methods able to improve mathematics education in the higher educational institutions.

The article objectives are the following:

- to carry out a close survey among teachers in Indian higher educational institutions and to distinguish the teaching strategies used in mathematics education;
- to establish traditional and innovative teaching strategies on the basis of teachers survey and describe the difficulties educators face within the educational process;
- to assess the hypothesis plausibility and to outline the most efficient teaching strategies able to improve mathematics education in Indian higher educational institutions.

Research Methodology

General Background

In this research the deductive approach that suggests applying theoretical methods like literature review and analysis of research results related to mathematics education in Indian higher educational institutions was used. These methods helped to establish already used in the educational process

teaching strategies and to develop new hypothesis to be verified. Empirical research methods including close survey in order to collect quantitative data on the problem. To analyze the results, mathematical analysis and statutory interpretation of teacher's answers were used. The numerical data contributed to the assessment of hypothesis plausibility and proved that innovative teaching strategies make the educational process more effective.

Sample / Participants / Group

The close survey was conducted during 2022-2023 academic year and included three stages: preparatory stage (May-August, 2022) when the literature review was carried out and the hypothesis was developed on the basis of findings; experiment stage (September-December, 2022) during this period the close survey was conducted; the final stage (January-February, 2023) was focused on the elaboration of recommendations for teaching stuff of Indian higher educational institutions. The empirical research involved 216 mathematics teachers from different higher educational institutions throughout India who filled in the questionnaire through Google forms. We informed the respondents about the survey objectives and all the teachers participated voluntarily.

Instrument and Procedures

The teachers were questioned through Google forms online to obtain necessary quantitative and qualitative data for the hypothesis verification. The questions referred to the teaching strategies used in the educational process to teach future mathematics in Indian higher educational institutions. The teaching staff was asked to assess the difficulties they face in the educational process. Some questions referred to the usage of innovative teaching strategies as we hypothesized that they contribute to modernization of mathematics education and help to prepare future mathematicians to professional activity more efficiently. Figures 1.1 and 1.2 show the questionnaires used in the close survey.

Figure 1.1

Form Used to Reveal Traditional and Innovative Teaching Strategies in the Process of Training of Future Mathematicians

You are kindly requested to fill in the following form in order to find out traditional and innovative teaching strategies used in the process of training of future mathematicians. Your answers will be used for the improvement of mathematics education in Indian higher educational institutions. Please, answer objectively and impartially. Thank you for your cooperation!

1. What is your teaching experience?			
a) less than 5 years	b) 5-10 years	c) 10-15 years	d) more than 15 years
2. What is your pedagogical load?			
a) full time		b) part-time	
3. Do you use teachers' guidelines?			
a) yes, strictly follow	b) yes, mostly follow	c) use some main recommendations	d) no, use own experience
4. Do you use traditional teaching strategies while teaching?			
a) yes, always	b) yes, very often	c) rarely	d) do not use
5. Read the following traditional strategies and answer whether you use them for teaching future mathematicians. Answer using grades from 1 to 4, where 1 means avoid using and consider innovative strategies are more effective; 2 = use rarely; 3 = use often; 4 = use always.			
6. Drill and practice			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
7. Oral lecturing			

a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
8. Seminars			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
9. Panel discussions			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
10. Home assignments			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
11. Analysis and correction of home assignments			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
12. Written tasks			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
13. Independent work			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
14. Group work			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
15. Supervised study			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
16. Problem solving			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
17. Work with textbook			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
18. Chalk and talk method			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
19. Real time example			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
20. Laboratory work			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
21. Do you face difficulties while using traditional teaching strategies?			
a) yes, always	a) yes, always	a) yes, always	a) yes, always
22. Do you apply innovative teaching strategies?			
a) yes, always	a) yes, always	a) yes, always	a) yes, always
Read the following innovative strategies and answer whether you use them for teaching future mathematicians. Answer using grades from 1 to 4, where 1 means avoid using and consider traditional strategies are more effective; 2 = use rarely; 3 = use often; 4 = use always.			
23. Bilingual education			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
24. Inter-subject links or integrated approach			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
25. Mobile learning			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
26. Microteaching			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
27. Gamification			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
28. Use of ICT			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
29. Flipped classroom			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
30. Personalized learning			
a) 1= avoid using	b) 2= use rarely	c) 3= use often	d) 4= use always
31. How do innovative teaching strategies affect the educational process?			

a) they bring positive changes	a) they bring positive changes	a) they bring positive changes	a) they bring positive changes
32. How do learning outcomes change when you apply innovative teaching strategies?			
a) improve significantly	a) improve significantly	a) improve significantly	a) improve significantly

Source: based on literature review.

Figure 1.2

Form Used to Reveal Traditional and Innovative Teaching Strategies in the Process of Training of Future Mathematicians

You are kindly requested to fill in the following form in order to analyze the difficulties you face in the educational process. Your answers will be used in the improvement of mathematics education in Indian higher educational institutions. Please, answer objectively and impartially. Thank you for your cooperation!

Look through the following list of difficulties occurring in the educational process and grade them in four points where 1 means do not face at all; 2 = rarely; 3 = often; 4 = always.

1. Applying a single method

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

2. Preparing a poor lesson plan

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

3. Lack of advanced training for teachers

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

4. Lack of mathematics kits at the educational institution or use of outdated educational materials

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

5. Different students' abilities and difficulties to assess all the learners

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

6. Shortage of computer hardware

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

7. High student/teacher ratio

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

8. The lack of information and communication technologies (ICT) skills among students and teachers

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

9. Inability to integrate ICT to pedagogy

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

10. Lack of interest or motivation among students

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

11. Difficulties in adopting a new strategy in the classroom

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

12. Lack of interactive methods

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

13. The necessity to incorporate game-based approach and play-way learning

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

14. Individual students' characteristics like self-assessment, self-education

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

15. Poor planning or inadequate curriculum

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

16. Inadequate content materials

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

17. Irrelevant features of learning environment and requirement to maintain more balanced classroom environment

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

18. Poor inter-subject links

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

19. Requirement to use ICT and digital technologies more extensively

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

20. Change of learning styles

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
--------------	---------------	--------------	---------------

21. Mathematics phobia

a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
22. A necessity to create encouraging materials for advanced learning			
a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
23. The use of realistic mathematics exercises			
a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
24. Low support of government			
a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
25. Teaching through Internet			
a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
26. The lack of adequate skills of teachers to create effective and creative learning environment			
a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
27. The use of different languages by learners like mother tongue, regional language, official language of the union, associate official language			
a) 1 = never	b) 2 = rarely	c) 3 = often	d) 4 = always
Read the following statements and say whether you agree or not. Describe your agreement in four points where 1 = completely agree; 2 = mainly agree; 3 = agree partially; 4 = do not agree.			
28. Implementation of innovations is very important in mathematics education.			
a) 1 = completely agree	b) 2 = mainly agree	c) 3 = partially agree	d) 4 = do not agree
29. Innovations are objective changes to modernize training of future mathematicians.			
a) 1 = completely agree	b) 2 = mainly agree	c) 3 = partially agree	d) 4 = do not agree
30. Do you undergo advanced training regularly?			
a) every year	b) every three years	c) every five years	d) do not remember exactly

Source: based on literature review.

Data Analysis

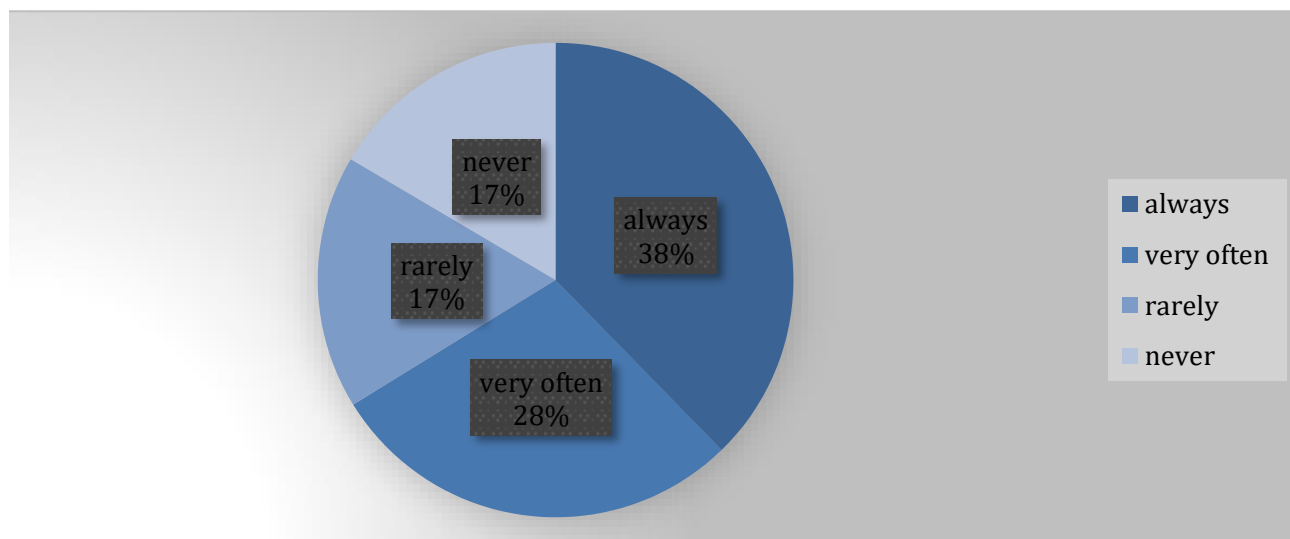
One analyzed the numeric data obtained during the survey that was focused to reveal the main teaching strategies used in the process of training of future mathematicians in Indian higher educational institutions and to assess the hypothesis plausibility that innovative teaching strategies are to be implemented more extensively. Also, the answers allowed us to describe the difficulties while using traditional teaching strategies. We presented our findings in the following sections below.

Research Results

The results of the close survey show that still a big number of teachers in Indian higher educational institutions apply traditional teaching strategies. Teachers explain their choice by the fact that teachers' guidelines recommend traditional strategies and many educators consider that such strategies help to preserve community values, improve moral and social skills and maintain national identity. Some teachers consider that innovative teaching strategies require additional workload.

Figure 2 shows that 38 % of teachers use traditional teaching strategies at each lesson and 28 % of teaching staff still choose traditional approaches to teaching mathematics. 17 % of teachers try to use traditional teaching strategies rarely and the same quantity avoid using traditional techniques in most cases as they consider innovative technologies are very effective in the process of training of future mathematicians. These findings show that teachers are very focused on preserving the existing traditions in the system of education and are not ready to immediately change their teaching strategies. At the same time the survey showed that young teachers are less comfortable at using traditional teaching strategies.

Figure 2



Source: based on survey results.

Analyzing the use of traditional teaching strategies in mathematics education in Indian higher educational institutions, it was evaluated that almost in each lessons 31,0 % of teachers use oral lecturing, 30,8 % - seminars, 50,1 % - home assignments, 40,8 % analysis and correction of home assignments, 35,7% - independent work, 34,0 % - work with textbook. At the same time, the findings show that some traditional teaching strategies are less applicable in mathematics education. They are the following: panel discussion, group work, real time examples, and laboratory work. Thus, 24,3 % of teachers never use panel discussion, 24,6 % of teachers avoid applying group work, 29,4 % of educators do not use real time examples at the lessons, and 21,0 % of teaching staff do not use laboratory work as their subject do not have the adopted algorithm for this.

Table 2

Analysis of Traditional Teaching Strategies Used in Mathematics Education in Indian Higher Educational Institutions

Traditional teaching strategies used in the process of training of future mathematicians	% of teachers			
	always	often	rarely	never
Exercise and practice	17,2 %	39,5 %	26,4 %	16,9 %
Oral lecturing	31,0 %	36,1 %	22,4 %	10,5 %
Seminars	30,8 %	33,1 %	18,5 %	17,6 %
Panel discussion	18,5 %	24,9 %	32,3 %	24,3 %
Home assignments	50,1 %	42,4 %	6,7 %	0,8 %
Analysis and correction of home assignments	40,8 %	34,9 %	20,3 %	4,0 %
Written tasks	32,6 %	34,4 %	18,1 %	14,9 %
Independent work	35,7 %	30,5 %	20,6 %	13,2 %
Group work	20,1 %	24,7 %	30,6 %	24,6 %
Supervised study	15,8 %	20,9 %	32,3 %	31,0 %
Problem solving	27,6 %	30,8 %	28,1 %	13,5 %
Work with textbook	34,0 %	31,1 %	19,4 %	15,5 %
Chalk and talk method	39,9 %	30,2 %	13,3 %	16,6 %
Real time example	18,7 %	21,2 %	30,7 %	29,4 %
Laboratory work	23,1 %	26,7 %	29,2 %	21,0 %

Source: based on survey results.

Despite the wide use of traditional teaching strategies respondents indicated in the questionnaire that they face difficulties that hinder the educational process and affect students' learning outcomes adversely. Table 3 presents the analysis of traditional teaching strategies used to train future mathematicians in Indian higher educational establishments.

The findings show that the most frequent difficulties are the following: high student/teacher ratio (30,7 %), difficulties in adopting a new strategy in the classroom (31,2 %), lack of interactive methods (39,4 %), necessity to incorporate game-based approach and play-way learning (32,9 %), requirement to use ICT and digital technologies more extensively (30,1 %), individual students' characteristics like self- assessment, self-education (29,7 %), and inability to integrate ICT to pedagogy (25,8 %), poor inter-subject links (29,5 %), and change of learning styles (23,5 %). At the same time, teachers specified some difficulties as less common. They include mathematics phobia that is typical for first-year students (0,2 %), low support of government (2,7 %), use of different languages by learners and necessity to teach in unified language or apply bilingual education (3,7 %).

Table 3

Analysis of Traditional Teaching Strategies Used in Mathematics Education in Indian Higher Educational Institutions

Difficulties facing while using traditional teaching strategies	% of teachers			
	always	often	rarely	never
Applying a single method	15,3 %	27,8 %	33,7 %	23,2 %
Preparing a poor lesson plan	10,6 %	20,5 %	40,8 %	28,1 %
Lack of advanced training for teachers	7,8 %	21,3 %	38,5 %	32,4 %
Lack of mathematics kits at the educational institution or use of outdated educational materials	12,9 %	29,6 %	24,1 %	33,4 %
Different students' abilities and difficulties to assess all the learners	27,8 %	30,6 %	20,6 %	21,0 %
Shortage of computer hardware	11,6 %	35,7 %	30,3 %	22,4 %
High student/teacher ratio	30,7 %	31,1 %	20,5 %	17,7 %
Lack of information and communication technologies (ICT) skills among students and teachers	28,9 %	25,6 %	30,2 %	15,3 %
Inability to integrate ICT to pedagogy	25,8 %	28,1 %	23,9 %	22,2 %
Lack of interest or motivation among students	20,6 %	22,3 %	31,5 %	25,6 %
Difficulties in adopting a new strategy in the classroom	31,2 %	32,7 %	20,9 %	15,2 %
Lack of interactive methods	39,4 %	31,8 %	17,0 %	11,8 %
Necessity to incorporate game-based approach and play-way learning	32,9 %	33,6 %	24,5 %	9,0 %
Individual students' characteristics like self-assessment, self-education	29,7 %	32,2 %	30,8 %	7,3 %
Poor planning or inadequate curriculum	19,7 %	38,9 %	28,7 %	12,7 %
Inadequate content materials	18,3 %	34,1 %	31,4 %	16,2 %
Irrelevant features of learning environment and requirement to maintain more balanced classroom environment	21,9 %	26,7 %	29,8 %	21,6 %
Poor inter-subject links	29,5 %	27,1 %	23,7 %	19,7 %
Requirement to use ICT and digital technologies more extensively	30,1 %	26,4 %	23,5 %	20,0 %
Change of learning styles	23,5 %	29,1 %	24,9 %	22,5 %
Mathematics phobia	0,2 %	3,6 %	12,5 %	83,7 %
Necessity to create encouraging materials for advanced learning	19,1 %	22,4 %	31,7 %	26,8 %

Use of realistic mathematics exercises	12,3 %	28,1 %	34,2 %	25,4 %
Low support of government	2,7 %	17,3 %	67,9 %	12,1 %
Teaching through Internet	15,5 %	23,4 %	39,3 %	21,8 %
Lack of adequate skills of teachers to create effective and creative learning environment	7,8 %	18,9 %	54,6 %	18,7 %
Use of different languages by learners like mother tongue, regional language, official language of the union, associate official language	3,7 %	29,1 %	42,0 %	25,2 %

Source: based on survey results.

The results demonstrate that purely traditional teaching-learning model leads to difficulties and, therefore, the educational process requires modernization or the use of innovations as the methods of knowledge acquisition change and profession of mathematician undergo deep transformations. The survey showed that teachers apply innovative teaching strategies but it does not happen extensively. One revealed that there are eight innovative teaching strategies used in the process of training future mathematicians. They are the following: bilingual education, inter-subject links or integrated approach, mobile learning, microteaching, gamification, ICT, flipped classroom, personalized learning. Table 4 gives the analysis of innovative teaching strategies used in mathematics education in Indian higher educational institutions.

The findings show that mobile learning, gamification, ICT, and personalized learning are the most common innovative teaching strategies. 28,7 % of teachers use mobile learning at each lesson, 29,8 % - gamification, 28,7 % - ICT, and 23,8 % - personalized learning. At the same time, a comparatively small amount of teachers apply bilingual education (3,9 %), inter-subject links or integrated approach (12,7 %), and flipped classroom (15,1 %). This is because the activities of teachers are regulated by institutional guidelines and so implementation of bilingual teaching, flipped classroom, or realization of inter-subject links are specified in curricula.

Table 4

Analysis of Innovative Teaching Strategies Used in Mathematics Education in Indian Higher Educational Institutions

Innovative teaching strategies used in the process of training of future mathematicians	% of teachers			
	always	often	rarely	never
Bilingual education	3,9 %	12,7 %	54,6 %	28,8 %
Inter-subject links or integrated approach	12,7 %	30,6 %	30,8 %	25,9 %
Mobile learning	28,7 %	40,5 %	19,4 %	11,4 %
Microteaching	17,6 %	29,7 %	40,2 %	12,5 %
Gamification	29,8 %	37,5 %	23,1 %	9,6 %
ICT	28,7 %	39,3 %	22,8 %	9,2 %
Flipped classroom	15,1 %	39,2 %	27,9 %	17,8 %
Personalized learning	23,8 %	32,5 %	37,0 %	6,7 %

Source: based on survey results.

During the survey one found that the use of innovative teaching strategies create a number of advantages and make the process of training of mathematicians in Indian higher educational institutions more efficient. The findings show that they improve not only the learning outcomes and mathematics skills among students but also increase the creativity, communication skills, decision-making, and professional flexibility positively. Thus, 53,5 % of teachers completely agree that innovative teaching strategies improve the creativity development, 60,2 % - enhancement of motivation to learning activities, 57,4 % - increase interest to professional activity, 54,9 % - understanding of materials, 65,3

% - formation of professional competency, 67,4 % student's learning outcomes, 59,1 % - formation of decision-making skills.

It was found that innovative teaching strategies have the least affect upon practicing of foreign language, development of personality and psychological readiness, and team building skills. Thus, only 19,8 % of teachers consider innovative teaching strategies help to enhance foreign language knowledge. 28,5 % of teachers consider that such strategies develop personality and psychological readiness. At the same time 18,6 % of educators think that students learn working in teams while training as future mathematicians. Table 5 shows the analysis of advantages using innovative teaching strategies in mathematics education in Indian higher educational institutions.

Table 5

Advantages of Using Innovative Teaching Strategies in Mathematics Education in Indian Higher Educational Institutions

Advantages of using innovative teaching strategies	% of teachers			
	Completely agree	Mainly agree	Partially agree	Do not agree
Development of creativity	53,5 %	24,7 %	12,2 %	9,6 %
Improvement of communication skills	40,1 %	27,3 %	17,8 %	14,8 %
Enhancement of motivation	60,2 %	29,1 %	7,3 %	3,4 %
Increasing of interest	57,4 %	30,3 %	11,0 %	1,3 %
Formation of leadership or facilitation skills	34,5 %	22,7 %	26,9 %	15,9 %
Better understanding of material	54,9 %	26,8 %	14,6 %	3,7 %
Preparation to use digital tools in future professional activity	48,4 %	32,1 %	17,1 %	2,4 %
Practicing foreign language	19,8 %	20,3 %	50,7 %	9,2 %
Formation of professional competency	65,3 %	23,1 %	9,5 %	2,1 %
Improvement of self-study skills	39,5 %	36,2 %	20,8 %	3,5 %
Modernization of educational materials	32,1 %	27,6 %	21,9 %	18,4 %
Improvement of students' learning outcomes	67,4 %	19,8 %	12,0 %	0,8 %
Teaching to work in teams	18,6 %	24,5 %	27,9 %	29,0 %
Improvement of critical thinking	43,9 %	25,1 %	18,4 %	12,6 %
Enhancement of professional flexibility	37,0 %	21,9 %	23,6 %	17,5 %
Development of personality and psychological readiness	28,5 %	23,5 %	26,0 %	22,0 %
Formation of decision-making skills	59,1 %	17,8 %	14,5 %	8,6 %
Training on the examples of real-life experience	29,4 %	39,4 %	18,9 %	12,3 %

Source: based on survey results.

Discussion

The systemic literature review and the close-open survey carried out among teachers of different higher educational institutions throughout India show that the use of innovative teaching technologies significantly improves the educational process and increase students' learning outcomes. They contribute to students' soft skills formation like critical thinking, creativity, communication or decision-making. At the same time, it is impossible to immediately and completely refuse traditional teaching strategies as the survey found traditional teaching help to transfer the values, moral and social skills and maintains national identity. In addition, mathematics education is regulated by normative documents like teachers' guidelines or methodical recommendations and their modernization requires time.

Innovative teaching strategies refer to new or modified forms, methods, techniques or principles of teaching and upbringing, oriented towards organization, management, and assessment of educational process improvement. The findings show that innovative teaching strategies gradually become applicable in mathematics education despite traditional teaching-learning models predominance in some institutions. It was found that bilingual education, inter-subject links or integrated approach, mobile learning, microteaching, gamification, ICT use, flipped classroom, and personalized learning are most common in Indian higher educational institutions. Table 6 characterizes these innovative teaching strategies based on literature review (Aggarwal, 2022; Bhinder, 2018; Chand & Das, 2022b; Das, 2019c; Puranik, 2022; Sharma & Priyamvada, 2022; Umam et al., 2019) and survey results.

Table 6

Characteristics of Innovative Teaching Strategies Used in the Process of Training of Future Mathematicians in Indian Higher Educational Institutions

Innovative teaching strategies used in the process of training of future mathematicians	Description of innovative teaching strategies and their contribution to mathematics education
Bilingual education	process of teaching students using two languages; using of different levels of native and second language (usually unified one) depending on the requirements specified in teachers' guidelines; helps to improve foreign language skills and integrate new specialist into community
Inter-subject links or integrated approach	Learning mathematics in combination with other subjects; building integrated understanding of professional activity and formation of readiness to solve difficult professional tasks in the sphere of mathematics; deals with introduction of mathematics notions and skills into other educational procedures and wide use of metacognition; contributes to the critical thinking development.
Mobile learning	Learning with portable devices like mobile phones, tablets, and laptops; helps to use a variety of educational videos and e-learning apps; helps to easy access, cover huge distances, test knowledge, and provides various content; used to encourage students to learning activities.
Microteaching	Refers to the explanation of new material in small portions by shaping the role of teacher and student; helps to reduce complexness of learning content; provides feedback and purposeful comments; contributes to formation of team building and leadership skills; helps to revise material and increases learning outcomes significantly.
Gamification	Includes play and fun activities in the classroom but students do not realize that they are learning as all the activities relate to mathematics; helps to apply content in different situations; engages students in the classroom; explains new material in simplified way; facilitate students and helps to self-evaluate; creates better understanding of new theory.

ICT use	Deals with networks that provide new opportunities for teaching-learning model through digital content; suggests using virtual environment, simulator, digital libraries, computer-assisted conferencing; enables students to solve difficult problems; contributes to gaining and discovering new meaning; helps to preserve deep knowledge; maintains high level of digital and technology literacy; improves critical thinking.
Flipped classroom	The method when the teaching content and activities are provided online to the students in advance before they attend the classroom; provides an access and review to new materials at students' pace; can be implemented through peer-learning when senior or more experienced students assist learning material; creates more active learning; increases motivation.

Source: based on literature review and survey results.

It was found that implementation of innovative teaching strategies depend on teachers' competency and innovative thinking. A teacher always plays an important part in developing mathematical ability among students. Teachers are called the hub of any educational process and the educational program will fail if the quality of teachers is compromised (Sethi, 2021). According to Mondal (2019), a professional teacher who is interested in innovative teaching strategies undergoes advanced training, maintains integrity of educational material, uses interactive techniques, implements ICT extensively, and encourages students.

The findings show that teachers need to take a number of measures to make the educational process more efficient. These measures include:

- 1) Plan the lesson properly and choose different strategies in the classroom, paying attention to the use of ICT and interactive learning;
- 2) Make the lesson dynamic not dogmatic, apply game-based approach and play-way activities to teach mathematics skills;
- 3) Orient students towards future professional activity, train them to be flexible while solving professional tasks and focus upon formation of high level of mathematics skills among students through different techniques and methods;
- 4) Maintain inter-subject links and provide integration of mathematics into other subjects to build integrated vision of professional activity;
- 5) Use high-quality bilingual textbooks and teaching-learning materials so that students enable to think and speak about both in their home language/mother tongue and in English;
- 6) Explain the importance of mathematics for the development of society and India's future including the development of such prospective fields like artificial intelligence, machine learning, and data science, etc.

Thus, the training of future mathematicians in Indian higher educational institutions requires gradual and relevant implementation of innovative teaching strategies in order to make the educational process more efficient and to prepare future specialists to act in changing professional environment. Innovative teaching strategies significantly improve the educational process increasing students'

learning outcomes and personal development. At the same time, traditional teaching strategies cannot be completely excluded from mathematics education as they maintain values, moral and social skills maintain national identity and help to educate future citizens of the country.

Conclusions and Implications

Methodology of mathematics education is a multi-aspect phenomenon, independent, dynamic and complex system of teaching strategies influencing the level of mathematics knowledge and skills as well as ensuring a sufficient level of professional-mathematics skills. The study shows that the selection of appropriate teaching strategies is very important to make the educational process more efficient. Nowadays there are two categories of teaching strategies in mathematics education: traditional and innovative.

Traditional teaching strategies are still widely used in Indian educational institutions. The findings demonstrate that traditional strategies are the following: exercise and practice, home assignments, analysis and correction of home assignments, oral lectures, written tasks, group work, self-study, supervised study, review, problem solving, chalk and talk method, real time example, panel discussion, laboratory work. However currently traditional teaching strategies show less efficiency and teachers using traditional teaching-learning model face a number of difficulties including preparing a poor lesson plan, different students' abilities and difficulties to assess all the learners Inability to integrate ICT to pedagogy Necessity to incorporate game-based approach and play-way learning, irrelevant features of learning environment and requirement to maintain more balanced classroom environment, change of learning styles, necessity to create encouraging materials for advanced learning.

This fact confirms that currently innovations are essential to present qualitative changes in the system of education. The main purpose of innovative teaching strategies is to make teaching mathematics more interactive as well as effective. Innovations improve methodological approaches, teaching methods or tools, facilitates the educational process. The survey shows that teachers use the following innovative teaching strategies: bilingual education, inter-subject links or integrated approach, mobile learning, microteaching, gamification, ICT, flipped classroom, personalized learning. These strategies improve learning outcomes and mathematics skills among students, affect creativity, communication skills, decision-making, and professional flexibility positively, improve development of creativity, enhance motivation to learning activities, increase interest to professional activity, provide better understanding of materials, form students' professional competency, and contribute to formation of decision-making skills.

It was found that implementation of innovative teaching strategies depend on teachers' competency and innovative thinking. A teacher always plays an important part in developing mathematical ability among students. The study enabled the elaboration of the measures to be taken by mathematics teachers in higher educational institutions in order to make the educational process more efficient.

References

Abd Algani, Y. M., & Eshan, J. (2023). *Modern educational methods in teaching mathematics: Changing thoughts*. Cambridge Scholars Publishers.

- Acharya, N., & Johny, J. (2020). Innovative teaching-learning practices for higher education institutes – Mumbai (India). *SFIMAR Research Review*, 15(2). <https://ibmrjournal.in/index.php/srr/article/view/169343/0>
- Aggarwal, R. (2022). Approaches to enhance mathematical thinking to realize NEP 2020 vision for young learners. *International Journal of Innovative Science and Research Technology*, 7(4), 557–561. [https://ijisrt.com/assets/upload/files/IJISRT22APR568_\(1\).pdf](https://ijisrt.com/assets/upload/files/IJISRT22APR568_(1).pdf)
- Albina, A. P. (2018). Effectiveness of E-content in teaching of mathematics education among B. Ed. student-teachers. *American Journal of Educational Research*, 6(7), 1021–1028. <https://doi.org/10.12691/education-6-7-20>
- Bhinder, N. (2018). Innovatsiini tekhnolohii u protsesi profesiinoi pidhotovky prykordonnykiv u Respublitsi Indiiia [Innovative technologies in the process of professional training of border guards in the Republic of India]. *The Scientific Issues of Ternopil Volodymyr Hnatiuk National Pedagogical University. Series: Pedagogy*, (2), 132–139. <https://doi.org/10.25128/2415-3605.18.2.18>
- Borikar, S. M. & Seikdar, S. M. (2019). Education of mathematics in India and Japan at the pre-college level: A comparison & contrast. *International Journal of Research & Review*, 6(1), 208–210. https://www.ijrrjournal.com/IJRR_Vol.6_Issue.1_Jan2019/IJRR0031.pdf
- Castelino, A. D., & Hegde, C. (2020). *Mathematics: Self learning material for B.Ed. Degree Programme (Open and distance learning) of second year*. Karnataka: Mangalore University. [https://mangaloreuniversity.ac.in/sites/default/files/2020/Course-8\(b\)%20Mathematics.pdf](https://mangaloreuniversity.ac.in/sites/default/files/2020/Course-8(b)%20Mathematics.pdf)
- Chand, B., & Das, K. (2022a). Indian Vedic science and mathematics education. *International Journal of Creative Research Thought*, 10(7), 537–546. <https://www.ijcrt.org/archive.php?vol=10&issue=7&pubmonth=July-2022>
- Chand, B., & Das, K. (2022b). Effective micro-teaching skills for pre-service mathematics teachers' teaching practices and improve self-efficacy. *International Journal of Current Science*, 12(3), 72–78.
- Chorlay, R., Clark, K. M., & Tzanakis, C. (2022). History of mathematics in mathematics education: Recent developments in the field. *ZDM Mathematics Education*, 54, 1407–1420. <https://doi.org/10.1007/s11858-022-01442-7>
- Das, K., & Gupta, M. (2020). Action research on mathematics phobia among secondary school students. *International Journal of Indonesian Education and Teaching*, 4(2), 239–250. <https://doi.org/10.24071/ijiet.2020.040207>
- Das, S. K. (2019d). A study of teacher's mathematics pedagogical content knowledge (MPCK) and its effect on students' attitude towards mathematics and scholastic achievement in mathematics of secondary level students of Negaland. *Insight: Journal of Applied Research in Education*, 24(1), 201–215. <http://education.uok.edu.in/Files/4f96dde9-9a35-46c7-9b3e-c80291ed5689/Journal/f7047c0e-7ffe-49c3-b17a-18d63fef3f8d.pdf>
- Das, K. (2019a). Pedagogical approaches in mathematics: Indian perspectives and practices. *International Journal of All Research Writings*, 1(3), 16–21.

<http://www.ijarw.com/Users/ManuScript/PastIssueDetails/66ef8948-e0bc-4f3b-8f6d-5a6779eac5fc#>

- Das, K. (2019b). Significant of mathematics laboratory activities for teaching and learning. *International Journal on Integrated Education*, 2(5), 19–25. <https://doi.org/10.31149/ijie.v2i5.138>
- Das, K. (2019c). Role of ICT for better mathematics teaching. *Shanlax: International Journal of Education*, 7(4), 19–28. <https://doi.org/10.34293/education.v7i4.641>
- Das, K. (2021). Digital technologies on mathematics education at the Covid-19 lockdown situation in India. *Indonesian Journal of Innovation and Applied Sciences*, 1(2), <https://doi.org/10.47540/ijias.v1i2.197>
- Das, K., Mondal, R., Chowdhury, R., Boral, D., & Paul, R. (2019). Applications of mathematical knowledge in history, geography, fine-arts & physical education subjects in two-year B.Ed. programme: Indian context. *Journal of Emerging Technologies and Innovative Research*, 6(6), 8–15. <https://www.jetir.org/archive?v=6&i=6&j=June%202019>
- Dimple. (2018). Role of innovation in Indian education. *International Journal of Advanced Research in Commerce, Management & Social Science*, 1(2), 29–33. <https://inspirajournals.com/uploads/Issues/2026902431.pdf>
- Government of India. (2020a). *All India survey on higher education (AISHE) 2019-20*. https://www.education.gov.in/sites/upload_files/mhrd/files/statistics-new/aishe_eng.pdf
- Government of India. (2020b). *National education policy 2020*. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
- Government of India. (2021). *All India survey on higher education (AISHE) 2020-21*. <https://aishe.gov.in/aishe/viewDocument.action?documentId=321>
- Mondal, A. (2019). Teaching as a profession in Indian context – A debatable issue. *Research and Reflections on Education*, 17(3). <https://www.sxcejournals.com/jul-sep-2019/paper2.pdf>
- Mondal, M., & Roy, S. C. (2021). Contemporary techniques of teaching in education. *International Journal of Creative Research Thoughts*, 9(1), 4609–4613. <https://www.ijcrt.org/papers/IJCRT2101564.pdf>
- Munna, A. S., & Kalam, A. (2021). Teaching and learning process to enhance teaching effectiveness: A literature review. *International Journal of Humanities and Innovation*, 4(1), 1–4. <https://files.eric.ed.gov/fulltext/ED610428.pdf>
- Naga Subramani, P. C., & Iyappan, V. (2018). Innovative methods of teaching and learning. *Journal of Applied and Advanced Research*, 3(1), 20–22. <https://dx.doi.org/10.21839/jaar.2018.v3S1.161>
- Nishitha, S. K. S. (2019). A study on modern teaching methodologies and its influence on work-life balance. *Think India Journal*, 22(14), 8559–8565. <https://thinkindiaquarterly.org/index.php/think-india/article/view/15116>
- Puranik, S. (2022). Innovative teaching methods in higher education. *BSSS Journal of Education*, 9(1), 61–75. <https://doi.org/10.51767/je0907>

- Sharma, H. L., & Priyamvada (2022). Innovative teaching strategies to foster critical thinking: A review. *International Journal of Creative Research Thoughts*, 10(5), 883–889. <https://ijcrt.org/papers/IJCRT2205558.pdf>
- Satapathy, A., & Malhotra, S. (2020). Promoting research and innovation in teacher education. *Amity International Journal of Teacher Education*, 6(1). <https://www.amity.edu/aen/aijte/articles2020/PROMOTING.pdf>
- Sethi, S. (2021). A Study on Problems in Teaching Mathematics at Upper-Primary Level of Khurda District, Odisha. *DEI-FOERAA*, 1, 1-7. <https://www.dei.ac.in/dei/deifoeraa/files/A%20Study%20on%20Problems%20in%20Teaching%20Mathematics%20at%20Upper-Primary%20Level%20of%20Khurda%20District,%20Odisha.pdf>
- Umam, K., Nusantara, T., Parta, I. N., Hidayanto, E., & Mulyono, H. (2019). An application of flipped classroom in mathematics teacher education programme. *International Journal of Interactive Mobile Technologies*, 13(03), 68–80. <https://doi.org/10.3991/ijim.v13i03.10207>
- Verma, G. (2019). Jugaad thinking: Contextualized innovative thinking in india through science, technology, engineering, and mathematics (STEM) education?. In R. Koul, G. Verma, & V. Nargund-Joshi (Eds.), *Science education in India* (pp. 3–26). Singapore: Springer. https://doi.org/10.1007/978-981-13-9593-2_1

DOI: <https://doi.org/10.57125/FED.2023.25.03.03>

How to cite: Humeniuk, T., & Romaniuk, P. (2023). On the Development of Information and Communication Technologies in Education of the Future: The Possibilities of Cloud Computing Technology, *Futurity Education*, 3(1), 34–44. <https://doi.org/10.57125/FED.2023.25.03.03>

On the Development of Information and Communication Technologies in Education of the Future: The Possibilities of Cloud Computing Technology

Tetiana Humeniuk*

PhD, specialty - Theory and teaching methods (technical disciplines), Associate Professor, Senior Specialist Accreditation Department National Agency for Higher Education Quality Assurance (NAQA), Kyiv, Ukraine, <https://orcid.org/0000-0003-2826-8079>

Pavlo Romaniuk

Senior Programmer/Developer, Capgemini America Inc, <https://orcid.org/0000-0003-3821-2183>

***Correspondence email:** Gumenyuktb@ukr.net.

Received: December 4, 2022 | **Accepted:** January 19, 2023 | **Published:** March 25, 2023

Abstract: Information and communication technologies have created a real revolution in various spheres of activity and the field of education is no exception. Online learning is becoming increasingly important, especially with the evolution of new information and communication technologies. Consequently, the purpose of the article is to consider the experience of using and implementing information technology in the educational process, informatization of education, the spread of cloud technology, and the popularization of the use of cloud computing technology. This IT tool is adapted for easier access to a database or services through a secure virtual space. It is also an efficient solution for storing and accessing information at any time. The growth of digital literacy is accompanied by the institutionalization of the use of information and communication technology (ICT) in education. As a result of the process of selection and verification over a large number of scientific papers involved in the topic, only the 20 most current sources from 2018-2022 were selected for this analysis. The paper used

scientific methods such as analysis and synthesis. Several examples of cloud computing technology in education were selected for analysis. The synthesis method identified the main drawbacks and The conclusion notes that digital innovation has proven its usefulness in accompanying, enriching, and transforming education, and has the potential to accelerate progress toward the goal of sustainable development for education and transforming overall access to learning. This will help strengthen the quality and relevance of learning, reinforce inclusion, and improve the administration and management of education. In times of crisis, distance learning can be used to mitigate educational disruptions and closures.

Keywords: information and communication technologies, cloud computing technologies, virtual space, education of the future, digital development.

Introduction

Cloud computing is a paradigm for large-scale distributed computing that leverages existing technologies such as virtualization, service orientation, and network computing. They offer another way to acquire and manage IT resources on a large scale. Today, cloud computing technologies are in the service of education. This is especially due to the healthcare crisis, which has multiplied the need for e-learning. The events of 2020 were decisive for the development of IT technology because of the coronavirus pandemic. The pandemic also led to the most significant crisis in education. Education was one of the sectors most affected by the pandemic (Alshammari & Aldribi, 2021). Indeed, many schools and universities have been forced to switch to an online learning format. Faced with this situation, distance learning and online exchanges became lifesavers. If the field of education was beginning to debut in the digital world, the proliferation of Covid-19 accelerated this process (Ali & Alourani, 2021). In this aspect, the use of cloud computing technology is becoming more and more in demand in education. This solution for storing and managing data has overcome various geographical and medical limitations caused by geopolitical shifts. The use of the Cloud has been revolutionary for education (Ali, 2021). The past three years have been marked primarily by the virtualization of IT resources and improved availability of educational resources. Most institutions associated with the education sector have had to adjust their cloud computing strategies in order to realize their digital transformation project (Darwish et al., 2019). The use of cloud computing solves the new requirements of the subjects of education in the digital transition. It provides an opportunity for new teaching methodologies. On the one hand, it is a way to help students learn more creatively and interactively. In addition, the use of cloud computing allows educators to monitor their students' work more closely, even remotely.

Research Problem

Since cloud computing is associated with many benefits, the problematic of this paper is to analyze the use of cloud computing that facilitates access to various educational resources. The most popular platforms for education are selected and their advantages and disadvantages are described.

Research Focus

Analyzes how information and communication technology (ICT) can affect learning, digital literacy, and the ability to integrate it into the curriculum. Emphasizes the need for some action on the use of ICT in education, including: conducting cost-benefit analyses, supporting teachers and students

to use it effectively. Aspects and digital literacy and skills are examined. Shows how these aspects of IT digital literacy have changed the way we live, work, and learn.

Research Aim and Research Questions

The work aims to investigate the development of information and communication technologies in education of the future and the possibilities of cloud computing technology. Objectives: to describe the advantages and disadvantages of using cloud computing technology in education, to describe the experience of using the platforms Coursera, EDX, Udacity, NetExplorer, Microsoft Azure for Research, Microsoft Sharepoint, OneNote, Microsoft Teams, and InTune.

Research Methodology

General Background

The study provided examples of how the literature explores the use of cloud computing. The main advantages and disadvantages of using ICT in education were identified.

Sample / Participants / Group

The complex nature of this work requires it to be divided into stages. At the first stage, the most popular European ICT platforms were identified through analysis and synthesis. In particular, their main advantages and disadvantages are identified.

Instrument and Procedures

The second stage of the study involved a comparative analysis of cloud computing platforms. The comparison was made by comparing the capabilities of platforms actively used in education, as well as by analyzing the research results cited in the scientific literature.

Data Analysis

The third stage of the study determined the advantages of using ICT in education and the advantages and disadvantages of the selected platforms Coursera, EDX, Udacity, NetExplorer, Microsoft Azure for Research, Microsoft Sharepoint, OneNote, Microsoft Teams, and InTune. The conclusions summarize the advantages and disadvantages present in all platforms.

Research Results

In education, there is a significant amount of data produced regularly. All of this digital data is completely secure in the cloud, like NetExplorer, which is very popular in French education (Siddiqui et al., 2019). The data is hosted on servers, whether it is written documents, videos, images, or others. Access to this type of platform is protected by username and password. This avoids the risk of losing or leaking information, from exam results to personal student information. This is a much better solution than archiving physical documents.

Of course, the level of data security depends entirely on the provider in question. NetExplorer ensures that its customers' databases are protected from damage. Moreover, the storage centers of this provider are ISO 27001 certified (Al-Malah et al., 2021). Speaking of the benefits of cloud computing technologies, the first thing to note is that they are a low-investment solution. They also require little infrastructure and IT resources to manage. Using this type of system does not require ultra-modern

hardware, as the software is installed on a remote server. Workstations are used only to connect to the Cloud via the Internet. No expensive antivirus is required to protect data (Iatsyshyn et al., 2019).

In addition, it is the company in charge of the Cloud that takes care of the various upgrades and server management. The cloud user only pays for what they use. The cloud is accessible from all types of devices, be it a computer, tablet, or even a cell phone, making it a particularly suitable solution for supporting distance learning and accessing educational resources during social distance (Balyer & Öz, 2018).

Regardless of the education seeker's specialization, everyone ends up looking for a variety of textbooks and resources for their learning interests. Of course, physical resources have their advantages, but these resources are available digitally and have become available through cloud technology. Each cloud has features such as personal profile information, data access, and a managed firewall. They also give the education system transparent accountability. Yes, school administrators can have access to how, by whom, and when their platform is used. But on an individual level, the cloud gives maximum privacy (Bond et al., 2018). And it doesn't stop there - the cloud stores academic data with the ability to recover from data corruption or loss. Any data corruption is detectable.

In addition to all the benefits, cloud technology contributes to an innovative education system. The education system is constantly evolving and cloud technology makes it exciting. For example, in higher education in Spain, many courses are already available on platforms such as Coursera, EDX, and Udacity. The following are some of the most important benefits. Things like overcoming language barriers, cultural differences, and a number of other benefits are also a result of cloud technologies. They are the modern driving force of the global education system and with constant innovation will only get better (Table 1).

Table 1

The Benefits of Cloud Computing for Learning

Positive characteristics	The advantage
Higher education is not necessarily available worldwide. The physical payment process is long and inconvenient. The introduction of cloud-based digital payments makes it easier to pay for funds. Paying your tuition and getting a receipt takes just a minute.	Cloud training for digital payments
Using these collaboration tools, you can instantly share your research or scholarly work. While the availability of cloud technology helps students and faculty collaborate quickly, it also helps universities. Given the presence of different bodies, they can easily deploy collaboration systems to share information across the institution. This saves everyone time and helps with global innovation.	Cloud collaboration
It's at the heart of the cloud technology powering the education industry. It leads to a variety of overall improvements, from the ease of learning to the administrators running the institution. The number of staff is decreasing.	Automation

The ability to communicate over the Internet using cloud-based platforms reduces interaction time. With online education, everyone has a separate account and content management system where everything is organized automatically. Overall, by reducing the time to communicate and automating, task completion is greatly improved.	Efficiency
The ability to communicate, share resources, and perform different tasks from anywhere (and anytime) is exciting. These are some of the main reasons why cloud technology is rapidly being adopted across all sectors of education. It brings flexibility to the higher education sector, which was impossible without cloud technology.	Cloud application flexibility
Everything is hyper-accessible. By logging into a university portal, you can access the resources you need without wasting time.	Easy access to resources
The need for physical infrastructure (and support), transportation costs, and many measures that cost money are reduced with cloud education.	Save Money
With cloud applications, the administration (or management) running the institution has access to detailed information. Understanding operational failures and reasons for success can help the dean's office make effective decisions.	Data-driven solutions
Scaling up cloud infrastructure is easier than physical expansion. Physical limitations may have limited the university's growth in the past. The institution can easily meet the demands of more and more students and resources. And all at a reduced time commitment.	Scalability
Cloud-based learning is safe. Every student, instructor, and administrator gets privacy to work on homework, questions, billing, etc.	Privacy and data protection

Source: author's own development.

Just as work is no longer tied to the office, learning is no longer confined to the classroom. Universities are creating a learning community that extends beyond the campus to help students and faculty where they are and at any given moment, with technology.

According to a review of the literature, it was found that European education predominantly uses Microsoft technology to make learning accessible to all students. Web design classes use a blended learning environment to give students access to the resources they need at any time through Microsoft Sharepoint. Instructors work via Skype and record each class as students view it. With a more flexible schedule, students who are pursuing two degrees or have work, family circumstances can study at the right time without compromising the quality of their learning.

Students use the OneNote notebook for class to collaborate remotely on different projects. This means that instructors can access OneNote and provide instant feedback even if a student is unable to attend class in person. OneNote's digital collaboration tools for classes are integrated with Microsoft Teams, a new tool that allows instructors to create a single digital hub for classes. With Teams, instructors can manage groups of projects, assign and grade tasks, invite outside speakers and embed video content from the Web, share content, and have real-time conversation topics. New tools like InTune for Education are more accessible to education. They're also easier and faster to set up and

managing hardware and new Windows 10 devices becomes easy. All of these elements allow educators to focus on learning rather than technology (Table 2).

Table 2

Advantages and Disadvantages of the Described Platforms

Platform	Advantages	Disadvantages
Coursera	Interactive platform; large selection of courses; free learning resources.	Course content is limited to academic subjects and professional skills; large membership contribution; some instructors shy away from the camera.
EDX	Nonprofit, open-ended platform; online education and promotion; new formats emerging all the time.	Passive learning; long instructional videos; mostly IT subjects certified.
Udacity	Simple design; project-based, active learning; cutting-edge content.	Pioneer in education; quite expensive; no app.
NetExplorer	Runtime - timely garbage collection; asynchronous model; the framework is robust.	Difficult to use; very many apps to the program itself; their quick "death".
Microsoft Azure for Research	Most popular among clouds; increased power and manageability; data security and retains large amounts of information.	Hybrid model, difficult for the average user; many services to support migration; need to take courses in use beforehand.
Microsoft Sharepoint	Uses fewer IT resources; personal library; low cost.	User resistance; file properties do not migrate; metadata is not stored.
OneNote	Overlaps all possible tasks; quick access to any data of arbitrary nature; has the form of notebooks organized by visual area.	Rather confusing workspace; operations to create your own notebook are complicated enough for a novice; when editing a document, there is no connection between the original document on disk and its copy in Onenote.
Microsoft Teams	Free app; easy to distribute tasks; no license required and easy to use.	Lack of notifications; similar and redundant tools; limited number of channels.
InTune	Easy to manage mobile apps from the cloud; workforce productivity; protect corporate data and integrate familiar apps into the cloud.	Unattractive interface; easily attacked by viruses; quite expensive.

Source: the table is the author's own development.

In addition to educational tasks, cloud programs are intensively used in science and ecology. For research-oriented higher education institutions, digital transformation provides the means to support influential research aimed at transforming the world. Microsoft Cloud provides researchers with

enterprise-class data storage, computing power, collaboration tools, and analytics while ensuring that they can work quickly and accurately with any combination of data sources in a secure, real-time environment, regardless of location.

With Microsoft Azure for Research, Microsoft offers free Azure storage and computing resources for innovative research projects such as the University of Oxford-led REACH initiative. The program uses Azure machine learning to help improve access to safe drinking water in Africa and Asia (Rashid & Chaturvedi, 2019).

Technology can enable students today to create the world of tomorrow. Students who are equipped by the education system today with digital skills will have brilliant careers and develop new technologies that are now unimaginable. Educators, parents, and technology companies have a responsibility to provide young people with the best education and tools to make this future a reality. Technology is the key to helping our students succeed, think creatively, and create a better world.

Discussion

In identifying the features of the platforms Coursera, EDX, Udacity, NetExplorer, Microsoft Azure for Research, Microsoft Sharepoint, OneNote, Microsoft Teams, InTune and reviewing academic sources, it is determined that the question of the power of technology to transform education is acute in academia today. According to Amani et al. (2020), if used properly, digital transformation can solve one of society's most pressing problems: the democratization of educational opportunities. According to European scholars, educational institutions need new strategic thinking, a better understanding of data, personalized services, and flexible infrastructure. The use of Coursera cloud computing programs is helping to create cognitive campuses that help teachers and students improve outcomes from kindergarten through higher education (Avidov-Ungar et al., 2022). It is solidified that this educational technology supports personalized learning, increases research capacity, and optimizes operations, leading to a greater cost-effectiveness in higher education. In the context of this paper, recall Cuellar (2002), who notes that to take advantage of digital transformation, all schools and universities must recognize that today's students learn differently than previous generations. And in this context, considers the Microsoft Azure for Research platform to be the most impactful. Bonfield et al. (2020) describe the disadvantages of using EDX specifically. Researchers consider one of the biggest challenges in using EDX for teachers to be interest and engaging the classroom because they think it is quite complex. Many educators think that using cloud computing technology "is a time- consuming process and so they try not to use it in their work, but their concerns are completely unhelpful". For a distance educator, the use of EDX documents is especially important. Cloud technologies are quite accessible to ordinary users. The basic concept of these technologies is the storage and processing of information by web servers. The user gets the result with a browser. Thanks to special web page commands, the owner can not only enter certain information but also modify it on his personal computer. For example, experience in European countries, including Ireland and Spain, where class sizes are larger than the OECD average, shows that teachers have difficulty controlling many of the factors that affect student learning. We believe that technology can improve them by encouraging more student engagement and highlighting important skills, such as creativity and collaboration, that students will need in future jobs. We agree that the power of extensive data and analytics makes individualized approaches possible in a group environment. Educational technologies such as Udacity, cloud-based hybrid computing, and data management improve learning environments, expanding learning potential, leading to better outcomes and more rewarding experiences for students (Mishra et al., 2020).

In the context of this work, note Shatri (2020) advising NetExplorer, Microsoft's enterprise-class cloud computing platform that provides computing power and analytics tools. But American scientists suggest using Microsoft Teams for education. Microsoft Teams data and educational technology allows North Carolina State University to find new solutions to help its students efficiently manage and analyze large amounts of structured and unstructured data from different sources Hawkrige (2022). Indeed, the European experience described above using additional cloud computing technologies such as Microsoft Sharepoint, OneNote, and InTune may be of interest to the modern student, it may be a way to better understand certain topics through explanatory images and videos. In addition, there is an opportunity to learn everything through the Internet and deepen your knowledge. The interactivity of certain tools allows for cognitive development. In this study, it was shown that students are able to understand a course better when it is designed through computer support and therefore promotes memorization and motivation.

There are many research papers on the benefits of using ICT and cloud technology in education. Wu and Plakhtii (2021) consider cloud technology to be especially important for schools receiving students who need an adapted educational path. This is especially true for dyslexic students who may require special attention (Holinska et al., 2019). To truly democratize education, these needs must be identified and supported by the right technology. supports this view by stating that for elementary school, Microsoft learning tools provide students with all the abilities to read independently (Mukhtoralievna & Tavakkalovna, 2022). The tool works by highlighting in real-time the words students read as they read. Although it should be noted that in some European educational institutions digital transformation is still regarded as a technology specific to themselves, but computers, electronic whiteboards, and e-books are referred to as tools only. Speaking about the benefits of ICT, Mukhtoralievna and Tavakkalovna (2022) touch on the problems of inclusiveness. Modern pedagogical technologies are aimed at improving the quality of education. Due to the development of inclusive education, teachers are required to improve their computer skills, to use different information and communication technologies for distance learning of children. In the traditional form classic e-mail is used. First, the teacher downloads the student's letter, writes it down, reads the information after running the program. Cloud technology in education allows the use of browser-based email. The teacher has the ability to download attachments, such as student tests, read emails on any computer that has access to the Web. Students have long been actively using cloud computing technology in education. For example, they upload music files and computer games to the repository. In addition, electronic aids can be placed in the virtual library. Nowadays, there are many servers to which data can be transferred with good image quality. For example, an instructor posts electronic textbooks and sends them to a student. When doing homework, he can use the video, audio clips available in the book. No more carrying textbooks in a briefcase or bringing them to the library after completing the syllabus for that discipline.

Indeed, with digital learning, educators who are fully aware of each student's situation can intervene early and provide students with the help they need to overcome barriers to learning. Computational cloud technology simplifies orientation and improves understanding of educational material. With these types of technologies, the education system can offer better and like training to educational subjects and, as a result, improve their performance at all levels. Cloud technologies, actively implemented in the educational process, allow to facilitate the work of the teacher, to increase the cognitive interest of students. Computerization of education is a prerequisite for the successful implementation of new standards and an opportunity for the personal development of a child. Thanks to ICTs, a teacher can monitor a child's development and his or her individual educational trajectory. Such technologies help overcome geographic, social, and political limitations. Currently, educators - actively use cloud storage, but many of them are still suspicious. Cloud technology has become possible

after the powerful development of hardware every day, there is an increase in the power of computer processors, upgraded multi-core architecture, increased hard drive capacity. In addition, faster and wider Internet channels are becoming available. Cloud technology in education is a set of software and hardware, through which the processing and implementation of learning objectives.

Conclusions and Implications

There is no single, universal definition of ICT, it is generally accepted that the term means all the devices, networked components, programs, and systems that collectively allow people and organizations to interact in the digital world. The main disadvantage of ICT in education is the incompetence of its implementation in the educational process or the direct lack of basic skills required to use it. Enough disadvantages of cloud computing platforms have been highlighted. Generalized disadvantages for all the platforms described above are the following: quite expensive price; certain platforms do not have applications; difficult to use; their rapid “death”; hybrid models, difficult for the average user; quite confusing workspace; easy to be attacked by viruses.

Nevertheless, cloud computing technologies go beyond the mere availability of technology because they facilitate learning and teaching. They are present in all spheres of modern life, so they play a fundamental role in the configuration of society and culture, so it is obvious that digital changes have also coincided in the educational systems of different countries, which has entailed many transformations due to the inclusion of these technologies. Among the generalized benefits are highlighted the following: they are interactive platforms with a large selection of courses; project-based, active learning; advanced content; increased power and ease of management; data security and retains large amounts of information; corporate data protection and integration of familiar applications in the cloud.

Modern education requires a reconfiguration of curricula at all levels. Digital tools as learning tools are gaining more meaning and pedagogical life depending on the curriculum in which they are introduced. Teachers are a key element of this change and therefore need to carry the innovative nature of education. Technological accessibility is much more complex than the existing knowledge for its application in teaching, so much effort is needed in developing didactic models that make original and effective use of information and communication technologies. We understand the function of modern learning as a bridge that helps to discover knowledge through information and communication technology. Among the many advantages, we highlight: convenience, automation, control, cost-effectiveness, reduced administrative burden. In addition, for students practicing multiple education at the same time or working, cloud computing technologies provide many ways to understand and process information, to explain certain concepts, and to express the acquired knowledge. Most students learn better through visual and tactile methods; ICTs can help them discover information on their own, rather than just reading and hearing. Mobile devices also offer programs (apps) that further support students with special needs with features such as simplified screens and instructions, logical menu layout and control features, illustrations combined with text, acoustic feedback, the ability to adjust speed and difficulty level, relevant and understandable information, and easy error correction. At this point, developing the appropriate use of ICT and cloud computing technology is a powerful tool for designing the education of the future.

References

- Ali, M. B. (2021). Multi-perspectives of cloud computing service adoption quality and risks in higher education. In M. Khosrow-Pour D.B.A. (Ed.), *Handbook of research on modern educational technologies, Applications, and Management* (pp. 1–19). IGI Global. <https://doi.org/10.4018/978-1-7998-3476-2.ch001>
- Ali, A., & Alourani, A. (2021). An investigation of cloud computing and E-learning for educational advancement. *International Journal of Computer Science & Network Security*, 21(11), 216–222. <https://doi.org/10.22937/IJCSNS.2021.21.11.30>
- Al-Malah, D. K. A. R., Aljazaery, I. A., Alrikabi, H. T. S., & Mutar, H. A. (2021). Cloud computing and its impact on online education. *IOP Conference Series: Materials Science and Engineering*, 1094, Article 012024. <https://doi.org/10.1088/1757-899X/1094/1/012024>
- Alshammari, A., & Aldribi, A. (2021). Apply machine learning techniques to detect malicious network traffic in cloud computing. *Journal of Big Data*, 8(1), Article 90. <https://doi.org/10.1186/s40537-021-00475-1>
- Amani, M., Ghorbanian, A., Ahmadi, S. A., Kakooei, M., Moghimi, A., Mirmazloumi, S. M., ... & Brisco, B. (2020). Google earth engine cloud computing platform for remote sensing big data applications: A comprehensive review. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 13, 5326–5350. <https://doi.org/10.1109/JSTARS.2020.3021052>
- Avidov-Ungar, O., Shamir-Inbal, T., & Blau, I. (2022). Typology of digital leadership roles tasked with integrating new technologies into teaching: Insights from metaphor analysis. *Journal of Research on Technology in Education*, 54(1), 92–107. <https://doi.org/10.1080/15391523.2020.1809035>
- Balyer, A., & Öz, Ö. (2018). Academicians' views on digital transformation in education. *International Online Journal of Education and Teaching*, 5(4), 809–830. <https://eric.ed.gov/?id=EJ1250526>
- Bond, M., Marín, V. I., Dolch, C., Bedenlier, S., & Zawacki-Richter, O. (2018). Digital transformation in German higher education: student and teacher perceptions and usage of digital media. *International Journal of Educational Technology in Higher Education*, 15(1), 1–20. <http://www.sciepub.com/reference/358175>
- Bonfield, C. A., Salter, M., Longmuir, A., Benson, M., & Adachi, C. (2020). Transformation or evolution?: Education 4.0, teaching and learning in the digital age. *Higher Education Pedagogies*, 5(1), 223–246. <https://doi.org/10.1080/23752696.2020.1816847>
- Cuellar, N. (2002). The transition from classroom to online teaching. *Nursing Forum*, 37(3), 5–13. <https://doi.org/10.1111/j.1744-6198.2002.tb01005.x>
- Darwish, A., Hassanien, A. E., Elhoseny, M., Sangaiah, A. K., & Muhammad, K. (2019). The impact of the hybrid platform of internet of things and cloud computing on healthcare systems: Opportunities, challenges, and open problems. *Journal of Ambient Intelligence and Humanized Computing*, 10(10), 4151–4166. <https://link.springer.com/article/10.1007/s12652-017-0659-1>
- Hawkridge, D. (2022). *New information technology in education*. Taylor & Francis. <https://doi.org/10.4324/9781003312826>

- Holinska, T., Komarovska, O., Melnyk, O., Pet'ko, L., Shpitsa, R., Sova, O., & Strohal, T. (2019). Cloud technologies in art entrepreneurship education. *Journal of Entrepreneurship Education*, 22(5). <https://lib.iitta.gov.ua/717935/1/Cloud-technologies-in-art-entrepreneurship-1528-2651-22-5-457.pdf>
- Iatsyshyn, A. V., Kovach, V. O., Romanenko, Y. O., & Iatsyshyn, A. V. (2019). Cloud services application ways for preparation of future PhD. In A. E. Kiv & V. N. Soloviev (Ed.), *Cloud technologies in education : Proceedings of the 6th workshop on cloud technologies in education (CTE 2018)* (pp. 197-216). <http://ceur-ws.org/Vol-2433/paper12.pdf>
- Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, 1, Article 100012. <https://doi.org/10.1016/j.ijedro.2020.100012>
- Mukhtoralievna, Z. S., & Tavakkalovna, A. G. (2022). History of information technologies in education. *Spanish Journal of Innovation and Integrity*, 6, 359–363. <http://sjii.indexedresearch.org/index.php/sjii/article/view/271>
- Rashid, A., & Chaturvedi, A. (2019). Cloud computing characteristics and services: A brief review. *International Journal of Computer Sciences and Engineering*, 7(2), 421–426. <https://doi.org/10.26438/ijcse/v7i2.421426>
- Shatri, Z. G. (2020). Advantages and disadvantages of using information technology in learning process of students. *Journal of Turkish Science Education*, 17(3), 420–428. <https://www.tused.org/index.php/tused/article/view/1099>
- Siddiqui, S. T., Alam, S., Khan, Z. A., & Gupta, A. (2019). Cloud-based e-learning: Using cloud computing platform for an effective e-learning. In S. Tiwari, M. Trivedi, K. Mishra, A. Misra, & K. Kumar (Eds.), *Smart Innovations in Communication and Computational Sciences, Volume 851* (pp. 335–346). Springer. https://doi.org/10.1007/978-981-13-2414-7_31
- Wu, W., & Plakhtii, A. (2021). E-learning based on cloud computing. *International Journal of Emerging Technologies in Learning (IJET)*, 16(10), 4–17. <https://www.learntechlib.org/p/220086/>

How to cite: Zinchenko, V., Dorosheva, A., & Mosiy, I., (2023). Innovative and Cultural Transformations of Educational Environment of the Future: Digitalization, Barriers for Traditional Learning. *Futurity Education*, 3(1), 45–62. <https://doi.org/10.57125/FED.2023.25.03.04>

Innovative and Cultural Transformations of Educational Environment of the Future: Digitalization, Barriers for Traditional Learning

Viktoriia Zinchenko

PhD in Pedagogical Sciences, Associate Professor Department of Social Humanities and Legal Disciplines, faculty №1, Donetsk State University of Internal Affairs, Kryvyi Rih Educational and Scientific Institute, Kryvyi Rih, Ukraine, <https://orcid.org/0000-0003-3080-4272>

Antonina Dorosheva

PhD in historical sciences, Assistant Professor, Prydnai Branch of Private joint-stock company "Higher educational institution "Interregional Academy of Personnel Management", Izmail, Ukraine, <https://orcid.org/0000-0003-3257-7173>

Iryna Mosiy*

Senior Lecturer, Ukrainian National Forestry University, Lviv, Ukraine, <https://orcid.org/0000-0002-5637-9799>

***Correspondence email:** mosiy.iryana.m@gmail.com.

Received: November 27, 2022 | **Accepted:** January 23, 2023 | **Published:** March 25, 2023

Abstract: The purpose of the article is to characterize innovative and cultural transformations of the educational environment on the principles of digitalization and the existing barriers. The objectives of the study were to find out the use of digital tools and to outline the barriers hindering their

implementation; to describe the efficient algorithm of implementation of innovative and cultural transformations. Within the framework of research, one analyzed 31 works devoted to the problems of transformations of educational environment and its digitalization from 2018 to 2022. As a result, theoretical research is linked to 5 articles. 4 articles described the prospects of future development of education under digital changes, and 6 studies were oriented towards the impact of COVID on digitalization. Also, the course of transformations in developed (USA, Finland, Norway, and Turkey) and developing countries (Ukraine, Pakistan, India, Bangladesh, Indonesia, Thailand, China) was analyzed. A systematic literature review and synthesis of conceptual research results on the problem were used. The case study to describe the peculiarities of implementation of digital technologies and to identify barriers of traditional learning within the educational process was carried out. To collect and process the data an interviewing, a pedagogical observation, an in-depth review, an open-ended survey, and methods of statistical analysis were used. The results evaluated that all the participants of the survey consider digitalization an effective innovative transformation and both teachers and learners have similar preference in using various digital tools. Also, the study revealed that teachers and learners face a number of barriers that complicate the educational process. To enhance the efficiency of educational environment and to achieve pedagogical intentions one outlined the measures to remove the barriers identified. The study showed that a barrier-free digital educational environment could enhance the efficiency of education of the future where learners will be prepared to various challenges of information society.

Keywords: digitalization, educational environment, transformation, mode, barriers.

Introduction

Education has always been a key determinant of stable society development, and the efficiency of education system ensuring remains an important issue. German pedagogue and education theorist F. Froebel admits that there are epochs when education has become the core concept of community interests. Definitely, one lives in the age when people have placed their great hopes on education. But each historical period imposes different requirements or social challenges (Dar, 2018). And certainly, today's reality brings new challenges for reformists, educators, or scientists that must be constantly taken into consideration and trigger effective transformations as education is oriented towards adequate and flexible development. Only if distinguishing education as the priority for future enhancement, it may lead to positive changes and modernization within the educational environment which will be able to combine harmoniously innovations and remove existing barriers of traditional learning.

Transformations of educational environment provide great opportunities to enhance the efficiency of education. Simultaneously, these transformations require significant changes within the organization of learning and removal of existing barriers since they hinder the development of methodological approaches and the implementation of innovative technologies or tools. Modern educational environment allows teachers to generate and transfer new knowledge, to form readiness to study under the circumstances affecting the educational process.

Under conditions of global threats and related large-scale changes, education faces new challenges that require rapid responses and transformations of all its components. The emergency switching to online learning caused by the COVID-19 pandemic and the deterioration of security conditions are a direct reflection of this new configuration of educational environment.

Development of digital economics as a strategic priority is oriented towards facilitation of digital technologies in different spheres of community. The new generation training for digital economics in general and preparation of every learner to act within the digital society in particular have become the key tasks of modern education.

The digitalization of educational environment is complicated, multidimensional, and long-term process related to change of objectives, content, organizational forms and methods of educational process. At the same time, digitalization leads to qualitative modifications and involves using innovative digital technologies for gradual transition to person-centered and result-oriented educational environment.

Therefore, the primary target of education of the future refers to the change of conventional educational paradigm into progressive cultural one that implements innovative development using wide- spreading digital technologies. As a result, the education focuses on mechanisms of self-actualization, self- development, self-protection, self-regulation, self-education and adaptation to innovations among new generations. It also reverses the negative trends within the educational environment of the future. In order to achieve this, it is necessary to outline innovative and cultural transformations of educational environment of the future considering digitalization and the necessity to remove barriers of traditional learning.

Research Problem

Education environment is changing due to rapid digital transformations and in this digital transition, education is gradually transforming as well (Akour & Alenezi, 2022), refocusing on different cultural values and cultivating cognitive, interpersonal, and intrapersonal skills among learners (Reimers, 2020). Consequently, educational environment of the future should be adapted according upcoming transformations and use them to enhance the efficiency of education.

Therefore, the analysis of innovative and cultural transformations including digitalization is very important as these transformations can be applied within the framework of changing educational environment. In addition, it is essential to elaborate the measures for removal of barriers of traditional learning in order to enhance the efficiency of education in future and prepare the today's learners to future challenges.

Research Focus

A transformation is understood as a long-term and quality process of adaptation to changes and implementation of innovations (Lata Narayan & Shailashri, 2021; Leal Filho et al., 2018; Reimers, 2020). At the same time, a transformation means the reason for converting and reforming the education system (Qutoshi, 2021; Reimers, 2020). According to García-Morales et al. (2021) and Leal Filho et al. (2018), a transformation is an objective process under the existing conditions of development. In the context of education, transformation is the creative implementation of innovative achievements within the educational environment. Positive transformations are usually well-organized and result-oriented. Also, they have value and motivation orientation (Akour & Alenezi, 2022; Batchenko et al., 2020). Therefore, transformation of the educational environment concerns structural and quality change in order to implement essential innovations.

The modernization of education and application of fundamental transformations for the future are actively discussed. Modernization of education is not about education as an amount of knowledge, it's

about the way people are educated. Moreover, it brings to a new level of innovative skills for teachers and students (Armila et al., 2022). Digitalization is a priority direction of modernization transformations; it is often called unavoidable process within the educational environment that will certainly intensify in future (Balyer & Öz, 2018; García-Morales et al., 2021). It is important to consider them while preparing action plans or strategic vision of education system development.

Digitalization of educational environment is a pervasive phenomenon (Gopal, 2020) that means extensive use of digital technologies (Armila et al., 2022; Islam & Jahan, 2018) that, in return, form a meaningful approach to significant changes in education (Pu, 2022). According to Anggraini and Handayani dan (2021), digitalization deals with implementation of digital technologies to modernize and maximize the educational process. At the same time, in education digitalization refers to distant and algorithm- based application (Armila et al., 2022). In some findings it is called pedagogical revolution (Gopal, 2020). These definitions testify that digitalization of education environment is widely applicable within the educational environment and it will only accelerate.

Today, the knowledge transfer and acquisition, formation of skills and abilities is effectuated through computer and network; learning material requires to use new methods, forms, and instruments of formation of knowledge and skills that are appropriate for the current and, obviously, for the future educational environment (Anggraini & Handayani dan, 2021). Digitalization changes the principles of organization and structure of educational environment. It is very much in need for the development of new courses and educational materials, continuous improvement and modification of teaching methods.

The digitalization as an innovative transformation encourages simplification of educational process making it more flexible (Balyer & Öz, 2018) and adaptive to modern realities and contributes to building of good professionals from today's learners (Pu, 2022). At the same time, digitalization is believed to enhance the quality of education (Armila et al., 2022). Digital technologies allow increasing the learning outcomes, collect data on teaching efficiently. Due to digitalization new possibilities arise; they go beyond traditional learning and help to remove the barriers that complicate the educational process (Islam & Jahan, 2018). This quality helps not only to enhance the efficiency of educational process but rapidly solve the problems within the educational environment.

Also, digitalization of educational environment causes mobility, continuity, and individualization of educational process (Balyer & Öz, 2018) and an educational institution converts into a space for innovations (Lata Narayan & Shailashri, 2021). It is necessary to admit that digitalization affects and changes educational content management, teaching methods, instruments and technologies, organizational forms and cognitive activity of learners. It suggests a combination of individual and group work, unlimited time for learning that create favorable environment for feedback and development of personalized learning plans (Ugur, 2020). Some scholars emphasize that digitalization is closely connected with the use of information and communication technologies (ICT) (Ali et al., 2022) or virtual classroom (Soodtoetong & Rattanasiriwongwut, 2022). These characters of digitalization signals constantly change and take place in developing countries more deeply and intensively as they had to improve not only content or methodical base but IT infrastructure.

The digitalization suggests a fundamentally new format of educational environment that provides easy and accessible services and platforms for more efficient interaction of all participants of educational process, enhancement of its transparency (Anggraini & Handayani dan, 2021). To understand the nature of digitalization better, it is necessary to outline its modes within the educational environment. Jakoet-Salie and Ramalobe (2022) claim that digital educational environment exists in

three different modes: in- class mode with the use of ICT, mediated learning, blended learning, and fully online mode (Table 1). The transition to blended learning or fully online mode was mostly affected by the pandemic and the current period is called post-COVID stage of education transformation (Meshram, 2020; Zhao & Watterston, 2021) that means we will see even more changes and modification in future.

Table 1

Modes of Digital Educational Environment

Mode	Description
In-class mode with the use of ICT or simplified mode	Refers to instruction in the classroom and suggests using of different ICT to present new material, perform reproductive and productive tasks, and assess learning outcomes.
Mediated learning	Involves training in the classroom but requires extensive use of digital tools including web pages, electronic schedule, and digital dissemination of material, online quizzes and streaming videos.
Blended learning	Blends online and face-to-face training. Suggests delivering lectures and some discussions online but seminars or panel discussion are organized in the form of face-to-face meeting.
Fully online mode	All activities take place online including discussions, seminars, assessment sessions and delivering presentations.

Source: Jakoet-Salie and Ramalobe (2022).

The use of different modes testifies that there are different approaches to educational process organization and building of educational environment. The application of certain mode depends on various factors like learning objectives, external conditions, existing resources and readiness of educational environment. Teachers may practice different modes in specific situation. Depending on learners' needs a teacher may also mix them during the learning period. Obviously, certain mode demands the implementation of specific instructional techniques, the use of technical aids, and support services. Each mode imposes the requirement to teachers and educational institutions. According Haleem et al. (2022), main requirements to organize efficient digital educational environment include: creation of learning resources and digital platforms that support interactive multimedia content available for teachers and learners; development and implementation of innovative multimedia and computer-based educational instruments to build digital educational environment (multimedia classrooms, laboratories, integrated groups, mixed learning groups, etc.); development of blended or fully online learning with the use of cognitive and multimedia technologies. Sinku (2021) also adds the importance of online curriculum management systems use. The implementation of ICT and technological infrastructure encourages further development of innovations and intensification of organization, structural, cultural, educational and methodological changes within the educational environment (Iswari, 2019). Digital technologies possess a significant didactic potential (Ugur, 2020), that simplify the search for information, its personalization or orientation towards learners' needs, interactivity, multimedia, specific cultural features. Such innovations create the situation of comfort and remove barriers. Therefore, the digitalization of educational environment is caused by the necessity of extensive use of innovative technologies, new requirements for forming key competencies of future

professionals and upbringing of new digital generation with special social and psychological characteristic and cultural profile. Petersen and Bartel (2022) found that cultural transformations affect instructional and management approaches within the educational environment and contribute to the overall success of new era of education.

At the same time, digitalization of education promotes sociotechnological cultural transformations, sociocultural and socioeconomic modernization (Armila et al., 2022) as well as organizational-culture change (Briody et al., 2021) within the society and educational process in particular. Digital transformations of educational environment require development of a high-performing digital education ecosystem and the improvement of digital skills and competencies among the participants of educational process (Stanković, 2021).

At the same time, implementation of innovative and digital technologies may face a number of certain barriers. They include the following categories: vision or clarity, strategy and policy including the absence of action plan, resources like experts, funds and time, insufficient leadership, low level of digital skills and knowledge of instructors and learners, poor IT infrastructure and IT support service, low adaptability to innovation, poor resistance to change, inadequate government and economic measures (Aditya et al., 2021). According to Latifah et al. (2022) cultural barriers should be separately identified and they affect instructional techniques, leadership of educational process, management of educational institution, and, in fact, change educational environment building its new framework. Besides, Erstad et al. (2021) claim that overcoming of barriers of digital educational environment require an immediate improvement of two components – logistics and content.

Due to a well-organized and barrier-less innovative environment, the education is getting more available and comfortable; it also requires lower financial costs, time and human resources (Jakoet-Salie & Ramalobe, 2022; Lata Narayan & Shailashri, 2021). It is not only important to use innovative technologies and digital instruments but to choose the most appropriate ones, combine them and manage to make the educational process more efficient.

Research Aim and Research Questions

The purpose of the article is to characterize innovative and cultural transformations of the educational environment of the future on the principles of digitalization and the necessity to remove barriers of traditional learning.

The article objectives are the following:

- to carry out an open survey among teachers and learners to find out the use of digital tools within the educational environment peculiarities;
- to outline the barriers typical for traditional learning and hindering the implementation of digital tools;
- to describe the efficient algorithm of implementation of innovative and cultural transformations within the educational environment of the future considering objective advantages of digitalization and barriers of traditional learning.

Research Methodology

General Background

To conduct the research, a number of theoretical methods like systematic literature review, synthesis of conceptual research results on the problem of innovative tendencies in education, modernization of educational process and digitalization of educational environment) were used. As well a case study in order to analyze the problem of implementation of digital technologies and to identify barriers of traditional learning within the educational process was carried out. To collect and process the data one used the following methods: interviewing, pedagogical observation, and in-depth review, open- ended survey among teachers and learners, and methods of statistical analysis.

Sample / Participants / Group

In the study we involved 72 teachers and 118 learners of different educational institutions from different regions of the country during 2021-2022 academic years. The survey was conducted through online forms. All the participants agreed to fill in the forms voluntarily and they were explained about the study aim, its procedures and stages. The teachers and learners answered independently; they did not discuss their answers with each other. When the data processing was finalized, they were informed about the results.

Instrument and Procedures

All the participants of the study (both teachers and learners) interacted within the educational environment. The teachers were responsible for the implementation of digital tools and enhancement the efficiency of digital educational environment. Also, teachers and learners were asked about the barriers hindering the efficiency of learning. The survey was organized with the use of online forms with open- ended questions.

The respondents were interviewed in order to obtain relevant information on the research and to outline the limits of the pedagogical problem. First of all, the questions covered the principles of implementation of digital educational environment, the main digital tools used within the educational process and the barriers hindering the learning achievements. The form included the following questions:

- Do you agree that digitalization is important requirement of modern educational environment?
- Do you find digitalization advantageous?
- What advantages of digitalization can you name? (Provide at least three advantages)
- What mode of digital educational environment do you experience? (e.g., in-class mode with the use of ICT or simplified mode, mediated learning, blended learning, fully online mode, or none of these and prefer traditional instruction)
- What digital tools do you prefer?
- How often do you use digital tools?
- Why do you use digital tools and technologies (e.g., for presenting information, for assessment, for self-study, for preparation of initiative projects)?

- How do you assess the efficiency of educational process you interact in?
- What barriers do you face? (Name at least three barriers)
- What improvements would you recommend to enhance the efficiency of educational process?
- What type of educational environment do you prefer: innovative or traditional?
- Do you agree with the statement that digital tools will only extend in future? If yes, why?
- What level of digital competency do you possess in your opinion? Do you regularly work on its enhancement?

Data Analysis

Having analyzed the obtained data, one outlined the peculiarities of the use of digital tools within the educational environment; the barriers hindering the implementation of digital tools were outlined and the efficient algorithm of implementation of innovative and cultural transformations within the educational environment that can be applicable for the future was described. The findings of the case study are presented in Research Results and Discussion parts of the article.

Research Results

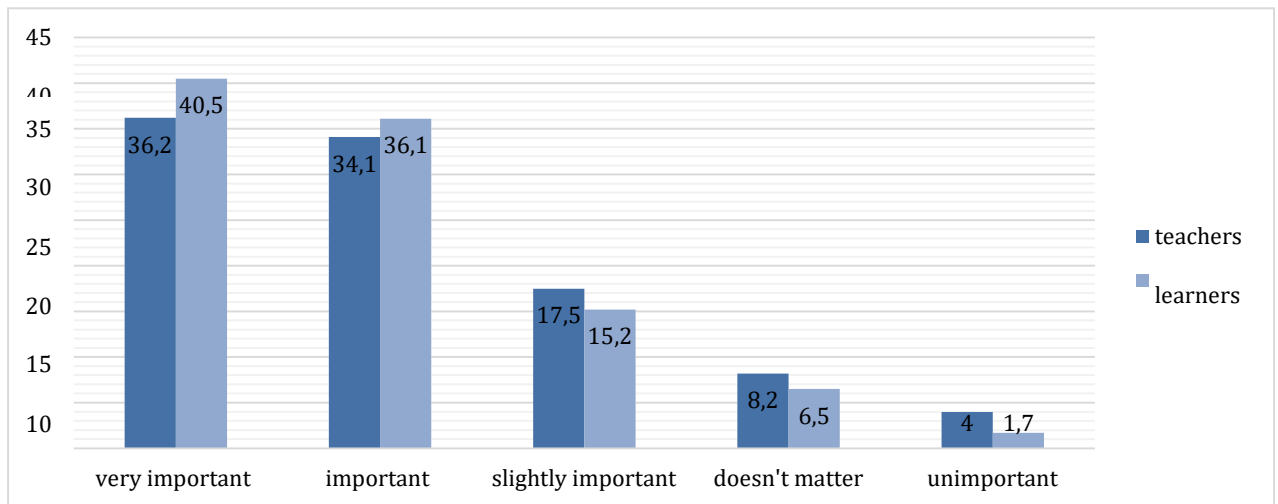
The findings showed that both teachers and learners consider digitalization as an effective innovative transformation and agree that it will extend in future. Figure 1 shows the attitudes of participants to digitalization.

Thus, the findings show that most of respondents assess digitalization positively. 36,2 % of teachers consider digitalization very important and unavoidable and 34,1 % think it is important and enhances the quality of educational process. It is necessary to admit that 8,2 % of instructors do not care about the advancement of digitalization and they are sure digital technologies do not change the educational process. And a very small number of teachers (4 %) think that digitalization is unimportant and it will complicate the learning. The results suggest that educational environment transformations under conditions of digitalization are a topical issue of pedagogical science and it will remain the same in future.

To compare, slightly more learners (40,5 %) agree that digitalization is very important and 36,1 % consider it important process. At the same time, 6,5 % and 1,7 % of young learners think digitalization doesn't matter or is unimportant respectively. These figures show that young population is aware about digital transformation within the society and educational environment in particular and consider changes objective phenomenon.

Figure 1

The Significance of Digitalization of Educational Environment According to Teachers and Learners



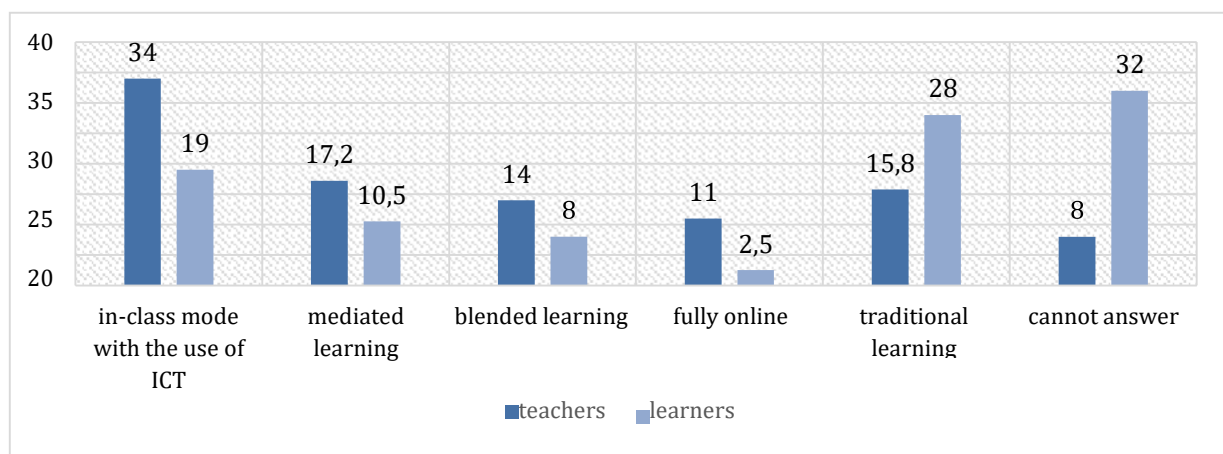
Source: based on survey data analysis.

Also, one found that teachers differentiate the modes of digital educational environment to some extent and use all of them. Figure 2 shows the percentage of teachers organizing digital educational environment.

The results showed that most of teachers (34 %) prefer to work in simplified digital environment that suggests instruction in the classroom and periodical use of ICT. 17,2 % of teachers prefer to work in mediated mode. A sufficient large number of teachers (15,8 %) work in traditional mode that requires improvement of their digital skills. At the same time, it is very difficult for learners to differentiate mode of digital educational environment and explain the difference between them. Most of young people (32 %) couldn't explain clearly their learning experience which means they have insufficient level of digital competency. 28 % think of learners think they study in traditional educational environment. And only 2,5 % of learners assess fully online mode of digital educational environment positively.

Figure 2

The Use of Different Modes of Digital Educational Environment Among Teachers and Learners

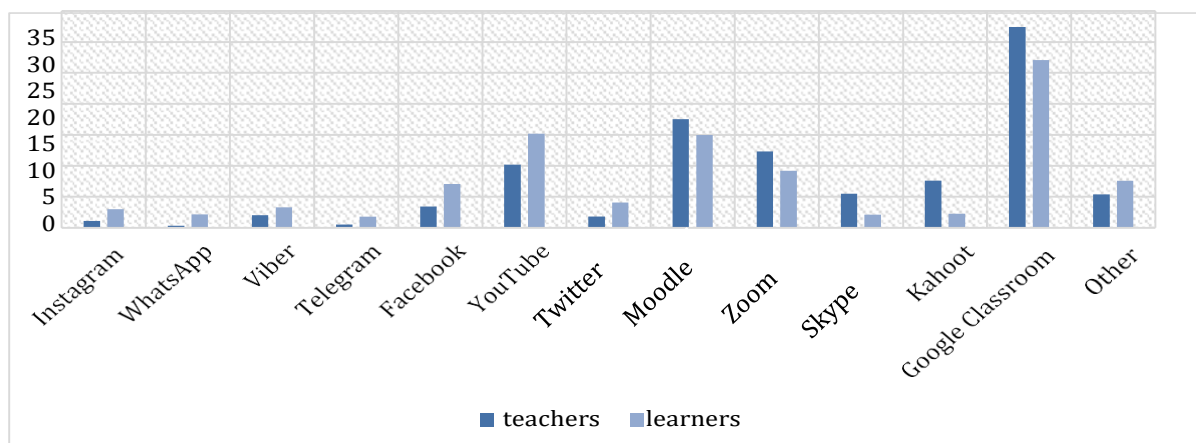


Source: based on survey data analysis.

As well, one found what digital tools are used most of all. Figure 3 shows the percentage of teachers and learners using or preferring the specific digital tool.

Figure 3

The Use of Digital Tools Among Teachers and Learners



Source: based on survey data analysis.

The findings showed that teachers consider the following digital tools easy and simple to use: Google Classroom (32,4 %), Moodle (17,5 %), YouTube (10,2 %), Zoom (12,3 %) and Kahoot (7,6 %) the most. At the same time teachers almost do not use social networks for teaching. Learners have the highest indices towards the following digital tools: Google Classroom (27,1 %), YouTube (15,5 %), Moodle (15 %), Zoom (9,2 %), and Facebook (7,1 %). Interestingly, learners prefer using social networks for learning more. They use Facebook and Twitter for searching additional information when preparing project. Also, they use messenger to conduct short quizzes and interact with working group.

One of the questions in the form concerned the barriers hindering the educational process. Table 2 demonstrates the analysis of barriers based on the answers of teachers and learners. The results prove that most teachers face a number of barriers and think it is necessary to overcome or prevent them in order to make the educational environment more efficient. One found that the following barriers are the most significant ones: bad digital infrastructure (46,7 %), digital tools are difficult to use for very younger learners (38,3 %), time-consuming tasks (37,6 %), and low information literacy (28,1 %). Learners also may face barriers and they show poorer learning outcomes when they study in the educational environment with barriers. We compared their answers and found that learners think that the following barriers hinder the efficiency of educational process the most: lack of collaboration (67,2 %), low level of digital competency (60,3 %), inappropriate teaching methods used (53,2 %), time consuming tasks (50,4 %), lack of practice during online lessons (48,2 %), bad digital infrastructure (34,5 %).

Table 2

Barriers Hindering Implementation of Innovative and Cultural Transformations

Barriers	% of the total number of teachers	% of the total number of learners
----------	-----------------------------------	-----------------------------------

Poor digital infrastructure	46,7	34,5
Low information literacy	28,1	35,8
Time consuming tasks	37,6	50,4
Low level of digital competency	27,4	60,3
Lack of necessary scientific and methodical literature	18,3	2,4
Inappropriate teaching methods used	12,4	53,2
Low motivation	4,5	29,0
Lack of practice during online lessons	19,4	48,2
Lack of collaboration	23,1	67,2
Do not consider the needs of learners	2,3	6,8
Poor Internet connection	19,2	13,5
Bad or unclear instruction	8,1	27,3
Difficult to assess the participation	19,5	17,3
Absence of guidance on digital educational environment	21,6	1,2
Necessity to combine many materials	20,3	26,4
Difficult to manage the classroom	18,5	13,7
Lack of digitalized teaching resources (like textbooks or manuals etc.)	11,0	19,6
Difficult to select and sort information	13,7	28,5
Do not use social networks or apps for learning	1,2	40,0
Difficult to undergo tests or quizzes	2,3	32,1
Difficult to use for very young learners	38,3	2,1
Takes long time to study new tool	25,1	18,0
Requires psychological readiness to work through computer	20,5	21,6
Changes relations between teacher and learners	23,8	14,5
Breaks social links in the classroom	18,7	20,1
Lower learning outcomes	18,3	24,7
Difficult to participate in interactive activities and games	27,5	32,6

Source: based on survey data analysis.

Discussion

The systemic literature review and the case study conducted among teachers and learners of different educational institutions show that the focus of deep and efficient changes within the educational environment depends on the stage of its development and external conditions. The current educational environment requires innovative and cultural transformations through implementation of digitalization and modernization of traditional learning and immediate overcoming of existing barriers to make the educational process easy, interesting, highly-motivating, and efficient for all the participants.

One found that innovative and cultural transformations of educational environment include solving the specific barriers hindering the educational process and complicating the interaction between the teachers and students. The findings of case study conducted among teachers and learners facing current transformations allow us to outline the measures to solve the barriers identified. Table 3 shows the list of barriers described and the measures recommended to use in order to overcome barriers.

Table 3

Barriers Hindering Implementation of Innovative and Cultural Transformations and the Measures to Overcome Them

Barriers	Measures to overcome barriers
Bad digital infrastructure Poor Internet connection	Installation and use of computer equipment, networking vehicles and support systems, information terminals, pedagogical and methodical techniques, and provide qualified technical maintenance of equipment; Providing the authorized access to information and communication instruments for distance learning.
Low information literacy Difficult to select and sort information	Formation of information literacy as an ability to select and sort information.
Low level of digital competency	Formation of understanding among the participants of educational process the principles of digitalization and its advantages within the educational environment as an innovative transformation; Formation readiness of students to study using digital tools and formation their digital competence.

Lack of necessary scientific and methodical literature	Methodical support of young teachers.
Absence of guidance on digital educational environment	
Low motivation	Enhancement of motivation to learning through digital tools and building of individual learning trajectory.
Time consuming tasks	
Lack of collaboration	Unlocking the pedagogical potential of teachers, implementation of variety form of teaching like individual work and teamwork as well as innovative teaching methods including game-based approach.
Lack of practice during online lessons	
Difficult to assess the participation	Improvement of assessment techniques and methods on the principles of transparency and objectivity including automated testing and self-assessment techniques.
Difficult to undergo tests or quizzes	
Difficult to manage the classroom	Development of flexible curriculum and leaving the possibility for administration and teaching staff to make changes in content and methods according to learners' academic and professional needs.
Do not consider the needs of learners	
Difficult to use for very young learners	
Takes long time to study new tool	
Inappropriate teaching methods used	
Bad or unclear instruction	
Lack of digitalized teaching resources (like textbooks or manuals etc.)	Promotion of positive sociotechnnological cultural transformations as well as sociocultural and socioeconomic modernization.
Necessity to combine many materials	
Do not use social networks or apps for learning	Development of self-education skills among learners.
Requires psychological readiness to work through computer	Development awareness to work with digital tools.
Changes relations between teacher and learners	Formation of partner relations between teachers and learners on the principles of mutual trust, interest, desire to experience exchange, motivation to self-development and self-actualization, person-centered approach in teaching.

Breaks social links in the classroom	Maintenance of effective feedback to learners that contributes to learning and achievement and helps to overcome psychological difficulties of digitalization like fear, uncertainty, shyness during online presentations, etc.
Lower learning outcomes	Development of creativity through digital technologies and tools, orientation towards project-based technology (preparation of reports, presentations, video, etc.).
Difficult to participate in interactive activities and games	Use of different modes of digital educational environment, maintenance of asynchronous and synchronous interaction; Use a variety of communications means integrated in the learning management system Moodle or Google Classroom, e-mail, messengers, videoconferencing, forums and chats, and presentations with real-time feedback.

Source: based on survey data analysis.

One agrees with Qutoshi (2021) that development of digital technologies and learning instruments and searching for the new ones demands understanding the peculiarities of digital transformation of educational environment, the needs for digitalization and specification of behaviour of today's learners. As a result, the digitalization of educational environment, on the one hand, provides great opportunities for enhancement the efficiency of quality of education, and on the other hand, requires fundamental changes of methodological approaches to organization of learning and using of new technological instruments.

According to this research findings, the digitalization of educational environment is aimed at achievement of learning outcomes using a wide range of digital instruments including social networks, online courses, artificial intelligence methods, virtual reality tools, broadband access and mobile Internet, online curriculum management, learning management systems, and work with big data. In addition, digital educational environment can be organized through in-class mode with the use of variety ICT, mediated learning, blended learning, and fully online mode.

On the basis of given observations in this area as well as findings of Bygstad et al. (2022), Jackson (2019), and Ugur (2020) give the possibility to assert that innovative and cultural transformations within the efficient digital educational environment require a whole set of measures. They include development of digital infrastructure within educational institution to ensure maximum access of all the participants of educational process to digital technologies; development and dissemination of new learning forms and technologies within the digital educational environment that is based upon synthesis of new digital tools, digital sources, platforms and apps; introduction of organizational, technological and infrastructural preconditions to achieve necessary transformations of educational environment; development and implementation of new digital educational content; gamification of educational process and extensive use of didactic games, digital resources and simulators or virtual laboratories on the principles of benefiting from visualization of technologies and augmented reality; expansion of the

range of Massive Open Online Courses (MOOCs), course websites and library systems; advancement of distance learning; use of social networks and messengers within the educational process; development, testing and implementation of new platform solutions and learning management systems that contribute to mastering of educational programs.

The most important task of modern education is permanent upgrading of content, instruments, technologies of learning and methodology. Also, we can claim that digital educational environment should possess two components to be effective and to be able to overcome barriers. They are logistics and content. The content of educational environment during digital transformation does not have significant differences from the traditional content. It features mainly the methods of working with content or the principles of collaborative and person-centered learning with the use of digital instruments. The logistics involves management of transfer and acquisition of knowledge; it also contributes to generation of new information employing digital instruments.

One insists that development of innovative teaching methods using Internet resources stimulates, motivates, and provides the high level of personification of educational environment. Also, it completely changes instructional techniques and educational leadership. Learners can be involved in individual work, teamwork, project-based activities, participate in virtual lectures, panel discussions, sessions, and materials exchange. They also study through peer-learning and cross-learning models that improve their soft skills and forms readiness to perform in the digital surrounding.

Moreover, innovative transformations provide flexible access to educational environment and help to overcome traditional barriers. Learners can proceed in self-paced courses and choose what platforms to use. That is why it is easier to adapt educational materials to learners, their professional and academic needs. At the same time, cultural transformations contribute to improvements within educational management, form participants' positive attitudes to digitalization and socioeconomic modernizations.

Thus, an efficient digital educational environment is the well-organized and didactic system of instruments oriented towards realization of educational content and creation of conditions for personality development and creative self-actualization, upbringing of national and universal human values, creation of the possibilities for youth to obtain qualitative education, training them to new conditions of information society and adjustment to use of innovative techniques and teaching technologies, democratization of education, and life-long education.

The principles of innovative and cultural transformations within the educational environment considering objective advantages of digitalization and barriers of traditional learning must be implemented in future to enhance the efficiency of education.

Conclusions and Implications

The study evaluated the importance of educational environment transformations due to the peculiarities of educational process organization, external conditions of information society and requirements to learners' readiness. The main objective of education of the future is believed to change the conventional educational paradigm into a progressive cultural one that implements wide-spreading digital technologies. Transformations of educational environment provide great opportunities to enhance the efficiency of education but they require significant changes and removal of the barriers since the latter ones hinder the methodology development and innovative technologies implementation.

Transformation refers to a long-term objective and quality process of adaptation to changes and implementation of innovations.

The digitalization directly deals with the implementation of innovative technologies to modernize and maximize the educational process. Due to digitalization; educational environment goes beyond traditional learning and aims to remove the existing barriers. Moreover, digitalization suggests a fundamentally new format of educational environment where digital technologies provide more efficient interaction between all participants of educational process; also, these technologies enhance the transparency of educational process.

The findings show that digital educational environment exists in three different modes: in-class mode with the use of ICT, mediated learning, blended learning, and fully online mode. Each of these modes is used under specific conditions and requires different digital technologies. At the same time, it faces barriers hindering the efficiency of educational process and affecting the learning outcomes adversely.

To conclude, the innovative and cultural transformation contributing to creation of efficient digital educational environment require specific measures including the development of digital infrastructure, the dissemination of new learning forms and technologies, the implementation of new digital educational content, the enhancement of gamification and extensive use of didactic games. Similarly, it needs to possess appropriate digital resources and simulators as well as new platform solutions and learning management systems.

Besides, innovative and cultural transformations of educational environment there is a need of solving the specific barriers hindering the educational process and complicating the interaction between the teachers and students. The systematic literature review and the findings of case study allowed outlining the measures to solve the identified barriers.

Therefore, an efficient educational environment should be well-organized and a didactic system of digital instruments should be favorable for the realization of educational content, for the creation of specific conditions for personality development, upbringing of the youth on national and universal human values, for the democratization of education, and life-long education extension. Innovative and cultural transformations within the educational environment must consider the objective advantages of digitalization. In addition, they must be applied on the principles of overcoming the barriers typical for traditional learning and complicating digital educational environment. These transformations will help to create an efficient educational environment of the future where learners will be prepared to various challenges of information society.

References

- Aditya, B. R., Ferdiana, R., & Kusumawardani, S. S. (2021). Categories for barriers to digital transformation in higher education: An analysis based on literature. *International Journal of Information and Education Technology*, 11(12), 658–664. <https://doi.org/10.18178/ijiet.2021.11.12.1578>
- Akour, M., & Alenezi, M. (2022). Higher education future in the era of digital transformation. *Education Sciences*, 12(11), Article 784. <https://doi.org/10.3390/educsci12110784>
- Ali, H., Shah, Z., & Khattak, S. (2022). Significant transformation of engineering education. *IEEE Technology Policy and Ethics*, 7(1), 1-6. <https://doi.org/10.1109/NTPE.2022.9778143>

- Anggraini, R., & Handayani dan, Y. (2021). Digitalization in education: A literature review. *Journal of Digital Education, Communication, and Arts*, 4(2), 62–73. <https://jurnal.polibatam.ac.id/index.php/DECA/article/view/2942/1622>
- Armila, P., Sivenius, A., Stanković, B., & Juutilainen, L. (2022). Digitalization of education: Commodification hidden in terms of empowerment?. *Postdigital Science and Education*. <https://doi.org/10.1007/s42438-022-00347-8>
- Balyer, A., & Öz, Ö. (2018). Academicians' views on digital transformation in education. *International Online Journal of Education and Teaching*, 5(4), 809–830. <http://iojet.org/index.php/IOJET/article/view/441/295>
- Batchenko, L., Dielini, M., & Honchar, L. (2020). A Value-oriented polyparadigm approach to the development of management education in the conditions of transformation change. *Baltic Journal of Economic Studies*, 6(5), 42–53. <https://doi.org/10.30525/2256-0742/2020-6-5-42-53>
- Briody, E. K., Rodríguez-Mejía, F. R., & Berge, E. J. (2021). Professional staff making a difference: Cultural change in higher education. *Innovative Higher Education*, 47, 297–325. <https://doi.org/10.1007/s10755-021-09577-3>
- Bygstad, B., Øvrelid, E., Ludvigsen, S., & Dæhlen, M. (2022). From dual digitalization to digital learning space: Exploring the digital transformation of higher education. *Computers & Education*, 182, Article 104463. <https://doi.org/10.1016/j.compedu.2022.104463>
- Dar, R. A. (2018). Educational works of Friedrich August Froebel. *International Journal of Advanced Multidisciplinary Scientific Research*, 1(5), 13–17. <https://doi.org/10.31426/ijamsr.2018.1.5.513>
- Erstad, O., Kjällander, S., & Järvelä, S. (2021). Facing the challenges of 'digital competence' a Nordic agenda for curriculum development for the 21st century. *Nordic Journal of Digital Literacy*, 16(2), 77–87. <https://doi.org/10.18261/issn.1891-943x-2021-02-04>
- García-Morales, V. J., Garrido-Moreno, A., & Martín-Rojas, R. (2021). The transformation of higher education after the COVID disruption: Emerging challenges in an online learning scenario. *Frontiers in Psychology*, 12, Article 616059. <https://doi.org/10.3389/fpsyg.2021.616059>
- Gopal, V. (2020). Digital education transformation: A pedagogical revolution. *i-Manager's Journal of Educational Technology*, 17(2), 66–82. <https://www.proquest.com/docview/2457880994>
- Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3, 275–285. <https://doi.org/10.1016/j.susoc.2022.05.004>
- Islam, S., & Jahan, N. (2018). Digitalization and education system: A survey. *International Journal of Computer Science and Information Security*, 16(1), 70–73.
- Iswari, M. (2019). The challenge of improving special education quality in digital era. *Journal of ICSAR*, 3(1), 91–94.
- Jackson, N. C. (2019). Managing for competency with innovation change in higher education: Examining the pitfalls and pivots of digital transformation. *Business Horizons*, 62(6), 761–772. <https://doi.org/10.1016/j.bushor.2019.08.002>

- Jakoet-Salie, A., & Ramalobe, K. (2022). The digitalization of learning and teaching practices in higher education institutions during the Covid-19 pandemic. *Teaching Public Administration*, 41(1), 59–71. <https://doi.org/10.1177/01447394221092275>
- Lata Narayan, H. & Shailashri, V. T. (2021). A study on transformation of higher education system: Present scenario and future outlook. *International Journal of Management, Technology, and Social Sciences*, 6(2), 1-11. <https://doi.org/10.5281/zenodo.5145600>
- Latifah, R., Budiyanto, C., & Saputro, H. (2022). Digital transformation readiness in higher education institutions in Indonesia: A systematic literature review. In *12th annual international conference on industrial engineering and operations management* (pp. 5256–5263). IEOM Society International. <https://ieomsociety.org/proceedings/2022istanbul/1061.pdf>
- Leal Filho, W., Raath, S., Lazzarini, B., Vargas, V. R., de Souza, L., Anholon, R. ... Orlovic V. L. (2018). The role of transformation in learning and education for sustainability. *Journal of Cleaner Production*, 199, 286–295. <https://doi.org/10.1016/j.jclepro.2018.07.017>
- Meshram, J. (2020). Post Covid-19 era: Higher education transformation from offline to online. *Advanced Materials Proceedings*, 5(4), 1-2. <https://doi.org/10.5185/amp.2020.040409>
- Petersen S. A., & Bartel S. M. (2020). When culture and change collide in higher education: A case study at one university. *Administrative Issues Journal: Connecting Education, Practice, and Research*, 10(2), 46–59. <https://doi.org/10.5929/2020.10.2.4>
- Pu, R., Tanamee, D., & Jiang, S. (2022). Digitalization and higher education for sustainable development in the context of the Covid-19 pandemic: A content analysis approach. *Problems and Perspectives in Management*, 20(1), 27–40. [https://doi.org/10.21511/ppm.20\(1\).2022.03](https://doi.org/10.21511/ppm.20(1).2022.03)
- Qutoshi, S. B. (2021). Journeying through informing, reforming and transforming teacher education: Reflections on curriculum images. *Journal of Transformative Praxis*, 2(1), 8–18. <https://doi.org/10.51474/jrtp.v2i1.520>
- Reimers, F. M. (2020). Transforming education to prepare students to invent the future. *PSU Research Review*, 4(2), 81–91. <https://doi.org/10.1108/PRR-03-2020-0010>
- Stanković, B., Armila, P., & Haverinen V.-S. (2021). *Digital imaginaries and imperatives of education of the 21st century – Critical perspectives from sociology of new public management and philosophy of education*. DEQUAL. <https://blogs.uef.fi/dequal/2021/03/18/digital-imaginaries-and-imperatives-of-education/>
- Sinku, S. (2021). Digital transformation in education sector: The way forward for India. *Journal of Emerging Technologies and Innovative Research*, 8(9), 38–48. <https://www.jetir.org/papers/JETIR2109507.pdf>
- Soodtoetong, N., & Rattanasiriwongwut, M. (2022). Educational transformation with virtual classroom: Integrated between TTF and Social Motivation. *TEM Journal*, 11(1), 439–445. <https://doi.org/10.18421/TEM111-56>
- Ugur, N. G. (2020). Digitalization in higher education: A qualitative approach. *International Journal of Technology in Education and Science*, 4(1), 18–25. <https://doi.org/10.46328/ijtes.v4i1.24>
- Zhao, Y., & Watterston, J. (2021). The changes we need: Education post COVID-19. *Journal of Education Change*, 22, 3–12. <https://doi.org/10.1007/s10833-021-09417-3>

DOI: <https://doi.org/10.57125/FED.2023.25.03.05>

How to cite: Aliyeva. G. B. (2023). Educational Trends in the Development of Philological Education in Azerbaijan in the Era of Digitalisation: A Forecast of the Future. *Futurity Education*, 3(1), 63–75. <https://doi.org/10.57125/FED.2023.25.03.05>

Educational Trends in the Development of Philological Education in Azerbaijan in the Era of Digitalisation: A Forecast of the Future

Aliyeva Gulchohra Babali

PhD in Philology, Associate Professor, Head of the Department of English Language Azerbaijan State Marine Academy, Baku, Azerbaijan, <https://orcid.org/0000-0003-2266-947X>

***Correspondence email:** *emma_fn@mail.ru.*

Received: November 17, 2022 | **Accepted:** January 26, 2023 | **Published:** March 25, 2023

Abstract: Education is an indicator of societies socio-economic and cultural development provides the national interests of the country in all areas of its activities in the world arena. The process of integration of cultural, educational, scientific, as well technical spheres – the introduction of modern norms and the standardization of education, the development of science and technology, the culture’s expansion, and the dissemination of scientific and technological achievements. Contemporary professionals face the recent year’s scientific and technical developments problems. The solution of these problems is conditioned by the need of their professional skills continuous development even after having obtained the higher education and the specialization diploma. The penetration into all fields of professional activity of the skills traditionally characterized by high technology leads to the emergence of new trends. The current axiom “digital humanities” is gaining popularity. In this context, the implementation of combined scientific, cultural-educational, and other projects and the involvement of scientists and specialists in research programs are particularly important. The COVID-19 pandemic affected more than 169,015 students in Azerbaijan (Valiyev & Valehli, 2022). This fact forced educators to develop new methods of teaching, with the introduction of distance learning as a single alternative to the desire for pedagogical continuity. Such a situation led to many difficulties, such as lack of experience,

technical problems, and difficulties with technical equipment. In addition, many teachers realized that they required digital skills. This paper presents the trends of education with the use of closed survey among teachers in the field of philology. The university community had to develop new ways of teaching and learning, particularly the introduction of distance and online learning that kept students connected and offered different perspectives. Search engines found 457 articles between 2018 and 2022. Relevant articles were searched in the Scopus and UpToDate databases, relevant articles for 2018-2022 were selected and processed by the title and abstracts, 20 scientific works were presented in this study. As a result, the situation of education in Azerbaijan was identified, one highlighted negative trends and prospects for the development of philological education in the context of digitalisation. The highlighted trends and forecasts give a new outline of the impact of digital technologies and the problems of changes in learning, knowledge sharing, and transformation in philological education. The findings open new perspectives on the relationship between science and society and the role of philological research in the context of digitalisation.

Keywords: pandemic, digitalisation, distance learning, philological education, digital society.

Introduction

Researches concerned with digitalisation are a valuable asset to the development of society and education. This scientific thought enables the design and implementation of effective methodical development strategies that serve as the basis for the construction of public knowledge and the new global challenges that have arisen with the pandemic (Anderson, 2018). This research allows to project a new dynamic of transition to responsible innovation that can master a globalized society and face new challenges and, particularly, the war in Ukraine, global warming, the factor of inequality between peoples (Kuorme & Heinla, 2020). That is why this study is designed to investigate the digitalisation of the humanities, which are part of a “digital humanism” (Koseoglu et al., 2020) and a new vision of the world, are important to address the challenges posed by the use of digital technology in higher education. The definition and implementation of national standards of education are the main trends in the development of education in modern Azerbaijan. Integration of education covers all levels of education, but most often it is used in the formation of the content of philological education (Jalilbayli, 2022).

Digital technology transforms the world because, like any revolutionary technology invented by humans, it transforms the society in which it was invented and integrated (Huwer et al., 2019). Therefore, it is important to understand and predict this transformation in order to at least try to avoid disadvantages and especially to benefit the most from progress. In this context, Pacheco et al. (2018) emphasize that technology is a priori “neutral,” but its misuse by humans can lead to serious consequences. Digital technology-and at its core computing-is not just technology, it is also science, industry, and now culture (Mykhailyshyn et al., 2018). It is for this reason that modern education seeks to enable every educator to become a developer and not just a consumer of this transformation, to enable every educator to realize themselves in the new educational environment (Namestyuk et al., 2020). Langset et al. (2018) offer their contribution to digital learning in the context of current educational issues and challenges. The authors conduct digital science research in collaboration with other disciplines and interdisciplinary approaches, and primarily with the philological sciences, cognitive sciences, and neuroscience. In this context, let us add that an interdisciplinary approach should promote scholarly work, where the challenge is to know how to work together beyond disciplinary

relationships, focusing on some basic problems and knowing how to define methodologies for evaluating the results of this work, without which there can be no rigorous progress for the benefit of students (Dykhnych et al., 2022). The development of relevant and reliable knowledge, in the context of the accelerated evolution of the relevant practical field, is a challenge in itself. Progress is impossible without realizing that understanding the use of digital technologies in education and learning is not limited only to their technical and pedagogical aspects.

Research Problem

In order to foresee the changes of education in Azerbaijan in the era of digitalisation, a closed survey (anonymous questionnaire) was conducted among the teachers of Azerbaijan State Pedagogical University in the field of philology. Based on the analysis of tangential works and questionnaires, trends and forecasts of future breakthroughs and prospects for the development of philological education were highlighted. As well as to describe the problems concerned with the shift to distance learning in during the pandemic and to show how these challenging could be undergone in the particular field of philology.

Research Focus

The highlighted trends and projections provide new insights into the impact of digital technologies and the challenges to learning, knowledge sharing, and transformation in scholarly practice. They open new perspectives on the relationship between science and society, as well as the role of philological research on digitalisation.

Research Aim and Research Questions

The aim of the article is the scope of philology in digital era, to describe the shift of face-to-face to distance learning in terms of digitalisation. The objectives are to show how challenging is it for students and educators to teach and learn in digitized modality considering the skills to be learned in this particular field of philology. To describe the prospects of knowledge acquisition and the means of its transfer in a technological process, to highlight the main axes for the successful digitalisation of philological education, to describe the negative trends and challenges facing Azerbaijani education in the pandemic.

Research Methodology

General Background

The following theoretical methods were used in the study: analysis of scientific and pedagogical research, synthesis of research results, and the main transformations of education in Azerbaijan. The empirical method of research combined with the modern method of interviewing online focus group, observation, and survey (closed anonymous questionnaire survey). The closed method of research questionnaire, observation, and survey of teachers of Azerbaijan State Pedagogical University revealed the research questions.

Sample / Participants / Group

In the first phase, a questionnaire was administered to 100 faculty members from different departments in the field of philology. The study was conducted at Azerbaijan State Pedagogical University. In the cluster selection, philology professors were selected. They were sent a Google form with a questionnaire to their university mailboxes.

The focus group was offered an online questionnaire. All responses were analyzed in detail. All participants in the online focus group (100 participants, including all faculty members from different majors) provided approval of their willingness to participate in the survey. The questionnaire was conducted on the Internet in the author's own domain.

Instrument and Procedures

The online focus group method was used to obtain qualitative information. The respondents were the target audience of teachers of different higher groups who connected to an online form session. On their monitor screens, the moderator sent a google questionnaire form. The moderator chose google forms to make it easier for the online focus group, in case of poor computer typing skills. The google form offered was essentially a closed questionnaire. The scope of the qualitative questions given to the online focus group was to reveal their opinion concerning trends of education in the field of philology. Teachers were asked basic questions on trends in educational development:

1. Whether the gaps between the achievements of modern science and the content of the disciplines need to be bridged.

- a) yes
- b) no

2. The enrichment and modernization of the invariant component education is a priority.

- a) yes
- b) no

3. It is necessary to optimize the proportions between the humanities and natural-mathematical knowledge blocks.

- a) yes
- b) no

4. Humanization of the content of higher philological education is the main vector for its development.

- a) yes
- b) no

5. It is necessary to strengthen the training program by forming interdisciplinary integrated blocks of knowledge content.

- a) yes
- b) no

6. The intensifying of social and practical disciplines and the latest information technology introduction is prior.

- a) yes

b) no

7.The adaptation of curricula and their methodological support in accordance with the conditions and needs of a multicultural and multi-ethnic student body.

a) yes

b) no

8.Improving the organizational mechanisms and methodological foundations of curriculum knowledge to ensure that it is absorbed by the vast majority of students.

a) yes

b) no

Data Analysis

The object of the research as general population was the questioning. According to the focus-group answers the conclusions were applied. The sample population in the experiment was the respondents. The subject to study was the questioning. The units of the analysis were the answers of Dagestan Humanitarian Institute labor collective.

Today, the improvement of student training programs occupies one of the leading places in the overall context of the modernization of the content of higher education in Azerbaijan (Nodira, 2022). Characterizing the development of teaching content in the university and the institute, we can highlight the contradictory aspects, so important from the dialectical point of view of this process, as:

- Contradiction between the unlimited amount of knowledge accumulated by mankind and the limitations of educational programs. There is no full opportunity to reflect this knowledge in sufficient volume and with appropriate depth.

- Contradiction between the integrity of spiritual and practical experience of mankind and predominantly fragmentary or disciplinary way of teaching students.

- Contradiction between objective content of knowledge and objectivity of forms and modalities of their translation and assimilation.

- Contradiction between social conditionality of knowledge content and individual-subjective characteristics of students' needs and dispositions for its assimilation.

Research Results

2020 was a test case for the whole world, Azerbaijan was no exception. The COVID-19 pandemic has put higher education in an unprecedented situation and forced them to set up distance learning as the only alternative to striving for pedagogical continuity (Habibova, 2020). The results of a closed survey allowed investigating the impact of the pandemic on educational trends in the development of philological education, to highlight the problems faced by Azerbaijani teachers at the beginning of the transition to online learning, to determine the forecasts of digitalisation of university education in Azerbaijan. The first stage of the conducted closed-ended questionnaire revealed the main challenges, which were found in all the answers to the survey.

Table 1

Challenges During the Shift to Distance Learning During the Pandemic in Azerbaijan

Trends	Ratio	Teachers' Responses
Lack of contact with students	89% of teachers	Responded that at the beginning of the shift to distance learning, there was a lack of a unified database with the personal students emails
Technical problems	78% of teachers	Poor internet connection and inconsistency with the choice of initial online platform
Difficulties with connection	80% of teachers	The development of new digital skills requires time and rapid response in critical situations

Source: authors own development.

The following survey responses can be summarized by the fact that the rapid evolution of web technologies and the intensive use of social media have contributed to the introduction of many forms of distance learning and the accessibility of scientific information to all students. The widespread use of digital tools has had a major impact on higher education in Azerbaijan, changing the content and methods of teaching/learning.

Indeed, as the survey participants noted, most of the specialists in the field of philology have responded accordingly to the rapid digitalisation in the post-pandemic environment, as they have already acquired the necessary skills and abilities. It is about the instructional content development in the context of the permanent transformation of educational platforms, the use of social media, online resources, simulation centers, distance learning, computational cloud technology, and artificial intelligence. In the era of digitalisation, the communication tools of philological education are changing both education and science. Digitalisation is changing not only the content of philological education but also the traditional tools and methods of teaching humanities subjects, the role of the teacher and students.

Data Analysis

The main course of action for the future for philological studies was identified by survey participants as putting the student back at the center of learning. It is about re-examining the levels and types of constructed skills, teaching methods with not only the creation of a multimodal and decentralized personal learning environment but also with the creation of real individualized learning policies. An effective teaching is a necessary but not sufficient condition for educational transformation. It is necessary to plan teaching/learning activities, to guide the desire to learn, and to plan learning over time.

In this aspect, Arici et al. (2019) emphasize that the countries most advanced in integrating digital technology into education, such as South Korea, the Netherlands, and Australia, are those where this issue was approached from a pedagogical perspective. without hesitation in questioning the functioning of the education system. These are the countries where there was not only a strong pedagogical commitment but also a strong political will. As the authors explain, knowledge develops. In all disciplines, the processes of knowledge construction and education are being transformed, enriched by digital technologies. The aggregate of philological disciplines no longer allows for the construction of

the knowledge needed by a twenty-first-century person. It is important to consider new knowledge, to articulate it between them because of the transdisciplinary complexity and openness to the technological process.

It is believed that the main trend in the development of philological education in Azerbaijan is the change in the status of knowledge itself. It is about “humanities knowledge,” which becomes salutary in the face of global shifts and upheaval. The constant flow of new information complicates the mission of philological education. Its goal can no longer be limited to transmitting an established body of knowledge. It is now necessary to learn how to learn and acquire skills that will enable one to realize the new reality (Aliyeva et al., 2021). The ability of the Azerbaijani education system to integrate these dimensions is a condition for the success of education policy.

Of course, digital technologies are constantly questioning and rethinking the role and missions of teachers. This rethinking of their tasks, and therefore of the profession, goes side by side with the need of providing quality training in digital tools and systems for all teachers. This is the foundation of educational policy in Azerbaijan, integrating digital technologies. As Allahyarova (2023) writes, the integration of technology in its practice disrupts the modes of teaching-learning and, particularly, distance teaching requires new skills. The results of the closed survey identified various classifications of distance learning skills for teachers in the philological field. One distinguishes three main areas of competence:

Table 2
Classifications of Distance Learning Skills for Educators

Skill	Task
Pedagogical	course design
Cognitive	leadership (mentoring) learning and spiritual development
Social	communication, feedback
Managerial	learning management
Technological	digital skills
Facilitation	student supervision

Source: author’s own development.

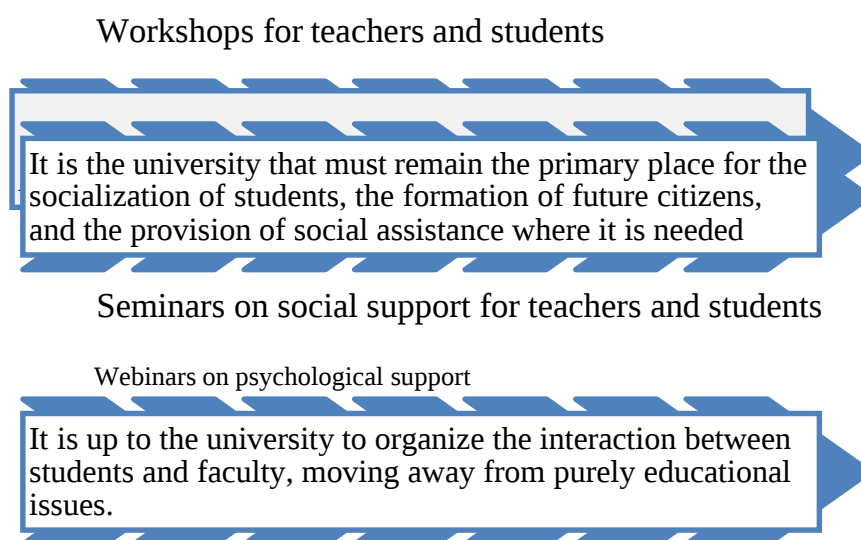
The major developments in distance learning concern the pedagogical design of courses and student support, with the need to see the student as “the learning foundation”. This implies creativity and solid training, which must be constantly enriched. Finally, the use of digital technologies in philological education requires explicit government support. Policies for the digitalisation of education may differ from country to country, but they cannot be limited to the infusion of financial resources. Policies must be the bearers of the vision of society, science, and education in a digital society. The digitalisation of teaching/learning and distance learning obviously completely changes teachers' pedagogy and their roles and missions and leads to a complete rethinking of their profession, which requires the development and implementation of appropriate training for all teachers in all areas of liberal arts education. A new vision of the world and strong political support are needed.

The crisis pedagogy aim is enabling every student to continue learning without productive cessation. Modern philological education in Azerbaijan seeks coherence in the educational process, articulation between projects and programs, multidisciplinary teamwork, and complementarity between educational actors.

Regarding the trends and prospects for future post-pandemic philological education in terms of the shifting to distance learning, first and foremost is the continued transformation of pedagogical methods. Even if the urgent transition to distance learning was at times critical, the technological capabilities and digital competence of educators have leveled and optimized the learning process. Now, despite the improvement in Azerbaijan, it is necessary to maintain a group spirit and work collegially in the vector of cutting-edge education. Never before have there been so many tools to achieve these goals, and they only get better every year.

Figure 1

Opportunities to Enhance Digital Skills in the Education of the Future



Source: author's own development.

Obviously, this means that in addition to the pedagogical transformation, it is necessary to offer the faculty the opportunity to improve digital qualifications. Drawing on the results of the survey, the impact on learning of combining experience, knowledge, and skills in the university community is reflected and analyzed. Such experiences allow the articulation of research dimensions, humanities learning, and teaching that are important when it comes to digital university pedagogy.

Discussion

Today, learning is redefining its form. The granularization of knowledge opens up the process of digital multimodal creativity. In recent years, new information and communication technologies have developed to such an extent that there are almost no sectors that do not yet use computers for information transfer and communication. This development of digital technologies has not bypassed humanities education, in particular the philological sciences, so that most educators in this field have not only accepted the idea that the introduction of digitalisation into education is inevitable, but they have also realized that this evolution creates many challenges for them. This explains why information and communication technologies are increasingly part of any philologist's basic tools, and why modern philology is becoming, at least in part, digital.

According to Arora and Srinivasan (2020), all educational processes must be revised. In the context of this work, it is worth noting the SMAC model proposed by scholars (Sociality, Mobility, Analytics, and Cloud). Its aim is to develop a digital culture, turning all objects of digitalisation into learning objects, epicentralized around pedagogical coherence. Indeed, in terms of the rapid development of technology, the education of Azerbaijan is in an age when it is necessary to “learn everything together”. Digitalisation of the country is in a period of mastery, but one should not forget that the mastery has the same basis as the art, requiring the creation by these tools of pedagogical harmony, carrying the message of collective progress (Gillpatrick, 2020).

Azerbaijan's education system faces the challenge of preparing educators with the professional skills that will enable them to work effectively in a digitalized environment. In practice, advanced public universities operate in a competitive environment and are therefore proactive. This is why humanities universities are entering into networked partnerships with technical universities to train a new generation of humanities professionals with a technical slant and science and technology professionals with a humanities slant, something that has been impossible to imagine until now. At the same time, teaching has been partially shifted to an interactive environment: the growth of massive open online courses and the development of cloud-based educational platforms have attracted universities to the digital space. In the near future, we are likely to encounter a “duplication” of universities: there is the existence of a conventional “material” university and its “digital twin” on the Internet, both of which will be able to work together and offer their own educational programs.

There is no doubt that in order to keep up with digitalisation, a set of new skills and competencies is needed. Every educator must have the know-how and knowledge that is a must in the face of technological advances. This is important not only to understand the essence of the production process and how to simplify it with technology but also to be able to manage this process and to be able to evaluate the results of digitalisation (Namestiuk, 2022).

One of the main trends is the transfer of an important part of the educational process to the Internet, blurring the boundary between the so-called “classical university” and the “newest private” education. In Azerbaijan, the market of paid online courses amounts to hundreds of thousands of students per year and continues to grow rapidly. The system of formal education will increasingly have to compete with these educational innovations, which implies an inevitable partnership between the education system and enterprises and the need to develop modular and network forms of education.

Each modern institution of higher education seeks to reflect the interests of the field for which it trains specialists. Although the field of philology shows a pronounced tendency toward digitalisation, this cannot but affect the approach to learning. Today, a number of liberal arts universities in Azerbaijan are setting up working groups to teach digital know-how to students and teachers. Some universities go further, developing master's programs for future CDOs (Directors of Digital Technology), participating in the creation of online courses and textbooks.

In this aspect, it is worth noting Fensham-Smith (2019). In this work, the author résumés that during the greatest crisis and the transition to distance learning, all educators felt a lack of the necessary level of technological education. Indeed, the results of this survey show that this lack of digital skills is largely due to the absence of training in the field. A similar opinion is expressed by European scientists. The authors presented the results of their study highlighting the interest in the contribution of cognitive psychology in the field of distance collaborative learning (Dubé & Wen, 2022) and, therefore, the need to introduce cognitive science into the curriculum of philological subjects. In his work, in a collaborative

learning context, Castro (2019) aimed to develop hypertext references to help understand scientific text in French L2, in a plurilingual context, and pre-and post-test assessment tools in the form of concept maps. A systemic analysis of the complex field of biology, homeostatic equilibrium, consisting of subsystems, allowed the development of an experimental text involving an intrasystem and inter-system type of information, as well as hypertext links consisting of explanations of both types of information. Biology students who participated in the experiment completed three readings, followed by three tasks to recall the learned material and therefore comprehensible information, one unaided reading, one reading with hyperlinks and intra- or inter-system explanations, and one distance paired reading. The results indicate the effectiveness of the method. The post-test concept maps created by students indicated that they understood and integrated scientific concepts and causal relationships between concepts. This study showed the interest and the need to create specific and thorough teacher training in the era of digitalisation of society, in the context of distance learning and globalization.

Aru-Chabilan (2020), in a similar experiment, presented one of the few research studies on the methodological principles derived from an experimental approach to the effects of digital technology on future elementary school teachers' outcomes. The results showed that students accustomed to using digital technology in the classroom understood what they were reading faster and better. The reading speed of hypertext documents acquired by students accustomed to using digital technology was impressive (+30%). In addition, this reading speed does not harm students' academic performance. It confirms that this is indeed a new selective reading mode (learning effective navigation) (Motornaya, 2022). The results show that the skills learned in these systems can advance the reading skills in general.

Speaking about the development of philological science, let us recall Ishchenko et al. (2022) with ideas about the perspective pedagogy – the base configuration of the functions of education: from the role of preservation of the past to the role of stabilizer in a changing world. According to the authors, it is necessary to analyze the current trends in order to identify the consequences that will later have a strong echo and materialize in objects and dangers for 2-3 decades.

The question to be clarified today is whether philological education should focus on cultivating the capacity to adapt to changes or on cultivating a critical attitude toward that change (Hodges et al., 2020).

A possible answer would be that a philological education should develop the capacity for change control, which means developing the critical spirit and attributes necessary to create new meanings. This is not a set of specific skills very important to the modern professional, but rather the ability to understand and anticipate trends in modernity. Usually, there is a general skill set and body of knowledge that every experienced employee should have. This has always been taught in universities, that digitalisation forces you to the further development: to learn to analyze goals, to understand the relationship between processes, people, and machines, and to look for ways to improve your own efficiency.

Conclusions and Implications

The results of this scholarly work survey lead to the reconsideration of philological education in the XXI century, with the generalization of digital technologies in all spheres of life and society. One illuminates this need as follows: the informational flow leads to a generalized competition of all ideas, a deregulation of the 'cognitive market,' with the unfortunate consequence of hijacking, often for the worse. Today, the human attention endures the "impact of screens" and is ace to the misunderstanding of the "new". The society's response to the progress will depend on the possibilities of escape from what

should be called a civilizational threat (Han et al., 2019). Although modern philology has no longer the monopoly on the dissemination of ideas and knowledge as in previous centuries, it must refocus on the fundamental missions that only philology can fulfill and position itself at the center of society, especially with the regard to digital technologies.

It is the philological science that must ensure the respect for the values of the educational system: the access to education for all, the equality of access to knowledge, the guarantee the relevance of information and knowledge, and the evaluation of the process of knowledge construction in students.

It is up to philology to provide humanities students with “deep knowledge,” so it should be able to help them to build the competence in prioritizing information and thus enable students to develop structured knowledge, to implement it, and therefore to promote coherence in their own actions.

References

- Allahyarova, T. (2023). The concept of development and current topical aspects of the distance learning system in Azerbaijan. *Distance Education in Ukraine: Innovative, Normative-Legal, Pedagogical Aspects*, 1(2), 79–94. <https://doi.org/10.18372/2786-5495.1.17307>
- Aliyeva, T., Rzayeva, U., & Khalilova, J. (2021). Problems and Prospects in the Applying Methods of Analysis Educational Data. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 12(6), 1255–1266. <https://doi.org/10.17762/turcomat.v12i6.2465>
- Anderson, M. (2018). Humanization in the digital age: A critique of technophilia in education [Unpublished doctoral dissertation]. *Georgia State University*. <https://doi.org/10.57709/12049910>
- Arici, F., Yildirim, P., Caliklar, Ş., & Yilmaz, R. M. (2019). Research trends in the use of augmented reality in science education: Content and bibliometric mapping analysis. *Computers & Education*, 142, Article 103647. <https://doi.org/10.1016/j.compedu.2019.103647>
- Arora, A. K., & Srinivasan, R. (2020). Impact of pandemic COVID-19 on the teaching–learning process: A study of higher education teachers. *Prabandhan: Indian journal of management*, 13(4), 43–56. <https://doi.org/10.17010/pijom/2020/v13i4/151825>
- Aru-Chabilan, H. (2020). Tiger Leap for digital turn in the Estonian education. *Educational Media International*, 57(1), 61–72. <https://doi.org/10.1080/09523987.2020.1744858>
- Castro, R. (2019). Blended learning in higher education: Trends and capabilities. *Education and Information Technologies*, 24(4), 2523–2546. <https://doi.org/10.1007/s10639-019-09886-3>
- Dubé, A. K., & Wen, R. (2022). Identification and evaluation of technology trends in K-12 education from 2011 to 2021. *Education and information technologies*, 27(2), 1929–1958. <https://doi.org/10.1007/s10639-021-10689-8>
- Dykhnych, L., Karakoz, O., Levchuk, Y., Namestiuk, S., & Yasynska, O. (2022). Prospects for the development of design thinking of higher education applicants in the culture and art industry in the context of digitalisation. *Journal of Curriculum and Teaching*, 11(5), 196–204. <https://doi.org/10.5430/jct.v11n5p196>

- Fensham-Smith, A. (2019). Becoming a home-educator in a networked world: Towards the democratization of education alternatives?. *Other Education*, 8(1), 27–57. <https://www.othereducation.org/index.php/OE/article>
- Gillpatrick, T. (2020). Innovation and the digital transformation of education. *The Journal of Limitless Education and Research*, 5(3), 194–201. <https://doi.org/10.29250/sead.797372>
- Habibova, K. A. (2020, May). Digital advertising and digital communication as a means of mass manipulation. In A. D. Nazarov (Ed.), *Proceedings of the International Scientific Conference "Digitalization of Education: History, Trends and Prospects" (DETP 2020)* (pp. 556–559). Atlantis Press. <https://doi.org/10.2991/assehr.k.200509.101>
- Han, E. R., Yeo, S., Kim, M. J., Lee, Y. H., Park, K. H., & Roh, H. (2019). Medical education trends for future physicians in the era of advanced technology and artificial intelligence: An integrative review. *BMC medical education*, 19(1), 1–15. <https://doi.org/10.19173/irrodl.v22i2.5381>
- Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020, March 27). *The difference between emergency remote teaching and online learning*. EDUCAUSE Review. <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning>
- Huwer, J., Irion, T., Kuntze, S., Schaal, S., & Thyssen, C. (2019). From TPaCK to DPaCK–Digitalisation in education requires more than technical knowledge. In *Education research highlights in mathematics, science and technology* (pp. 298–309). ISRES Publishing. https://www.isres.org/books/Erhmst2019_24-12-2019.pdf#page=302
- Ishchenko, Y., Kharchenko, T., Myhovych, I., Didkivska, I., & Viktorina, O. (2022). The qualification improvement model for teachers of philology on the use of cloud technologies in pedagogical activity. *Revista Tempos e Espaços em Educação*, 15(34), Article e17166. <https://dialnet.unirioja.es/servlet/articulo?codigo=8493901>
- Jalilbayli, O. B. (2022). Forecasting the prospects for innovative changes in the development of future linguistic education for the XXI century: The choice of optimal strategies. *Futurity Education*, 2(4), 36–43. <https://doi.org/10.57125/FED.2022.25.12.0.4>
- Koseoglu, S., Bozkurt, A., & Havemann, L. (2020). Critical questions for open educational practices. *Distance Education*, 41(2), 153–155. <https://doi.org/10.1080/01587919.2020.1775341>
- Kuurme, T., & Heinla, E. (2020). Significant learning experiences of Estonian basic school students at a school with the reputation of a “Happy School”. *US-China Education Review A*, 10(6), 245–259. <https://doi.org/10.17265/2161-623X/2020.06.001>
- Langset, I. D., Jacobsen, D. Y., & Haugsbakken, H. (2018). Digital professional development: Towards a collaborative learning approach for taking higher education into the digitalized age. *Nordic Journal of Digital Literacy*, 13(1), 24–39. <https://doi.org/10.18261/issn.1891-943x-2018-01-0>
- Motornaya, S. (2022). Apodictic foundation of modern educational concepts. *Journal of Psychology and Pedagogy Research in Modern Realities*, 1(1). <https://a-publish.com/ojs/index.php/jpprmr/article/view/13>

- Mykhailyshyn, H., Kondur, O., & Serman, L. (2018). Innovation of education and educational innovations in conditions of modern higher education institution. *Journal of Vasyl Stefanyk Precarpathian National University*, 5(1), 9–16. <http://lib.pnu.edu.ua:8080/handle/123456789/1431>
- Namestiuk, S. (2022). On the issue of teaching psychological and pedagogical disciplines at universities using immersive technologies. *Futurity Education*, 2(2), 33–42. <https://doi.org/10.57125/FED/2022.10.11.27>
- Namestyuk, S. V., Smolikevych, N. R., Bytsko, N., Zaitseva, K. I., & Orlova, O. O. (2020). Teaching a professional foreign language to specialists in various industries. *International Journal of Higher Education*, 9(7), 59–72. <https://doi.org/10.5430/ijhe.v9n7p59>
- Nodira, T. (2022). Innovative management in the development of the higher education system. *Journal of Academic Research and Trends in Educational Sciences*, 1(10), 346–351. <http://www.ijournal.uz/index.php/jartes/article/view/277>
- Pacheco, E., Lips, M., & Yoong, P. (2018). Transition 2.0: Digital technologies, higher education, and vision impairment. *The Internet and Higher Education*, 37, 1–10. <https://doi.org/10.1016/j.iheduc.2017.11.001>
- Valiyev, A., & Valehli, F. (2022). COVID-19 and Azerbaijan: Is the system resilient enough to withstand the perfect storm?. *Problems of Post-Communism*, 69(1), 103–114. <https://doi.org/10.1080/10758216.2021.1920840>

DOI: <https://doi.org/10.57125/FED.2023.25.03.06>

How to cite: Bukliv, R., Kuchak, A., & Vasylyuk-Zaitseva, S. (2023). Professional Training of Future Academic Staff and Digitalization of Education: Analysis of Mutual Influences. *Futurity Education*, 3(1), 76–85. <https://doi.org/10.57125/FED.2023.25.03.06>

Professional Training of Future Academic Staff and Digitalization of Education: Analysis of Mutual Influences

Roksoliana Bukliv*

PhD in Economic Sciences, Associate Professor Department of Chemistry and Technology of Inorganic Substances, Institute of Chemistry and Chemical Technologies Lviv Polytechnic National University, Lviv, Ukraine, <https://orcid.org/0000-0002-3837-5794>

Alona Kuchak

PhD in Physical and Mathematical Sciences, Teacher Chernivtsi High School of Commerce affiliated with of State University of trade and economics, Chernivtsi, Ukraine, <https://orcid.org/0000-0001-5056-8719>

Svitlana Vasylyuk-Zaitseva

MPhil in Physics (UK), Senior Lecturer, IT institute, department of Mathematics and Physics, Kyiv, Ukraine, <https://orcid.org/0000-0002-0875-462X>

***Correspondence email:** roksolyanabukliv@gmail.com.

Received: December 17, 2022 | **Accepted:** February 2, 2023 | **Published:** March 25, 2023

Abstract: Today's modern society is developing quite dynamically due to the use of the latest technologies and their implementation in quotidian life. The same trends are characteristic for the development of higher education and all participants involved in this process. The purpose of the article is to analyze the mutual influence of the professional training of future scientific and pedagogical

workers and the trends of education digitization. Particularly, the importance of acquiring digital competence was established – the importance of this process was confirmed by the use of content analysis of the literature: search engines found 60 most concerning articles for the years 2015–2023. In the results, materials of empirical and theoretical content were elaborated. It should be noted that students in Ukraine are not enough competent in the use of digital technologies, but some of them have not completely realized the essence of the responsibility and academic integrity regarding the use of various sources. The results also show that there are a number of difficulties (for example, lack of motivation and knowledge about digital competencies) in the professional training of future scientific and pedagogical workers using digital technologies. The conclusions summarize that digital skills will become especially relevant in the future, so the training of teachers and scientists should pay great attention not only to the use of digital technologies and resources in teaching, but also theoretical counseling, the formation of students' ability to critically perceive the digital content. Therefore, the system of professional training of future scientific and pedagogical workers should focus on the formation of digital literacy, critical thinking, and information competence of students. At the same time, the mutual influence on the digitalization of education is possible. Thanks to the cooperation with employers, teachers will change the content of training in accordance with the current requirements of the labor market, so digital training mechanisms will also need an improvement.

Keywords: scientific and pedagogical workers, digital technologies, digitalization of education, distance education.

Introduction

In today's information society the digital technologies development changes the educational process, ways, forms, and methods of teaching. The digital dimension touches the transformation of educational organization because the latter plays an important role in familiarizing participants in the educational process with the target application of digital technologies and tools in the digital society. This, in turn, requires adequate digital literacy. The digital competence influences the transformation of educational institutions taking into account the basic conditions of the information society. It also allows being successful in the new information world, managing information, making strict and quick decisions, acquiring important and relevant competencies and skills. Accordingly, professional training of scientific and pedagogical staff is impossible without taking into account digital trends.

The education's digitalization key aspects have been studied by many scholars. Aldhafeeri and Alotaibi (2022) revealed the effectiveness of using digital technology in the training of modern students. Stoika (2022) studied the peculiarities of digital transformation in education. The researcher analyzed all the measures taken by the Hungarian government in the field of digital transformation as well as factors for the further development of digital learning. Yoleri and Nur Anadolu (2022) characterized the level and digital literacy skills of undergraduate students who study in different departments according to the article, type of department, and daily use of the Internet. Bader et al. (2022) explored the digitalization of the education of the future through the lens of risk analysis and the choice of mechanisms to overcome the barriers of large-scale digitalization of the field. At the same time, Peruzzo and Allan (2022) characterized the main aspects of education digitalization against the background of the spread of the pandemic Covid-19, also described the threats and drawbacks of digital e-learning implementation. Tytova and Mereniuk (2022) explored the importance of digital literacy for future teachers in the realities of large-scale military aggression. Zhang and Aslan (2021) highlighted key

aspects, features of using AI technology in education. Yee Chung et al. (2021) analyzed the problem of using AI in modern digital and automated education. Safonov et al. (2022) characterized the digital transformation of education, the key challenges to its implementation. Nevertheless, the issue of the mutual influence of digitalization and education is still important for investigating, so the problem of analyzing the professional training of future educators and scientists with the involvement of digital technologies requires more reflection.

Research Problem

In terms of education digitalization problems this process is considered to have a one-way direction: the use of modern techniques seemed in order to influence the organization of the educational process. At the same time, the other vector is important - how scientific and pedagogical workers themselves are able to influence the development of digital technologies because the latter should correspond to the interests of society and be a reliable support in the use. For this reason, the problems of influencing the knowledge and competencies acquired during the training are also relevant, because they must meet the current challenges and evolve according to the needs of modernity.

Research Focus

The study focuses on the acquisition and use of digital competence through the prism of analysis of the most promising skills that will definitely be in demand in the next few years (established based on studies of labor market specialists). Certain new learning objectives open up opportunities for the use of computer technology to increase the quality of education, the formation of educational impact. Obviously, it is impossible to form future scientific and pedagogical workers without taking into account these specifics and further detailed research.

The solution of many topical difficulties depends on the mechanisms of functioning and improvement of methodological systems aimed primarily at the development of digital and information competence. Consequently, attention is also drawn to this aspect of the training of applicants for higher education, who in the future will be able to independently and effectively engage in scientific and educational activities. A particular attention will be paid to the need of introducing specific courses in responsibility for the information used and disciplines that address the review and acquisition of academic virtue skills. General skills development (e.g., critical thinking) through the digitalization of the educational process is also important.

Research Aim and Research Questions

The article aims to analyze the mutual influence of future scientific and pedagogical staff professional training and the trends of digitalization of education. In addition, the degree of mastering digital literacy of students and prospects for the development of training of future scientific and pedagogical workers are considered.

Research Methodology

General Background

This article refers to theoretical and empirical research as it was implemented in several stages: theoretical and empirical. The theoretical analysis of the problem is presented in the first part of the paper. At the same time, in order to determine the level of digital competence of future scientific and pedagogical workers a special survey was conducted on the online platform The theoretical part of the

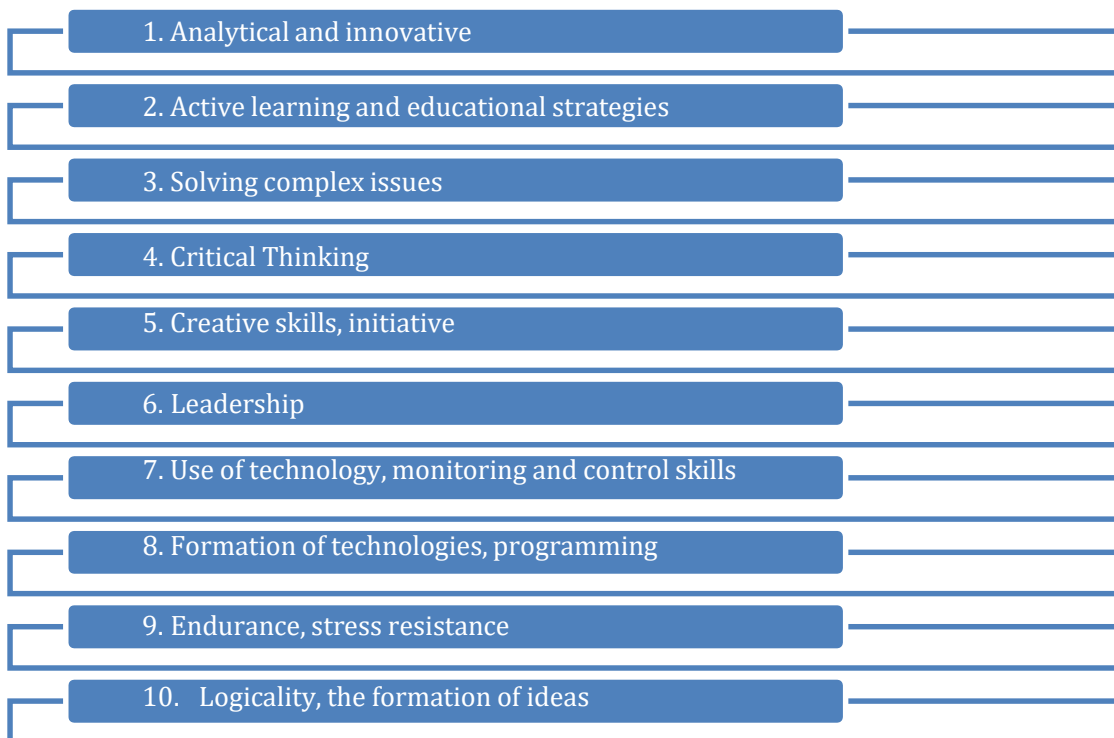
study is formed on the base of general scientific methods use: analysis, synthesis. Based on deduction it was possible to move from general (accepted in science) statements to the formation of own conclusions and hypotheses about the problem of professional training of future scientific and pedagogical worker on the background of digitalization of educational and scientific spheres. Through the use of the dialectical method, the phenomenon of students' professional training was considered as constantly changing and actively developing.

Research Results

The traditional system of education and science is undergoing significant changes in all periods of the educational and scientific process. The total process of digital technologies and innovations implementation in higher education among the various factors of improving the quality of obtaining education focuses on improving the comprehensive professional training of specialists and ensuring the demand for professionals in the modern labor market (Andros, 2022). At the same time, current education aims to provide the future specialist with key learning services and to adapt the pedagogical conditions in order to form an independent development of an individual capable of responding to a variety of global changes, digital as well (Baber, 2020). The process of active improvement of digital technologies, the introduction, and formation of various strategies and concepts of sustainable development, the use of digital communication tools in teaching contribute to the transformation of the digital environment of the educational and scientific sphere (Peruzzo & Allan, 2022). Consequently, the widespread use of digital technologies in the training system of the future scientific and pedagogical employee contributes to the formation of digital competence, now relevant and particularly in demand in the labor market (Turczynski, 2022). The World Economic Forum in Davos formed a rating of the most demanded skills, among which digital competence occupies a prominent place (See Figure 1).

Figure 1

Top 10 Most In-Demand Skills for the Next 5 Years



Source: adapted from Turczynski (2022).

Consequently, digital competence will be important for a long time: digital skills, monitoring, and control, technology creation, etc. are relevant. - these are things that the professional of the future must know (Kuzminska et al., 2019). Experts note that in the future even greater digitalization of all social institutions of humanity is expected, so the professional training of the future scientific and pedagogical employee should be based on the formation of digital and information competence (Turczynski, 2022).

An important element of digitalization is the appeal to various computer technologies, which influence the compliance with the criteria of collecting, processing, obtaining, and providing information using digital computer systems (Kuzminska et al., 2019). The basis of innovative computer technologies are three technological solutions that are currently used: the ability to store information on digital and physical media, the becoming and further development of communications, and automatic procedures for processing information using computers. Practically, computer technology is used in software and hardware complexes, which are formed from personal computers and the necessary set of peripheral devices connected to local and global computing networks and equipped with the necessary software (de Figueiredo et al., 2020). The use of the mentioned parts allows increasing the ability of scientific research and educational processes, which are the basis for their improvement (Safonov et al., 2022). The possibility of using computers allows the formation of new technological generations. Primarily it allows the increasing of education quality, form updated ways of educational influences, successfully interact with computational tools, and improve the information competence of teachers and students. For this reason, the following pedagogical goals of the use of digital resources in the training system of future scientific and pedagogical workers are highlighted:

1.The intensification of all levels of the educational process. It is important to note the prospects of non-formal education. Due to society's digitalization it begins to play an important role in learning. The turn to digital platforms (e.g., Promothus), will provide opportunities for digital self-learning and mastery of digital and information literacy. This opens up new opportunities for self-education and blended learning, where some of the material can be learned in higher education classes and some during additional and asynchronous work with educational platforms on the Internet. Although this potential is not fully exploited, it may be revealed in the future. Teachers can additionally influence this process: they can offer interesting and new formats of classes, so that digital platforms will undergo changes according to the chosen effective methodology.

2.The applicant's personality development: the formation of critical thinking, digital literacy, information competence, culture of digital communication (Andros, 2022).

3.Students' preparing for a comfortable life in the realities of the global information society.

At this stage, an important role is played by communication technologies: telephone communications, television, mainly used in the management of the learning process in distance learning systems (Stoika, 2022). The learning is concentrated on the obtaining of the learning informatization goals based on a set of functional and interrelated pedagogical, informational, methodological, psychophysiological, and ergonomic methods and features of the application. One example of the modern successful implementation of computer technology in modern educational institutions was the use of unlimited possibilities of the Internet in higher education institutions, analysis, and storage of comprehensive information, its transportation to all interested users (Yoleri & Nur Anadolu, 2022). The Internet quickly adapted for scientific, social, informative advertising work, but also - in education. At the same time, the first stages of the introduction of the Internet in educational environments revealed not only considerable opportunities for their development but also established difficulties that require

a prompt response and quality response in educational institutions (Rossikhina et al., 2019). First of all, it is a large cost of organizing digital education when compared to the capabilities of traditional technologies, which is associated with the need to address a considerable amount of technical and software (Stoika, 2022). An additional requirement is adequate training and preparation of teaching and learning materials. Note that as a result of using the latest digital technologies, future academic educators will not only be able to receive, find, research, process, interpret information, but also will be equipped with modern means of communication, affecting the formation of e-learning using the system of modular oriented principle (Bader et al., 2022).

The management of educational and scientific institutions with the help of digital, computer technologies implements the control of many processes, however, and the learning process, teachers use them in the preparation, organization, and conduct of lectures and seminars, students - directly in learning activities (Rossikhina et al., 2019). Current research discusses the main benefits of using digital technologies in the education for years (Aldhafeeri & Alotaibi, 2022; Bader et al., 2022). In general, they increase the effectiveness of learning through such factors as increasing the amount of useful information with the generalization of research and development; easier and faster search, storage, interpretation, transfer, and presentation of educational information materials; the ability to analyze a large volume of learning information; the ability to implement various tasks not previously solved in the traditional system; selection of topics and obtain results that are inaccessible by other means. The use of digital educational resources provides new opportunities for the quality of education improvement. At the same time, their use in the field of education allows teachers to qualitatively transform the content, tools, methods, and organizational forms of the process of professional training of future scientific and pedagogical workers.

Discussion

The professional training of future education specialists will generally require significant changes in the system of its organization. Such processes are associated not only with total digitalization but also with the Russian-Ukrainian war. Therefore, an experienced and competent use of various digital platforms will require the formation and provision of higher education institutions with quality products (Tytova & Mereniuk, 2022). One believes that this will affect the assessment to a variety of educational materials, current scientific developments, and research, the world's distance science libraries, etc.

According to Bader et al. (2022), the main directions of the modern process of educational digitalization consist in the creation of educational resources in order to support the interactive content, the creation, and implementation of digital, innovative computerized ways and methods of organizing the education. It also consists in the introduction of appropriate facilities, in the use of information and communication technologies at all levels of the educational process. Consequently, it is predictable that through the use of modern information and communication technologies in professional training, future teachers and scientists will be able to actively compete with other professionals and become more in demand in the labor market.

However, the analysis of modern scientific research demonstrates that there are a number of problems to be solved on the way to full-scale digitalization of education (Aldhafeeri & Alotaibi, 2022; Peruzzo & Allan, 2022; Safonov et al., 2022).

There are a number of difficulties in the system of professional training of future scientific and pedagogical workers using digital opportunities for the full digitalization of this process. First of all, it is

the lack of awareness of teachers and educators, their lack of motivation can be traced to an absence of knowledge and relevant digital competencies, which can be caused by subjective and personal factors (Rossikhina et al., 2019). There are also barriers that impede educators' professional development during the digital mastery process. Such barriers refer to individual human metastructures (Bader et al., 2022, p. 28). The study of these aspects will contribute to the awareness of the non-linearity of professional teacher training to work in a digital environment. There are also didactic barriers to the digitalization of the educational space: they are observed where teachers use shotgun methods of work organization, which cannot realize the full digital potential of education. Administrative barriers also play a notable role, such as outdated regulatory frameworks that remain unadapted to the widespread use of digital education. According to Bader et al. (2022), due to the fact that there are now many different educational Internet resources, a separate barrier is the security factor. Obviously, at present, many modern educational platforms do not have protection against various hacker threats and attacks. The implementation of the indicated problems will contribute to an even greater connection between digital technologies and the training process of a future scientific and pedagogical employee.

The resolution of many existing difficulties and contradictions is seen in the development and improvement of the methodological system aimed primarily at the development of digital and information competence of higher education students. This should also be realized through comprehensive training in computer technology. Separately, in order to increase the level of digital competence, we propose to introduce into the training system of future scientific and pedagogical workers special courses of responsibility for the information used and disciplines aimed at studying the phenomenon of academic virtue. Such steps will contribute not only to the formation of digital communication skills but also to the formation of responsibility and critical thinking in students.

At the same time, one should note that teachers and higher education are also able to influence digitalization. First, they can develop specialized training courses, which impose special requirements for digital platforms and methods of information transfer. Accordingly, IT product developers, responding to the demands of the academic teaching market, should make changes to their products and thus steer the direction of digitalization in the direction needed by the academic teaching staff.

Another way to influence the development of digitalization of education is the continuous improvement of digital competence and information literacy of scientific and pedagogical personnel. This can be realized through their participation in professional development courses, and internships with appropriate credits for listening to disciplines with appropriate digital learning.

Also, in the process of professional training, there should be close cooperation between teachers and employers (representatives of universities, research institutes, industries, businesses). Through such cooperation, it is possible to respond to the challenges of the time, i.e., to update the knowledge, skills, and abilities demanded in the labor market, including those in the field of digital technology. Stakeholder initiatives can become a driver of change when, out of the mass of digital material, the emphasis is placed on the most effective learning models. This will force the developers of educational content and technology to restructure their services, applications, etc. Note that elements of such stakeholder influence are already tangible: a mechanism for accreditation of educational programs has been launched, where the obligatory point is the celebration of cooperation with employers and the provision of a detailed package of documents to prove it. Although today there are cases when many educational institutions imitate such a process or put it formally from a bureaucratic point of view, the idea of establishing a dialogue with future employers is relevant and objective is beginning to be recognized as a necessary element for the successful completion of education. Accordingly, the tool to

influence the digitalization of learning (its content and forms) will have more influence and efficiency in the future.

Conclusions and Implications

The total society's digitalization has a great impact on the education. It is undergoing digital transformation at all levels and spectra. Therefore, the system of professional training of future scientific and pedagogical workers should focus on the formation of digital literacy, critical thinking, and information competence. Acquiring these skills, future scientific-pedagogical workers will be able to compete professionally in the labor market. In addition, in view of labor market trends, digital skills will become especially relevant in the future, so the training of teachers and scientists should be of great importance not only concerning the use of digital technologies and resources in teaching, but also in the theoretical counseling, in the formation of students' ability to critically perceive digital content and understand new innovative technologies.

The results of the study demonstrated that Ukrainian students do understand the use of digital technologies, but most were not fully aware of the importance of responsibility for the use of certain materials and academic virtue. In the professional training of future teachers and scientists, it is suggested introducing special courses on digital literacy and academic virtue, which will generally affect the correction of the above-mentioned trend.

The interaction between the educational industry and digitalization has demonstrated that there are several barriers to the total digital transformation of the sphere that require a solution to the professional training of education and science specialists. In particular, a significant drawback is the lack of awareness of teachers and educators, their lack of motivation can be traced to a lack of knowledge and relevant digital competencies. Also, as it was found, there are didactic, administrative, safe barriers to digitalization. Solving the identified problems will also contribute to an even closer digitalization of the educational sector, and thus will affect the professional training of specialists of the future. Teachers and academics can also influence the development of digitalization, particularly by improving their digital skills through participation in professional development courses and internships. Teachers can influence the digitalization of the educational process by developing specialized training courses using innovative technologies. The prospect of cooperation with employers as an effective mechanism to influence the content and forms of digital learning is noted. Stakeholders' requirements for training applicants and close cooperation with the teachers of educational programs will allow to transform the essence of academic disciplines and to adjust digital teaching methods accordingly. This will make it possible to adjust the forms of digitalization of education. Although this mechanism still needs further improvement, it will improve the way higher education institutions train their graduates.

References

- Aldhafeeri, F. M., & Alotaibi, A. A. (2022). Effectiveness of digital education shifting model on high school students' engagement. *Education and Information Technologies*, 27(5), 6869–6891. <https://doi.org/10.1007/s10639-021-10879-4>
- Andros, M. (2022). Information and communication competence of teachers in the era of digitization of education: Ukrainian discourse. *Actual Problems in the System of Education: General Secondary*

objectively. *Computers and Education: Artificial Intelligence*, 2, Article 100011. <https://doi.org/10.1016/j.caeai.2021.100011>

Yoleri, S., & Nur Anadolu, Z. (2022). Examination of digital literacy skills of undergraduate students according to various variables. *Advanced Education*, 9(21), 121–134. <https://doi.org/10.20535/2410-8286.262190>

Zhang, K., & Aslan, A. B. (2021). AI technologies for education: Recent directions. *Computers and Education: Artificial Intelligence*, 2, Article 100025. <https://doi.org/10.1016/j.caeai.2021.100025>

How to cite: Sanetra-Półgrabi, S. (2023). Features of the Organization of Distance Learning in the Process of Training Specialists in Administration and Public Administration (Polish Experience), *Futurity Education*, 3(1), 86–104. <https://doi.org/10.57125/FED.2023.25.03.07>

Features of the Organization of Distance Learning in the Process of Training Specialists in Administration and Public Administration (Polish Experience)

Sabina Sanetra-Półgrabi

PhD in Social Sciences Department of Administration and Public Policy, Pedagogical University of Krakow, Kraków, Poland, <https://orcid.org/0000-0001-9628-5327>

***Correspondence email:** sabina.sanetra-polgrabi@up.krakow.pl.

Received: December 23, 2022 | **Accepted:** February 8, 2023 | **Published:** March 25, 2023

Abstract: The article reflects the peculiarities of distance learning organization in the process of training specialists in administration and public administration on the example of the Polish experience. The methods of providing distance education, the challenges faced by specialists in higher education, and the advantages of such training of managers are considered. The presented article contains a review of the literature concerning distance learning in administration and public administration published in the last five years. According to the results of the processing of 45 articles presented in scientometric databases (Scopus, Web of Science, Index Copernicus), the trend of comparative analysis of distance and traditional educational models is typical. Research studies mainly focus on specific technologies and the degree of their effectiveness, the number of publications with the study of competencies has been growing only in the last two years. In addition, the predominant method is the analysis of quantitative data on students' academic performance and the adoption of the latest technologies by educators. Accordingly, the novelty of the study lies in highlighting the limitations of the discourse in the problem field: the focus on WEIRD sampling (respondents from Western, educated, industrialized, wealthy, and democratic societies), the lack of a meaningful conceptual framework for competency and self-efficacy research, the lack of qualitative data specific to a particular industry. Therefore, the purpose of the

presented work is to determine the elements necessary for the professional development of future managers in a distance learning environment and the degree of their implementation. In the course of the empirical study, the subjective perception of the quality of education in the conditions of distance learning and the compliance of qualifications obtained by students with the requirements of the professional environment in the field of management were analyzed. The research methodology is embodied by exploratory design, which is based on surveys of participants in the educational process and semi-structured interviews of specialists in the field of public administration. The results allowed drawing conclusions about the sufficient level of skills in the digital environment and the sense of satisfaction with the educational process among students and teachers. The main indicator of academic achievement was determined by the content of the curricula, which corresponded to the current trends of professional activity. In addition, in the distance mode, one of the important components of learning efficiency is the interpersonal contact between the teacher and the student, guaranteeing the experience of the content and quality of the educational process.

Keywords: distance education, higher education, PA programs, Central and Eastern Europe, CEE, Poland.

Introduction

The field of management, namely the public administration (PA), is an agent of change in modern society because reforms are primarily conditioned by the efficiency of managers' professional activity. Accordingly, the issue of qualitative training of specialists is particularly acute in the period of large-scale transformations. A particular attention should be paid to the issues of professional competence in the realities of diversification of the educational sector. For example, the Republic of Poland has developed a number of distance learning programs for public administration and management. It should meet the increasing demand for qualified personnel in this area and maintain the effectiveness of the educational process during quarantine restrictions. However, the issue of the quality of these programs remains relevant. Distance management training is characterized by significant features that reflect the overall context of future professional activity: technology-oriented, science-based, cooperative, autonomous, working with limits, and limited resources. The above-mentioned training conditions contribute to important meta-competencies mastering and giving experience in making micro- and macro-level managerial decisions. One of the key features is the training in the context of the transformation of the educational paradigm. Since managerial activity is primarily aimed at meaningful change, training under the supervision of educators, who are executors and initiators of restructuring the educational process, will allow the student to obtain the necessary knowledge and skills as an agent of change (Krukowski et al., 2021). It is noteworthy that the harmonious formation of a specialist is possible only with the effective implementation of pedagogical principles in the modern context. Consequently, it is necessary to justify effective learning interaction in the era of distance education taking into account the peculiarities of professional activity in the sphere of management.

Research Problem

The COVID-19 pandemic and the Russian-Ukrainian war emphasized the importance of effective distance learning in the training of specialists in administration and public administration in Poland. However, the technological maturity of higher education institutions in Poland and the quality of curricula in this field are insufficiently reflected in concerned studies, especially in the context of the historical heritage of Central and Eastern Europe (CEE) – mainly the specifics of the educational process

of leading European Union countries are covered. Explorations on Eastern Europe have become a trend of the last year and are descriptive in nature (Maleńczyk & Gładysz, 2019). The historical heritage of this region largely determines the educational trends in this area. In Poland, particularly, during the communist period, education served as a tool for the development of a socialist society, which was reflected in the ideological bias and low level of competence of graduates. To this day, the training of civil servants is a key mechanism for the Europeanization of the country and the development of the professional community (Donina & Jaworska, 2022). The role of education in the context of state development has been the topic of numerous academic debates. One of the main challenges facing CEE countries is the need to develop the potential of their people through education and training (Pevcin et al., 2019). The need for a rapid transition to an informational educational model has contributed to the reevaluation of information and communication technology (ICT) in RA training. Higher education institutions (HEIs) in Poland have had to rapidly adapt to the digitalization of their programs. The presented studies on the functionality of higher education are justified by the overriding role of universities and research institutes as guarantors of sustainable development. In addition, they outline the standards of the society of the future, relaying them through future managers. Available publications highlight the level of virtualization of educational institutions and the development of their digital infrastructure (Kucharska & Rostek, 2023). In general, the studies assess the Polish standard of training specialists as corresponding to the European one. At the same time, there is insufficient information about the viability of programs given the continued digitalization (Rudenko et al., 2019). Despite progress in program development and the integration of technology into the educational process, there is still a need for research on the feasibility of certain methods in the context of managerial training (Greenwood & Kudrycka, 2018).

Research Focus

Based on the results of the literature review, it is noted that the context of transformations of the educational program of public administration includes the following main components: the challenges of modern professional activity of managers and consistency of competencies of higher education graduates; the compliance with the technical and psychosocial resources of educational institutions of distance learning mode. Now Poland has shifted from the position of the recipient of changes and has acquired subjectivity in the innovation process. Therefore, the sphere of public administration is actively involved in the justification of strategic functions, implementation, and reflection (Hoffman, 2021). In addition, the digitalization of management actualizes the problem of data security control, which changes the context of specialists' activities. Untimely and incomplete adaptation of managers to the new requirements, in particular document management, risk control, auditing, and professional training, is characteristic (Szczepaniuk et al., 2020). Accordingly, it is advisable to study risk control, digital competencies, and their integration into distance learning programs, which will guarantee the relevance of the professional competence of the graduate. Digitalization has also significantly changed the training process itself, as distance learning has not only provided the opportunity to maintain functionality, but also created a new educational space. Participants in the learning process, like professionals in the industry under study, have to master ICT in a short period of time, and didactic principles are still not fully integrated in the new mode of operation (Ernst-Milerska, 2020). The problem of quality assurance of educational programs is a major obstacle to the development of distance learning (Marcin, 2019). One aims to illuminate the degree of consistency between the opportunities offered by innovative technologies in the distance mode and the current state of e-learning for managers in Poland, considering the ultimate goal of the training process.

Research Aim and Research Questions

Referring to the data obtained in the course of the literature review, it can be argued that determining the components of successful mastery of the management profession is an achievable task. For this purpose, one can rely on the criteria actualized in previous works: communication, resourcefulness, motivation (Krukowski et al., 2021); infrastructure, networking, scientific support (Jakimowicz & Rzekowski, 2021); digitalization, global communication, self-learning, motivation, transparency guarantees (Dobrowolski et al., 2022); systemicity, quality, public contextualization (Gabryelczyk, 2020). Although intelligence covers a significant number of different aspects of the field under study, some of them may not correspond to the socio-cultural context of the Polish educational process or the professional environment of managers. The task of this study is to identify those elements that play an essential role in the process of professional development of future managers in a distance learning environment and the degree of their implementation. One can distinguish the following research questions:

1. RQ1 What tools are needed in a remote management training environment?
2. RQ2 To what extent are participants in the educational process adapted to the digital learning environment?
3. RQ3 Does the current management training strategy meet the requirements of the professional environment?
4. RQ4 What are the key competencies for future professionals and require increased attention in a distance learning environment?

Research Methodology

General Background

In the study an exploratory approach in order to identify the key features of the organization of distance learning in administration and public administration in Poland was used. Both, qualitative and quantitative data, which allowed drawing conclusions regarding the substantive and relative aspects of the issue under study, were collected. The empirical research phase included two main approaches: a survey of participants in the educational process and semi-structured interviews with specialists in the field of administration. Formed questionnaires were distributed among students and teachers in the field of administration and public administration in educational institutions in Poland participating in distance learning programs. Semi-structured interviews were conducted with a group of managers for an in-depth analysis of the characteristics of the professional environment. Research participants were informed about the purposes of the study, they were given the right to refuse the interview at any stage, and the data were presented in anonymous form with a guarantee of confidentiality. The publication does not provide affiliations of the participants at the request of the teaching staff of educational institutions. In addition, consent to the processing of the collected data was obtained from each of the participants involved in the work. It should be noted that the presented results are significantly limited by the chosen methodology: subjective evaluation methods illuminate the peculiarities of students' and teachers' experience of Polish institutions, as well as of managers, and do not allow extrapolating the data obtained to another sociocultural context. In addition, the used methods of mathematical and statistical analysis impose limitations on the generalization of the findings. However, the findings are consistent with international standards, particularly NASPAA and EAPAA (Pevcin et al., 2019). This

strategy is due to the desire to separate the process of training of managers from the information field of management as an independent activity and to consider the studied object as an independent one in a certain sociocultural context. Thus, one seeks to bring the educational programs implemented in a distance form to the context of professional activities of managers, without losing the methodological basis of pedagogical activity. Summarizing, in this work we aim to focus on general and specific competencies and methods implemented in the training process, not only evaluating, but also actualizing them.

Sample / Participants / Group

The stratometric approach was used in order to select respondents, and then three research groups were formed. The groups consisted of professors, students, and public administration specialists. Teachers were selected on the basis of their experience in teaching distance courses in administration and public administration among employees of universities and educational institutions in Poland that offer such courses. The students involved in the study were enrolled in appropriate educational programs. Respondents from the public administration sector were recruited based on their availability and willingness to participate in the study presented. These individuals had more than 3 years of experience in public administration in Poland. A total of 319 people participated in the study, including 84 faculty members, 205 students, and 30 public administration professionals. Among the teachers, 64.3% identified themselves as women and 35.7% as men. The age range was 29 to 56 with an average age of 45. The majority of the faculty had a master's degree (84.5%) and the remaining 15.5% had a doctoral degree. Students in the sample were predominantly female (80%), 18 to 35 years old with an average age of 24.3 years. The ratio of undergraduate and graduate students is 76.6% and 23.4%, respectively. Public administration professionals in the sample are predominantly male (70%), with an average age of 49 (age range 32 to 64). All specialists had at least a bachelor's degree, 26.7% had a master's degree, and 10% had a doctorate.

Instrument and Procedures

By analyzing the current publications in this area, one identified characteristic trends. In addition, the basic framework of the application of the separated criteria in the coverage of the problem under study was determined. The research trends and samples of measurement tools are presented in the table of learning interaction. The table below summarizes the data presented in the processed articles, has overview content, and is intended to develop a theoretical and methodological basis for further research projects. The examples of diagnostic techniques provided serve as illustrative material. During the analysis of the research apparatus, the characteristic correspondence of the criteria highlighted by us to the aspects presented in Catalano (2018) was determined. Calls to works that allow evaluating the procedural characteristics of approaches to data collection are given. Complementing the data presented in the table, we note that often the methodology is not covered in the final publications. In addition, the tendency to use author's questionnaires and questionnaires without prior validation and assessment of psychometric qualities is characteristic. A contemporary trend is to turn to Likert's model, self-reports, and conceptual frameworks without prior validation, such as DigCompEdu and Eurostat (Kriksciuniene et al., 2019). Such studies provide an opportunity to assess the current state of distance learning and highlight meaningful aspects, but the issue of the consistency of data from different publications remains open. Moreover, in the absence of a unified methodology, discrete publications are presented to reinforce the realities of the reproducibility crisis. Often research works in this, and related fields have a descriptive orientation. Obviously, this approach to the development of methodology is due to the focus and concretization of research tasks, the embodiment of which requires appropriate

measurement procedures, but the advantage in the current context is still the research based on the analysis of the literature.

Table 1

Overview of Diagnostic Trends in the Study Area

Criteria	Examples of methods
Engagement and Satisfaction	E-learning Satisfaction Questionnaire, ELSQ (Cofini, et al., 2022) Course evaluation (Kuch & Roberts, 2018) End-Of-Course Evaluations, EOCE (Plante et al., 2022) Students 'Evaluation of Educational Quality, SEEQ (Fatani, 2020)
<i>Limitations: monocriteria, qualitative presentation of data, contextuality (program- or course-driven), subjective method of diagnosis.</i>	
Acceptance (Readiness and Self-Efficacy)	Technology Acceptance Model, TAM (Rizun & Strzelecki, 2020) Innovation Diffusion Theory, IDT (Al-Rahmi et al., 2019)
<i>Limitation: loss of predictors, realized in particular in the Unified Theory of Technology Acceptance and Use (Ahmed et al., 2022), adaptation to the digital environment of the intensional but not the behavioral dimension.</i>	
Meta-competencies (Readiness and Self-Efficacy)	Metacognitive Skills Assessment Tool, MSAT (Ali et al., 2022) Rubrics for Metacognitive Skills (Vincent-Lancrin et al., 2019) Assessment Criteria for Report Writing, ACRW (Siddiqui et al., 2020) Self-Directed Learning Readiness Scale (Chen & Fan, 2022)
<i>Limitation: lack of confirmatory tests of conceptual foundations, limitation of external validity, specialized and difficult operationalization of the phenomenon</i>	
Competencies (Achievement)	Caring Assessment Tool: administration, CAT-Adm (Wolverton et al., 2018) Exam lists (Ślósarz, 2019)
<i>Limitation: difficulty in assessing competencies in dynamics, contextuality (low data transfer potential), qualitative assessment of quality without detail</i>	
Effectiveness (Evaluation of Environment)	Distance Education Learning Environments Survey (Brown et al., 2021) Online Classroom Learning Environment Inventory (Rahayu et al., 2022)
<i>Limitations: monocriteria, predominance of self-reports, introspective nature, difficulty in diversifying components</i>	
Quality (Evaluation of Environment)	European Association for Public Administration Accreditation Standards (Mikułowski, 2017) Sloan-C Quality Framework (Sadeghi, 2018)
<i>Limitation: the conditionality of the standards of accreditation, the principles of educational policy, the inconsistency of the proposed frameworks of different management systems</i>	

Source: compiled by the authors based on a literature review.

The authors have preliminarily characterized the procedural trends in the research work in the direction of distance education for managers and in the related spheres. Detailed data of the table,

allowed a certain clarifications concerning the content component reflected in the criteria. The refinements of higher school specialists are more often focused on the indicators of student engagement and satisfaction. As a rule, the subjective experience of a student and undifferentiated indicator of the quality of educational interaction are evaluated. Specialists focus on predictors such as faculty support, course design, and higher education applicant interaction. Satisfaction of participants in the educational process is naturally more pronounced when hygienic factors are provided: favorable social climate, democratic method of activity management, loyal policy of administration, etc. Acceptance (readiness or self-efficacy) is an important category because of the wide implementation of the distance form. For the most part, scholars use self-reports to collect data on factors such as previous online learning experiences, level of digital literacy, and confidence in their ability to learn online. The correspondence of subjective readiness to the previous experience of students who have implemented their own competencies in the digital environment is evident. Separately, we defined such a criterion as metacompetence. In general, those qualities that are measured in the methods aimed at assessing the general competencies of participants in the learning process correspond to the Catalano (2018) category of self-efficacy. However, the formation of a new concept, in which metacompetencies are a zone of a combination of self-regulation and self-efficacy, gives new meaning to this criterion. The three objective components: competencies (achievement), effectiveness (environmental assessment), and quality (environmental assessment) are widely represented in accreditation and external assessment programs. Note that the research methodology in this direction exists in isolation from the realities of educational policy. Summarizing, one can actualize the following limitations of the available methods: focus on self-reports, limited samples, lack of standardization, and longitudinal designs. Distinctly, it should be noted that psychological and pedagogical publications in the field of law are often implemented separately, maintaining a certain distance between the realities of professional activity in higher education and the norms. Students may overestimate their engagement or enjoyment or underestimate the difficulties they encounter. Researchers should take steps to verify self-reported data by triangulating with other sources. There is a lack of standardized measures of the quality of the online learning environment in state government. This can make it difficult to compare the results of different studies or to draw definitive conclusions about the effectiveness of the online learning environment. Most studies rely on convenience samples (convenience samples) of the student body, which may not be representative of the broader population of students in public administration. Researchers should use the randomization method. The tendency toward cross-sectional searches reflects the manifestation of the qualities under study at a specific time point, limiting data on the dynamics of the phenomena, precluding a more accurate understanding of the effectiveness of the online managerial learning environment. At the same time, there is a focus on individual-level factors such as engagement, satisfaction, and self-efficacy, and a neglect of the broader institutional and contextual conditions that can influence the effectiveness of online learning environments. The need to develop a comprehensive approach to research is relevant, which is not possible in today's constraints.

Using the results of analytical-synthetic processing of research publications, operands for solving the research questions mentioned in the presented work are defined. The methodology of the presented work partially bypasses the above limitations. In order to answer RQ1 "What tools are needed in a distance learning environment for managers?", it was necessary to collect data on the technological support used in professional activities by managers and qualitative data on the needs of participants in the educational process (Pokryszko-Dragan et al., 2021). A questionnaire including an open-ended and closed-ended questions of the methods used to provide distance education, the challenges faced by participants in the educational process, and the benefits of this approach to learning Tomczyk (2022) was used. Closed questions are presented on a five-point Likert scale (Kriksciuniene et al., 2019). In

addition, a preliminary assessment of satisfaction with the current state of distance learning using the Satisfaction and Quality questionnaire is included in the design. This method has sufficient psychometric properties. Cronbach's alpha, a measure of the internal consistency of the elements of the method, was calculated for all six factors. Five of the six factors had values above 0.70, while one had a value of 0.691. Model fit statistics were also calculated, the reduced chi-square, including the overall degree of the figure, was 2.016, indicating significant variance in the data set under study. In addition, the Comparative Fit Index (CFI) was found to be 0.883 and the RMSEA was 0.078, indicating that the model was a good fit for measuring appropriate quality (Sebastianelli et al., 2015). The RQ2 question "How are participants in the educational process adapted to the digital educational environment of today?" required a quantitative assessment of the digital competencies of educators and education applicants. The authors used the Tomczyk (2020) questionnaire. The question RQ3 "Does the existing management training strategy meet the requirements of the professional environment?" was implemented in the form of semi-structured interviews with public administration professionals in order to detail the experiences of those actively involved in professional activities. The interview design, on the basis of which the data collection was implemented, is presented in Table 2. Question RQ4 "What competencies are key for future professionals and require increased attention in a distance learning environment?" is the final question and determines the discussion direction of the proposed article. Consequently, quantitative data collection involved the use of two standardized questionnaires, the author's questionnaire, and a number of semi-structured interviews according to the following plan.

Table 2

The Plan for a Semi-Structured Interview with Managers

Questions	Aims	Reflection
Stage 1. Introduction		
1. Can you state your age, gender?	Forming a contact, collecting background information.	How education and work experience have prepared them for their current role, what criteria are decisive according to the respondent.
2. Tell us about your education and work experience?		
3. Describe your current job responsibilities?		
Stage 2. Key Competencies		
1. What competencies do you think are critical to success in public administration?	Identification of the competencies that are most important for success in public administration work. Assess competencies on a 5-point Likert scale for further analysis.	Encourage the respondent to reflect on their own strengths and areas for improvement related to those competencies. Update the information about compensation.
2. Can you outline successful cases of implementing these competencies?		
3. Are there any competencies that are particularly important for public administration professionals but are not recognized or discussed?		
Stage 3. Experience and Challenges		

1. What are the biggest challenges in public administration?	Determine the real work conditions of managers, the current demands and constraints that future professionals will face	Draw on the respondent's unique experiences, detailing how those competencies rated as leading and those rated as weak were applied. Initiate a search for alternatives in the assessments.
2. How did you address these challenges and what competencies were important to do so?		
3. Are there challenges unique to the work of public administration, and how do they differ from challenges in other areas?		

Stage 4. Policy, Communication, and Ethics

1. How do you balance competitive interests and priorities while working?	Explore the categories of politics, ethics, and communication in the work of public administration and competence. Given the scope of the category, it is appropriate to allow the respondent the freedom to place emphasis on the topic under study.	Stimulate reflection on the respondent's professional crisis moments, apply the experience of actualizing resources. Refer to specific cases (as examples of any ethical dilemmas the respondent may have encountered)
2. How do you evaluate performance?		
3. Describe your interactions with stakeholders and the public in your work? How do you build and maintain these relationships?		
4. Does your organization have procedures for dealing with ethical and contextual issues?		

Stage 5. Technology and Innovation

1. What technologies, tools, or platforms do you use in your work?	Gain a deeper understanding of comfort level during work, the mastery of technology by the specialist. Determine the direction for improving the innovative potential of specialist training programs.	Encourage the respondent to think about the realities of ICT use, possible areas for improvement, the measure of providing the workplace with the necessary tools. Actualize attitudes towards innovation.
2. What problems have you encountered?		
3. Can you describe innovative approaches or technologies used to improve public administration?		

Stage 7. Conclusion

1. Have your assessments of previously defined competencies changed?	Collection of additional details, feedback on the interview process. Final evaluation of updated competencies	Reflection on the interview and new ideas. Identifying ways to improve the interview.
2. Is there anything else you would like to add?		
3. Do you have any questions or comments about the interview process?		

Source: author' development.

Data Analysis

Data collected from questionnaires and semi-structured interviews were analyzed using a combination of descriptive and logical statistics. Descriptive statistics were used to summarize the data collected from the questionnaires, including the calculation of the mean, standard deviation, and frequency distribution of responses. Inferential statistics were used to test the hypotheses formed during the study. The development of interview results included the identification of key themes and implicit models of professional activity. The analysis was conducted with the help of NVivo software. The actualized constructs were presented in an appropriate visualization and coordinated with the subsequent results. When working with questionnaire data, t-tests were used to compare average student and faculty response scores to questionnaire questions, as well as to compare average response scores of different groups of students and faculty based on their demographic characteristics. Chi-square was applied to determine associations between categorical variables, such as the relationship between gender and ICT readiness among teachers.

Research Results

The majority of public administration specialists (76.67%) must never take distance learning, while the rest noted that they had some experience with this method of training, namely in non-formal education. These results indicate a discrepancy in the experience of the respondents involved in the survey: while education professionals and job seekers have a steady experience of distance learning, professionals have mostly not interacted with this mode of learning activity. The indicated correlation imposes certain limitations on the transferability of the data obtained. However, the categories that were actualized during the interviews indicate a different kind of inconsistency. The learning environment is used by a methodology that does not include working with modern technology and software common in the field of management. At the same time, those qualities that are evaluated by experts as the most significant in the work, in the educational process are also often leading and appear in the focus of didactic implementations. Table 3 presents information about the core competencies covered in 30 semi-structured interviews. Additionally, data on latent aspects and the most popular examples of successful implementation were provided.

Table 3

Results of Thematic Analysis of Competencies Based on Interviewing

Competency	Frequency	Successful Implementation	Hidden Competencies	Required Connectives
Communication skills	20 (66.7%)	Increased public engagement	Empathy, active listening	Clear, concise communication, ability to explain complex issues
Critical thinking	18 (60.0%)	Streamlined processes	Cultural awareness	Analytical skills, attention to detail
Problem-solving	16 (53.3%)	Cost savings	Flexibility	Creative thinking, adaptability

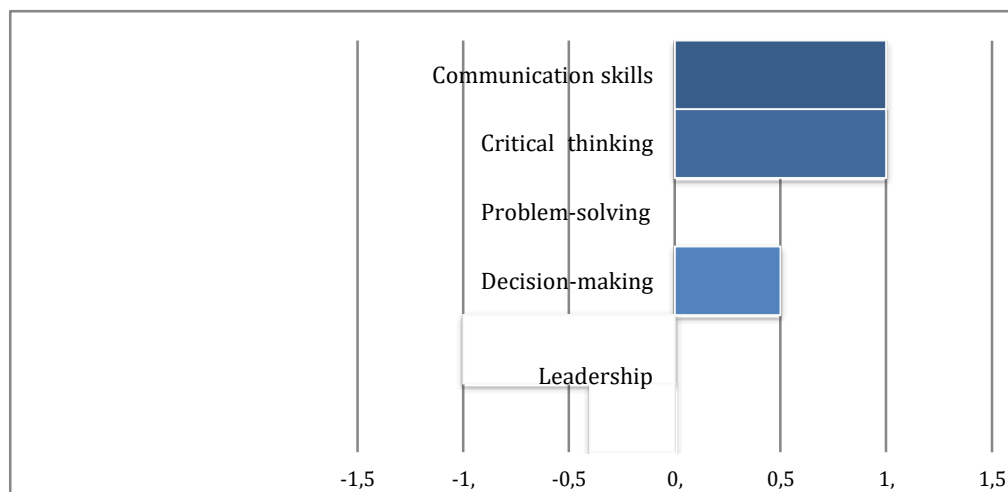
Decision-making	14 (46.7%)	Improved service delivery	Creativity	Strategic thinking, risk management
Leadership	12 (40.0%)	Stronger interdepartmental collaboration	Strategic thinking	Emotional intelligence, conflict resolution
Teamwork	10 (33.3%)	Cross-functional projects	Conflict resolution	Collaboration, problem-solving

Source: compiled by the authors on the basis of empirical research.

In general, the results of this content analysis are consistent with what are commonly highlighted as important competencies for public administration professionals. Effective communication (66.7%), critical thinking (60.0%), problem-solving skills (53.3%), and decision-making (46.7%) are frequently highlighted as guarantors of success in this field. The fact that these competencies were frequently and consistently discussed during the survey interviews suggests that they are indeed highly valued in the context of public administration in Poland. In addition, the relatively low emphasis on teamwork may reflect the hierarchical nature of public administration in some contexts, where individual decision-making and responsibility are marked by shared decision-making. However, it is important to note that teamwork and collaboration are still important in many areas of nonpublic governance, such as organizations that implement policies to involve the community in private sector activities. Overall, these results suggest that training programs for public administration professionals should prioritize the development of effective communication and integrated thinking, which can help prepare students for the complex and dynamic nature of the workplace and ensure that they are prepared to navigate emerging challenges and opportunities. in the contemporary context Note that according to the interview plan, professionals are given the opportunity to assess the competencies they voiced at the beginning and at the end of the interview. Those changes in the evaluations presented further in Figure 1 serve as an additional field in this problem, since the specialists' reflection took place at a more comfortable pace, and the circumstances of the interview facilitated self-disclosure. For example, communication skills and critical thinking scores increased from 3.5 at the beginning of the interview to 4.5 and from 4.1 to 5.1, respectively. This dynamic may indicate that interviewers placed more emphasis over time on the importance of analytical and interpersonal skills in public administration work as they covered more detail. The gradual increase in detail in the interviewer's questions encouraged managers to refer back to previous examples of competencies and assess them in a new context. The actual strategy offered the following data.

Figure 1

Changes in Assessments of Actualized Competencies During Interviews



Source: compiled by the authors on the basis of empirical research.

As the experts invariably noted the importance of being able to solve problem situations in the work of a public manager, the score remained relatively stable throughout the interview process with a slight decrease from 4.3 to 4.2. In conjunction with the increase in the indicators of decision-making and those mentioned above (communication and analytical abilities), we can predict that the length of service in public administration provides respondents with enough experience to revise those values that were identified as leading at the beginning of the professional path. From the position of their professional experience, the respondents evaluate the leading qualities of a specialist, such as autonomy and subjectivity. At the same time, the characteristics of commitment: leadership qualities, and teamwork were rated lower by specialists over time. Turning to specific instances of professional experience, respondents reconsidered their own perception of social intensionality in the context of managerial activity. Summarizing, the direction of the development of students' competencies in this area was concretized. In order to ensure the proper level of training, it is prognosticated that distance learning programs should be transformed in order to increase the contribution of independent work. Students need new opportunities to develop and practice their analytical skills through case studies, data analysis, and other problem-solving exercises. Written and verbal communication skills through presentations, report writing, and other forms of work should also be promoted (Diachok et al., 2020). Training for the digital environment is identified as a separate area. Particularly, digital literacy takes on a qualitatively new importance for managerial activities. Due to the growing importance of electronic management for future managers, there is a need to master the protocols of working with new technologies. Actually, during the interview, it was determined what kind of software and ICT skills are needed in today's market (see Table 4).

Table 4

The Results of the Thematic Analysis of the Work with Digital Collateral Based on Interviews

Competency	Frequency	Frequency Percentage
Technologies/Tools		

Data analysis	10	33.3%
Communication platforms (e.g., email, video conferencing)	9	30.0%
Project management tools (e.g., Trello, Asana)	7	23.3%
Cloud-based services (e.g., Google Drive, Dropbox)	6	20.0%
Social media platforms (e.g., Twitter, Facebook)	5	16.7%

Problems

Bureaucracy	14	46.7%
Limited resources (e.g., budget, personnel)	12	40.0%
Political interference	8	26.7%
Resistance to change	7	23.3%

Innovative Approaches

Open data	7	23.3%
E-government	6	20.0%
Artificial intelligence/machine learning	4	13.3%
Blockchain	3	10.0%

Source: compiled by the authors on the basis of empirical research.

The results of the content analysis responses to questions concerning the use of technology in public administration provided valuable information about the current state of the field. One of the findings is that there is a wide range of technologies, tools, and platforms used by public administration professionals, reflecting the diverse nature of their work. The most frequently mentioned technologies were digital communication tools such as email and messaging programs, followed by databases and information systems, video conferencing software, and various productivity tools. However, the analysis also showed that there were some significant challenges associated with the use of technology in public administration. Data and information security challenges, difficulties with system integration and interoperability, and the need for ongoing training and professional development were cited more frequently. Despite these challenges, interviewees were able to describe innovative approaches and technologies they used to improve public administration. For example, several interviewees discussed the use of artificial intelligence and machine learning to automate routine tasks and improve decision-making processes. Others mentioned the use of blockchain technology to improve the transparency and security of public records and transactions. These findings have important implications for distance learning for administration and public administration professionals. It is clear that technology is an integral part of their work and that ongoing training and professional development in this area is essential if they are to continue to perform their roles effectively. Distance learning can play a key role in ensuring this by offering flexible and accessible courses that can be designed to the specific needs and challenges of public administration professionals, such as data analysis or working with open data.

However, the question of how to improve the quality of remote interaction remains open. In addition, awareness of the predictors of the effectiveness of didactic interventions plays an important role. Table 5 actually shows the results of the multivariate linear model. The constructs proposed in the diagnostic method “Satisfaction and Quality” were defined as dependent variables: Learning, Satisfaction, and Quality proper, predicting the success of learning interventions in distance management training.

Table 5

The Multivariate Linear Regression Model

Variable	R-squared	F-value	p-value	Strongest Predictor	Beta Coefficient
Learning	0.326	92.58	<0.001	Course content	0.43
Satisfaction	0.239	61.92	<0.001	Professor-student interaction	0.53
Quality	0.484	110.03	<0.001	Mentoring support	0.57

Source: compiled by the authors on the basis of empirical research.

Discussion

The presented study was not intended to verify the theoretical model of the educational process in the distance mode. The initial goal was to identify trends in the exploratory study. Thus, the analysis conducted through a combination of quantitative and qualitative methods makes it possible to bring the learning interaction closer to the realities of professional activity. Particularly, semi-structured interviews with specialists in public administration focused on competencies and revealed several key themes. Professionals identified the importance of competencies such as communication, critical thinking, and ICT skills, and noted the need for practical experience to complement theoretical knowledge. The challenges of balancing competing interests and priorities in their work, evaluating their performance, and building and maintaining relationships with stakeholders and the public were also discussed. All of these categories should be conceptualized in training. Namely, the study identified the most significant factors that should be considered in the design and implementation of distance learning courses in this direction. High-quality course content and structure, as well as strict academic standards, should be provided first. According to the presented model, the content of the programs determines their effectiveness. Professionals need to rely on the qualities that are presented in the results of the thematic analysis, taking into account the ultimate goal of learning interactions - preparation for professional activities. The interviews showed that competencies such as communication, adaptability, and problem- solving are crucial and that there is a need for continuous professional development in order to keep abreast of new technologies and changing trends in the field. At the same time, the linear model analysis revealed meaningful relationships between various factors such as course content and satisfaction with distance learning, which specifies the direction of further movement for professionals in the educational segment (Rodek & Orlińska, 2021). Turning to the experience of Ober and Kochmańska's (2022) research design, we can confirm the importance of the social-emotional aspect of distance learning for management students. It is the interpersonal specificity that is decisive in the context of interaction with digital tools. It is necessary to provide students with an experience of involvement in the process of knowledge construction. In addition, communicative abilities are the leading competence necessary for the realization of management goals. By developing

interpersonal interaction, students are well-prepared to begin their careers and perform their responsibilities effectively. Moreover, it is important to promote interaction between instructors and students, as well as among students themselves, in order to facilitate the experience of academic stress in a crisis environment. The findings also underscore the importance of ICT skills and experiences for both academics and higher education applicants. To prepare students for the demands of the modern workplace, distance learning programs must provide opportunities for students to develop and improve their ICT skills, not just use software to perform traditional didactic tasks. Teachers must also have the necessary ICT skills and experience to use technology effectively in their teaching (Tomczyk, 2019). It is the professional development of the teaching staff that can be outlined as a vector for future development. Additionally, the results illuminate that gender and age differences in students' and teachers' experiences with distance learning are not significant. Consequently, providing continuing education and resources for self-study has the potential for inclusive education in a digital environment. Students and teachers will be able to fully participate in and benefit from distance learning programs despite the format of their implementation (Adamczyk & Betlej, 2021). In conclusion, the results in a visual representation for specificity are summarized (see Table 1).

Table 6

Answers to the Research Questions in this Paper

Research question	Statistical prediction	No
What tools are needed in a remote management training environment?	A number of digital platforms and technologies used in management (e.g., Open data, E-government, Artificial intelligence, machine learning, Blockchain). Thematic analysis of 30 semi-structured interviews with specialists in public administration	RQ ₁
How adapted are the participants in the educational process to the digital environment of today?	ICT proficiency among students and faculty is sufficient (mean=4.1 and mean=3.9 respectively). ICT Usage and ICT Skills predict positive changes in satisfaction with the educational process ($\beta=0.24$, $p<0.01$)	RQ ₂
Does the current management training strategy meet the requirements of the professional environment?	The program requires review and inclusion of new categories. Management systems are dynamic and valenced. The strongest predictor of dependent variables is course content ($\beta=0.43$, $p<0.01$).	RQ ₃
What are the key competencies for future specialists and require increased attention in a distance learning environment? <i>Source: compiled by the author on the basis of data analysis.</i>	Communication skills, Critical thinking, Problem-solving, Decision-making, ICT Skills, Innovation acceptance Thematic analysis of 30 semi-structured interviews with specialists in public administration	RQ ₄

Overall, the results of this study are important for the design and implementation of distance learning programs in public administration. Given the factors identified in this study, educators and administrators, as stakeholders, can create high-quality distance education programs that meet the

needs of students and provide the competencies necessary for successful self-advocacy. The COVID-19 pandemic has heralded changes in education, including how courses and programs are delivered (Hibszter & Tracz, 2021). However, distance learning offers educators new opportunities and approaches to training in administration and public administration. However, there is a need for ongoing efforts in order to improve the quality of education and better support students. Finally, competencies such as communication and adaptability are important to success in this field and should be the focus of curriculum development.

Conclusions and Implications

The study aimed to investigate of the organization of distance learning in the process of training specialists in administration and public administration peculiarities on the example of the Polish experience. A mixed approach was used, 205 students and 84 teachers were involved in the survey, and semi-structured interviews with 30 specialists from public administration were implemented. According to the results, in the available conditions, students have the potential to implement in the field, given a sufficient level in the assessments of their own digital competencies and the results of learning interactions. The leading role in the effectiveness of training programs is played by the course content that determines the final students' skills. Thus, students and teachers are ready for the new format of work, so more attention should be paid to the content of educational programs and their actualization to modern requirements. Particularly, the ability to productively solve management problems and management digitalization processes will play a primary role in the near future.

References

- Adamczyk, M., & Betlej, A. (2021). Social determinants of digital exclusion in an ageing society. The case of Poland. *Entrepreneurship and Sustainability Issues*, 8(3), 122–135. [http://doi.org/10.9770/jesi.2021.8.3\(7\)](http://doi.org/10.9770/jesi.2021.8.3(7))
- Ahmed, R. R., Štreimikienė, D., & Štreimikis, J. (2022). The extended UTAUT model and learning management system during COVID-19: Evidence from PLS-SEM and conditional process modeling. *Journal of Business Economics and Management*, 23(1), 82–104. <https://doi.org/10.3846/jbem.2021.15664>
- Al-Rahmi, W. M., Yahaya, N., Aldraiweesh, A. A., Alamri, M. M., Aljarboa, N. A., Alturki, U., & Aljeraiwi, A. A. (2019). Integrating technology acceptance model with innovation diffusion theory: An empirical investigation on students' intention to use E-learning systems. *IEEE Access*, 7, 26797–26809. <https://doi.org/10.1109/ACCESS.2019.2899368>
- Ali, M. S. Z., Idrees, Z., & Asghar, M. (2022). Metacognitive skills: Investigating the effect on pupil teachers' written task performance. *Journal of Development and Social Sciences*, 3(4), 125–136. [https://doi.org/10.47205/jdss.2022\(3-IV\)13](https://doi.org/10.47205/jdss.2022(3-IV)13)
- Brown, T., Robinson, L., Gledhill, K., Peart, A., Yu, M. L., Isbel, S., ... Etherington, J. (2021). Online learning during the Covid-19 pandemic: the experiences and perceptions of undergraduate occupational therapy students at two Australian universities. *International Journal of Health Professions*, 8(1), 60–71. <https://doi.org/10.2478/ijhp-2021-0006>
- Catalano, A. J. (2018). *Measurements in distance education: A compendium of instruments, scales, and measures for evaluating online learning*. Routledge. <https://doi.org/10.4324/9781315229447>

- Chen, S. L., & Fan, J. Y. (2022). Validation of the psychometric properties of the self-directed learning readiness scale. *Nursing Open*, 10, 1639–1646 <https://doi.org/10.1002/nop2.1418>
- Cofini, V., Perilli, E., Moretti, A., Bianchini, V., Perazzini, M., Muselli, M., ... Necozone, S. (2022). E-learning satisfaction, stress, quality of life, and coping: A cross-sectional study in Italian university students a year after the COVID-19 pandemic began. *International Journal of Environmental Research and Public Health*, 19(13), Article 8214. <https://doi.org/10.3390/ijerph19138214>
- Diachok, N., Chernukha, N., Tokaruk, L., Udovenko, I., & Petrova, M. M. (2020). Practical-oriented concept as a principle of professional education of the future professionals. *International Journal of Higher Education*, 9(4), 272–282. <https://doi.org/10.5430/ijhe.v9n4p272>
- Dobrowolski, Z., Drozdowski, G., & Panait, M. (2022). Understanding the impact of Generation Z on risk management—A preliminary views on values, competencies, and ethics of the Generation Z in public administration. *International Journal of Environmental Research and Public Health*, 19(7), Article 3868. <https://doi.org/10.3390/ijerph19073868>
- Donina, D., & Jaworska, M. (2022). Higher education governance in Poland: Reform pathway from the communist regime to Law 2.0. *Higher Education Policy*. <https://doi.org/10.1057/s41307-022-00293-x>
- Ernst-Milerska, R. (2020). Nauczanie na odległość w czasie pandemii jako wyzwanie wobec egalitarnego statusu szkoły publicznej. *Studia z teorii wychowania*, 11(4(33)), 193–210. <https://doi.org/10.5604/01.3001.0014.6565>
- Fatani, T. H. (2020). Student satisfaction with videoconferencing teaching quality during the COVID-19 pandemic. *BMC Medical Education*, 20(1), 1–8. <https://doi.org/10.1186/s12909-020-02310-2>
- Gabryelczyk, R. (2020). Has COVID-19 accelerated digital transformation? Initial lessons learned for public administrations. *Information Systems Management*, 37(4), 303–309. <https://doi.org/10.1080/10580530.2020.1820633>
- Greenwood, J., & Kudrycka, B. (2018). The unfinished revolution: Public administration education and training in Poland. In M. R. Davies, J. Greenwood, & N. Walkley (Eds.), *Serving the state* (1st ed., pp. 91–100). Routledge. <https://doi.org/10.4324/9781315196824>
- Hibszar, A., & Tracz, M. (2021). The impact of COVID-19 on education in Poland: Challenges related to distance learning. *Geographia Polonica*, 94(3), 397–411. <https://doi.org/10.7163/GPol.0211>
- Hoffman, T. (2021). Selected aspects of the Europeanization of public administration in Poland. *Studia Administracji i Bezpieczeństwa*, 1(10), 45–66. <https://doi.org/10.5604/01.3001.0015.6330>
- Jakimowicz, A., & Rzekowski, D. (2021). The impact of public administration digitalization on the decarbonization of the economy. *Energies*, 14(18), Article 5739. <https://doi.org/10.3390/en14185739>
- Kriksciuniene, D., Sakalauskas, V., & Lewandowski, R. (2019). Evaluating the interdependent effect for Likert scale items. *Business Information Systems Workshops*, 373, 26–38. https://doi.org/10.1007/978-3-030-36691-9_3

- Krukowski, K., Raczyńska, M., & Escher, I. (2021). Change management success factors in Polish public administration. *European Research Studies Journal*, 24(s3), 303–318. <https://www.um.edu.mt/library/oar/handle/123456789/105086>
- Kuch, F., & Roberts, R. M. (2019). Electronic in-class course evaluations and future directions. *Assessment & Evaluation in Higher Education*, 44(5), 726–731. <https://doi.org/10.1080/02602938.2018.1532491>
- Kucharska, A., & Rostek, K. (2023). COVID-19 and technological maturity of HEIs in Poland. *Social Science Computer Review*, 41(1), 27–43. <https://doi.org/10.1177/08944393211032199>
- Maleńczyk, I., & Gładysz, B. (2019). Academic E-learning in Poland results of a diagnostic survey. *International Journal of Research in E-learning*, 5(1), 35–59. <https://doi.org/10.31261/IJREL.2019.5.1.03>
- Marcin, M. (2019). Tincan i inne nowoczesne standardy w E-Learningu, kontra codzienność kształcenia na odległość. *HUMANITARIAN CORPUS*, 23(2), 60–63. https://enpuir.npu.edu.ua/bitstream/handle/123456789/24453/gum_23_tom2_print.pdf?sequence=1
- Mikułowski, W. (2017). Quality assurance of public administration programmes in Poland. In E. Löffler, & M. Vintar (Eds.), *Improving the Quality of East and West European Public Services* (pp. 143–156). Routledge. <https://doi.org/10.1007/978-94-017-9553-1>
- Ober, J., & Kochmańska, A. (2022). Remote learning in higher education: Evidence from Poland. *International Journal of Environmental Research and Public Health*, 19(21), Article 14479. <https://doi.org/10.3390/ijerph192114479>
- Pevcin, P., Špaček, D., & Klimovský, D. (2019). Public administration education in the CEE countries: How has it developed during the recent decades. *NISPAcee Journal of Public Administration and Policy*, 12(2), 217–232. <https://doi.org/10.2478/nispa-2019-0020>
- Plante, S., LeSage, A., & Kay, R. (2022). Examining online course evaluations and the quality of student feedback: A review of the literature. *Journal of Educational Informatics*, 3(1), 21–31. <https://doi.org/10.51357/jei.v3i1.182>
- Pokryszko-Dragan, A., Marschollek, K., Nowakowska-Kotas, M., & Aitken, G. (2021). What can we learn from the online learning experiences of medical students in Poland during the SARS-CoV-2 pandemic?. *BMC medical education*, 21(1), Article 450. <https://doi.org/10.1186/s12909-021-02884-5>
- Rahayu, W., Putra, M. D. K., Sulaeman, E., & Koul, R. B. (2022). Development and validation of Online Classroom Learning Environment Inventory (OCLEI): The case of Indonesia during the COVID-19 pandemic. *Learning Environments Research*, 25(1), 97–113. <https://doi.org/10.1007/s10984-021-09352-3>
- Rizun, M., & Strzelecki, A. (2020). Students 'acceptance of the COVID-19 impact on shifting higher education to distance learning in Poland. *International journal of environmental research and public health*, 17(18), 64–68. <https://doi.org/10.3390/ijerph17186468>

- Rodek, V., & Orlińska, A. (2021). Adult students' attitudes towards distance learning during the SARS-Co-V-2 virus pandemic. *International Journal of Research in E-learning*, 7(2), 1–13. <https://doi.org/10.31261/IJREL.2021.7.2.04>
- Rudenko, S., Bazaluk, O., Tsvykh, V., & Kalmuk, I. (2019). The role of philosophical disciplines in educational strategies for specialist training in the field of public administration. *Natsional'nyi Hirnychiy Universytet. Naukovyi Visnyk*, 2019(3), 158–163. <https://doi.org/10.29202/nvngu/20193/22>
- Sadeghi, S. H. (2018). *E-learning practice in higher education: A mixed-method comparative analysis*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-65939-8>
- Sebastianelli, R., Swift, C., & Tamimi, N. (2015). Factors affecting perceived learning, satisfaction, and quality in the online MBA: A structural equation modeling approach. *Journal of Education for Business*, 90, 296–305. <https://doi.org/10.1080/08832323.2015.1038979>
- Siddiqui, G. K., Lodhi, H., & Kalsoom, T. (2020). Intervening role of metacognition to improve task performance in prospective teachers: An experimental study. *Journal of Arts & Social Sciences*, 7(2), 52–59. [https://doi.org/10.46662/jass-vol7-iss2-2020\(52-59\)](https://doi.org/10.46662/jass-vol7-iss2-2020(52-59))
- Ślósarz, A. (2019). Democratizing potential of distance education. *E-learning and STEM Education*, 11, 51–67. <https://doi.org/10.34916/el.2019.11.04>
- Szczepaniuk, E. K., Szczepaniuk, H., Rokicki, T., & Klepacki, B. (2020). Information security assessment in public administration. *Computers & Security*, 90, Article 101709. <https://doi.org/10.1016/j.cose.2019.101709>
- Tomczyk, Ł. (2019). Digital literacy in the area of e-safety among teachers (Second stage of the primary school) in Poland. *Conference proceedings of eLearning and Software for Education (eLSE)*, 15(2), 130–135. <https://doi.org/10.12753/2066-026X-19-087>
- Tomczyk, Ł. (2020). Digital literacy and e-learning experiences among the pre-service teachers data. *Data in Brief*, 32, Article 106052. <https://doi.org/10.1016/j.dib.2020.106052>
- Tomczyk, Ł. (2022). Digital literacy among students of pedagogical faculties in Poland : a systematic literature analysis. In Ł. Tomczyk & L. Fedeli (Eds.), *Digital literacy for teachers* (pp. 411–440). Springer. https://doi.org/10.1007/978-981-19-1738-7_20
- Vincent-Lancrin, S., González-Sancho, C., Bouckaert, M., de Luca, F., Fernández-Barrerra, M., Jacotin, G. ... Vidal, Q. (2019). *Fostering students' creativity and critical thinking: What it means in school*. OECD Publishing. <https://doi.org/10.1787/62212c37-en>
- Wolverton, C. L., Lasiter, S., Duffy, J. R., Weaver, M. T., & McDaniel, A. M. (2018). Psychometric testing of the caring assessment tool: Administration (CAT-Adm©). *SAGE Open Medicine*, 6, <https://doi.org/10.1177/2050312118760739>

How to cite: Aljad, R. R. (2023). Methods to Improve the Effectiveness and Quality of Teaching the Disciplines of the Architectural and Artistic Profile (Experience of Libya), *Futurity Education*, 3(1). 105-127. <https://doi.org/10.57125/FED.2023.25.03.08>

Methods to Improve the Effectiveness and Quality of Teaching the Disciplines of the Architectural and Artistic Profile (Experience of Libya)

Reyad Rajab Aljad

Lecturer Elmergib University Libyan Ministry of Education, Khoms, Libya, <https://orcid.org/0000-0002-2104-7401>

***Correspondence email:** Ryiad.aljad@gmail.com.

Received: December 16, 2022 | **Accepted:** February 13, 2023 | **Published:** March 25, 2023

Abstract: The article analyses the methods of teaching the disciplines of the architectural and artistic profile in Libyan higher educational institutions. The research objectives address the close-open survey that outlines the methods currently used in the educational process, selection of the most efficient teaching strategies, and development of the recommendations for the teachers of architectural and artistic disciplines to use combined teaching methodology. For the study, we analyzed 30 recent scientific papers devoted to the problems of the organization of architectural education in Libyan higher educational institutions and abroad including China, Spain, Turkey, Egypt, India, Pakistan, Poland, and UK. We applied a number of research methods including interdisciplinary literature review, generalization of research results on the existing requirements to architectural education and the peculiarities of its organization. Also, we used teachers survey with close-open ended questions to collect objective data on teaching methodology. The survey was conducted among 187 faculty members with different teaching experience in different Libyan higher educational institutions that train future architects during one academic year. All of them participated in the survey voluntarily and answered the questions objectively and openly to further elaborate the appropriate recommendations for the enhancement of educational process. The findings demonstrate that effective and qualitative educational process requires combination of different teaching strategies and methods. The use of

combined methodology depends on many factors such as students' needs, learning objectives, peculiarities of educational environment, employer's requirements, and pedagogical mastery of teachers. The research proves that the effective teaching methods are productive, informative, satisfying, interactive, innovative; they must consider interdisciplinary links and contribute to improvement of integrated professional competency as well as soft skills. The research resulted in elaboration of recommendations for the teachers to apply combined methodology in teaching the disciplines of the architectural and artistic profile

Keywords: disciplines of architectural and artistic profile, teaching methods, educational process, combined methodology, innovation.

Introduction

Globalization and integration process throughout the world, social and economic transformations, cultural developments bring significant changes in all spheres, higher education in particular. Under contemporary conditions, society modernization should fully meet the requirements of businesses and industrial sector, including architecture, urban development and arts, since the construction industry is one of the major economic sectors and actually shapes national development.

As an art to design and construct buildings, architecture creates well-organized environment for human life. Today's customer needs creative projects, fresh architectural and planning as well as artistic and aesthetic solutions. New construction objects must differ from the ones, architects and artist designed earlier. These objects must be built according to modern construction and exploitation requirements, involve innovative technologies and meet the increasing artistic and aesthetic demands of customers.

In the Libyan context, architects, urban planners and environmental designers must pay attention to development of environmental, social and economic dimensions and, simultaneously, implementation of contemporary designs in construction projects of multiple utilization (Sasi, 2021; Tahir et al., 2022). It depends, first of all, on the harsh climate of Arab countries and new construction projects must consider the hot zone conditions and provide good indoor environment. Also, it is preferable to preserve building features of Islamic architecture and reflect Muslim identity (Alatrash & Grdalli, 2018). Stein et al. (2020) note the importance of work of architectural and artistic profile for post-conflict reconstruction in war-torn cities.

As energy efficiency of buildings have become a significant aspect within the urban planning, architects must offer human society the philosophy for sustainable urbanism and innovative efficient design of construction objects to decrease energy consumption to meet contemporary technological capabilities and designing (Bakoosh et al., 2021; Sasi, 2021; Tahir et al., 2022). In addition, new conditions of urban planning demand to choose green materials and technologies including the use of local materials to add a healthy atmosphere to buildings (Tahir et al., 2022).

Besides, the great challenge for modern Libyan architects, urban planners and environmental designers to understand human diversity and create urban space that will correspond with the needs of all segments in the society. They are to provide practical approaches to construction projects and to ensure comfortable and supportive environment for all the people on an equal basis (Al Sharif, 2022).

Architect is a special profession because architecture itself is at the same time philosophy, art, science, engineering, technology, mathematics, sociology and politics, creativity and sustainable development. Modern professional standards orient architects towards research, design, engineering, and management solutions. In addition, design and construction specialists should possess communication skills, digital competency, and perform intermediately functions between all interested parties including contractors, customers, and local communities.

Hence, these conditions determine high quality of education of architects. But training of future specialists in this sphere has a number of characteristic features, imposing requirements and restrictions on organization of educational process at the educational institution.

To enhance the effectiveness of teaching the disciplines of the architectural and artistic profile in Libyan institutions, it is necessary to combine theory and practice in construction planning and design, to consider historical and modern architectural heritage to students, and to apply innovative teaching strategies and methods extensively.

Research Problem

Today architectural education requires special attention and needs continuous development because of the changing nature of architectural practice. Moreover, educators should consider the fact that architecture and art differ from other professions because they usually involve two dimensions and changes within the local, technological, and cultural paradigms (Ghonim & Eweda, 2019).

According to Zaed and Chen (2021), the Libyan higher education sector suffers from a number of difficulties like the absence of proper planning and the use of ineffective teaching strategies. The result is a lack of qualified professionals in the Libyan construction and urban development industries, the use of advanced technology in particular.

Recently, this problem has gained more attention, and Libya's education system must be rapidly modernized considering the technological progress of international advanced architectural and artistic programmes. And Libya, as a developing country, must find more sophisticated educational solutions to enhance the effectiveness of education process in the field of architecture and other related specialities.

Thus, the problem of selection of effective teaching strategies and methods within the architectural education is especially important since it may contribute to improvement of training of future architects and urban planners and, consequently, provide national economy of Libya with professional and creative specialists who will improve economic growth, restore damaged buildings and architectural heritage, and develop infrastructure sector.

Research Focus

In Libyan universities the architectural education was introduced in the second part of the XXth century and remained unchanged for around 20 years. Some modifications started in the early 1980s. At present the Libyan educational institutions offer two types of bachelor degrees: Architectural and Urban Design and Planning (Zaed & Chen, 2021).

According to the National Libyan Public Education Reform: Entire Transformative Strategies, 2020–2026 (Elabbar, 2021), the Libyan Ministry of Education has put a plan of reforming the Libyan education system considering science, technology, and innovation efforts. The document emphasizes on the necessity of immediate improvement of education, including construction specialities.

Today the market demands a high level of professional competency from specialists working in construction, engineering, and urban planning. Obviously, professional education in architecture should adapt to the needs of social and economic progress, existing institutional facilities, and educational spending (Zaed & Chen, 2021; Zhou, 2020). And, moreover, education system should provide graduates with the skills and knowledge according to the employers' expectations (Pons-Valladares et al., 2021). Also, advances in technology and digital transformations lead to substantial changes in the curriculum of architectural and artistic disciplines and approaches to their teaching (Bayhan & Karaca, 2020; Soliman et al., 2019).

Findings show that architectural education is the focus of research of many pedagogues who study organization of educational process in programmes related to architecture and urban development and teaching strategies used to enhance the efficiency of training. Currently, scholars differentiate some approaches to organization of architectural education.

Findings show that most educational institutions in many countries apply traditional approach to teaching the disciplines of the architectural and artistic profile that involves classroom teaching and combination of theory and practice (Bayhan & Karaca, 2020; Pons-Valladares et al., 2021; Shareef & Farivarsadri, 2020; Zhou, 2020). Usually students attend lectures, do spatial composition models, and prepare scientific research to study specific topic in details (Zhou, 2020).

Other approaches include school-enterprise cooperation, digital training, and international cooperation (Pons-Valladares et al., 2021; Ruggiero, 2021; Zaed et al., 2021; Zhou, 2020). School-enterprise cooperation can be implemented in conventional activities like attending construction sites and joining the professional architects and participation in real projects. Also, some diversified forms are applied: establishing a production base or introduction of the actual enterprise project as a graduation project (Zhou, 2020). Digital training helps to cultivate designing skills since they create fabrication laboratories, make advanced tools and software available, use virtual reality (Pons-Valladares et al., 2021; Ruggiero, 2021; Zaed & Chen, 2021). International approach suggests implementing field trips, face-to-face students' exchanges, study visits to foreign educational institutions to gain new experience and inspiration (Zhou, 2020).

Regarding the methodology, Shareef and Farivarsadri (2020) claim that in architectural education various teaching strategies coexist and complement each other. As regular courses aim to cover students' professional competences to enhance readiness to practical activity and gaining important working skills (Pons-Valladares et al., 2021). This demands the use of different teaching strategies in the classroom and during self-study, active learning activities, student-centered learning, and cooperative technologies in particular (Bayhan & Karaca, 2020; Pons-Valladares et al., 2021; Shareef & Farivarsadri, 2020; Zaed & Chen, 2021).

The findings show that the following teaching strategies are used: problem-solving learning (Bayhan & Karaca, 2020), interactive lectures, Delphi method, expert seminars and focus groups, team-based learning, case-based learning exercises, storytelling, role play or work activity simulation (Pons-Valladares et al., 2021), project-based learning or class presentations, peer learning, brainstorming, class discussion or dialogues, collaboration and mutual projects with instructors and colleagues, game-based learning including unplanned, or game-like quizzes and surveys (Shaqour, 2021; Shareef & Farivarsadri, 2020; Zaed & Chen, 2021), conferences, workshops (Allanyazov, 2021).

Today computer technologies provide architects with new opportunities and displace traditional design technologies. As a result, the efficiency and control of new construction objects are introduced

through computational tools which are increasingly considered essential to architectural practices (Soliman et al., 2019). This fact affects architectural education significantly and educational institutions witness an increase in the digital technologies reshaping the overall design studio curriculum structure.

Computer technologies include online learning, including synchronous and asynchronous, e-learning activities, virtual learning activities such as use of virtual laboratories and virtual learning explorative activities, massive open online courses (MOOCs), flipped classroom, interactive simulations, videolectures on real cases, gamification activities (Goray & Patra, 2021; Pons-Valladares et al., 2021; Zaed & Chen, 2021), use of educational computer applications (Soliman et al., 2019). Computer technologies, online learning and virtual learning activities have been implemented more extensively in Libya under the influence of COVID-19 and resulting educational institute closures (Ata & Ganoun, 2020).

According to Lotfabadi and Mousavi (2022), due to the spread of COVID-19 pandemic practice-driven teaching approaches to architectural education shifted to virtual class activities including interactive or video lectures and group discussions, conferences, resumed lessons in virtual space, digital presentations. Also, online questionnaires, teamwork, individual assignments, project-based learning, hybrid learning, use of smart communication programs like WhatsApp, Viber, Skype or Zoom were widely used and they still remain popular (Maatuk et al., 2022; Selim, 2021). These teaching strategies and methods contribute to improvement of students' cognitive abilities, their motivation to be creative, connecting the students to the labor market, and easy introduction of innovative technologies and materials that are currently used in the architectural industry.

Makowska (2019) found that using of drawing and modelling exercises, work in small groups, elements of a play facilitate the transition of theoretical knowledge into key competencies, improvement of thinking flexibility, formation of practical architectural skills, creativity, independent decision-making, freedom in artistic work, and contribute to enhancement of partnership-based relationship between students and teacher.

Zaed and Chen (2021) and Zaed et al. (2021) show that incorporating BIM (Building Information Modelling) knowledge into current architectural and artistic disciplines curricula is very important as it helps to adapt education to real-world situation and prepare future architects to deal with the visual, technological, functional, and aesthetic elements in new construction objects.

Also, BIM-integrated courses help students study in positive atmosphere where cooperation is ingrained in the educational process and facilitates learning activities; it is useful for educators in architectural education and lifecycle oriented construction management (Zaed & Chen, 2019). BIM may be taught with the use of different teaching strategies and methods including instructional methods like lecturing, demonstration, group discussion, case-study, project-based activities, peer learning and assessment exercises as well (Zaed et al., 2021).

In addition, some findings show that onsite visits when students can observe professionals in the workplace, industry-community projects, scientific trips, and interdisciplinary activities contribute to formation of professional competency among future architects (Goray & Patra, 2021; Makowska, 2019; Pons-Valladares et al., 2021) and these strategies may improve the effectiveness of teaching of the disciplines of the architectural and artistic profile.

Also, the great attention is paid towards assessment including formative and summative, intermediate instructor's feedback, online assessment and quizzes, completing design-related

presentation (Goray & Patra, 2021), research or presentation of real-life situation, interview (Allanyazov, 2021). According to Shareef and Farivarsadri (2020) learning diaries are required within the educational process for continuous self-assessment. And at the end of training students are required to prepare a graduation project that is culminating project and demonstrates the peak of the experience and competency (Ghonim & Eweda, 2019).

Architectural education involves a number of courses, such as theoretical, practical, studio, and internship courses. Each of these courses has its own special characteristics and demands the use of different teaching strategies and methods (Ghonim & Eweda, 2019; Shaqour, 2021). Combined teaching strategies increase students' learning outcomes significantly and contribute to formation of professional competency during studying the disciplines of the architectural and artistic profile. Besides, combination of various teaching strategies adequately impacts the organization of interactive lessons and enhance learners' motivation significantly, improve their self-confidence and professional flexibility (Pllana, 2021).

Therefore, the use of appropriate strategies and methods in the process of teaching the disciplines of the architectural and artistic profile may improve the effectiveness and quality of architectural education and contribute to building of professionals for the national economy significantly. The students who are trained with the use of innovative methods and computer technologies will be ready to work in the changing conditions of developing country and will benefit social and economic enhancement.

Research Aim and Research Questions

The aim of the article is to reveal the most effective methods for teaching the disciplines of the architectural and artistic profile in Libyan higher educational institutions.

The article objectives are the following:

- to carry out a close-open survey among the teachers of architectural and artistic disciplines in Libyan higher educational institutions and to outline the methods used;
- to select the most efficient teaching strategies on the basis of teachers survey;
- to develop recommendations for the teachers of architectural and artistic disciplines to use combined teaching methodology.

Research Methodology

General Background

To carry out our research we applied theoretical methods including interdisciplinary literature review and generalization of research results on the existing requirements to architectural education and the peculiarities of its organization. These methods contributed to outline the teaching strategies and methods used in architectural education, in Libyan higher educational institutions in particular, and to outline the appropriate boundaries for their application. Also, a number of empirical methods were used. They involved teachers survey with close-open ended questions to collect objective data on teaching methodology.

Empirical research methods including close-open survey were used to collect quantitative data on the organization of teaching the disciplines of architectural and artistic profile. The use of empirical

methods helped us assess the quantitative data and select the most effective teaching methods that can affect the educational process positively and lead to its enhancement.

Sample / Participants / Group

The survey was conducted during 2022-2023 academic year in different Libyan higher educational institutions that train future architects. Open-close ended questions were sent out through emails to instructors teaching the disciplines of architectural and artistic profile both obligatory and elective courses (such as History of Architecture and Fine Arts, Descriptive Geometry, Freehand-Drawing and Visual Composition, Islamic Architecture, Contemporary Architecture, Domestic Architecture, Architectural Design Studio, Theories of Architecture, Acoustics, Air-conditioning, Building Technology, Environmental Control, Urban Design, Landscape Architecture, Building Restoration, Colour Theory, Architectural Graphics, Sustainable Design, Furniture architecture, Medieval Architecture, Social and Behavioral Factors for Design, Historic Building Preservation, etc.). The survey involved 187 faculty members with different teaching experience. All of them participated in the survey voluntarily and answered the questions objectively and openly to further elaborate the appropriate recommendations for the enhancement of educational process.

Instrument and Procedures

The teachers were questioned through the forms sent out by e-mails to obtain necessary qualitative and quantitative data on the organization of teaching the disciplines of architectural and artistic profile.

The questions referred to the methods used in the educational process to train future architects and artists in higher educational institutions of Libya. Also, the instructors were questioned about the advantages of innovative methods and their combination in the process of teaching the disciplines of the architectural and artistic profile. We informed the faculty members about the research objectives and all the teachers confirmed they participated voluntarily in the survey. Figure 1 shows the form used to question the teachers.

Figure 1

Form Used to Question the Teachers

You are participating in the close-open survey to reveal the most effective methods of teaching the disciplines of the architectural and artistic profile. You are kindly requested to fill in the following form. The survey results will be used to elaborate practical recommendations for the teachers of Libyan higher educational institutions training future architects and artists. Please, try to answer the questions objectively. Thank you for your help!

1. Choose the teaching strategies and methods you use most often in the educational process. Grade your answers in four points where 4 means the method is very effective and lead to rapid improvements of educational process, 3 = is partially effective and demonstrates rare drawbacks, 2 = do not use because do not have sufficient educational environment, 1 = never use because method does not show effectiveness and does not contribute to improvements of educational process.

activity simulation
 asynchronous online learning
 attending construction sites
 brainstorming
 case study
 class discussion
 class presentations
 classroom teaching
 combination of theory and practice
) educational conference
) cooperative technologies
) dialogues
) drawing and modelling exercises
) e-learning and m-learning activities
) expert seminar
) face-to-face students' exchanges
) face-to-face discussion
) field trips
) flipped classroom
) focus groups
) game-based learning
) graduation project
) instructor's feedback
) interactive lectures
) interactive simulations
) interdisciplinary activities
) interview
) learning diaries
) microlectures
) MOOCs
) peer learning
) presentation of real-life situation
) project-based learning
) quiz
) role play
) school-enterprise cooperation
) scientific research
) self-assessment
) self-study
) storytelling
) study visits
) synchronous online learning
) teamwork
) traditional lectures
) use of smart communication programs
) use of spatial composition models
) videolectures on real cases
) virtual learning activities
) virtual laboratory
) work with textbook

Source: based on literature review.

Also, the teachers were asked to answer open-ended questions to reveal the difficulties faced within the educational process and describe the solutions they use to improve the teaching of disciplines of the architectural and artistic profile. The questions were the following:

- 1) What prevents you from using innovative methods in the process of teaching?
- 2) Are all the lessons you conduct are effective and of high-quality? How do you assess students' learning outcomes: high, sufficient, low, or insufficient?
- 3) If some of your lessons fail, why does it happen? Does it belong on students' skills, peculiarities of educational environment, digital technologies, or your pedagogical mastery?
- 4) How do you improve the educational process?
- 5) Do you use single method or combine some methods to achieve the pedagogical intention?
- 6) If you use the combined methodology while teaching the disciplines of architectural and artistic profile, what advantages can you describe?
- 7) Do you agree that the combined methodology lead to the significant improvements of educational process?

Data Analysis

We analyzed the qualitative and quantitative data obtained during the teachers survey and managed to find out the widely used teaching strategies methods used for architectural education. Also, the teachers' answers helped us describe outline the peculiarities of the teaching the disciplines of the architectural and artistic profile and elaborate the recommendations for the further improvements of educational process. The findings are presented in the sections Research Results and Discussions.

Research Results

The survey showed that teachers in Libyan higher educational institutions use different teaching strategies and methods. The methods include traditional face-to-face methods as well as innovative methods based on digital technologies. We have found that computer-based approaches to organization of educational process have been widely used recently due to COVID-19 pandemic and gradual digitalization of society. Table 1 shows the analysis of using various methods in the process of teaching the disciplines of the architectural and artistic profile.

Table 1*Use of Methods in Teaching of the Disciplines of the Architectural and Artistic Profile*

Methods used	Teachers' answers			
	The method is very effective and lead to rapid improvements of educational process.	The method is partially effective and demonstrates rare drawbacks.	The method shows low effectiveness due to insufficient educational environment.	The method shows low effectiveness and does not contribute to improvements of educational process.
activity simulation	21,4 %	33,7 %	29,5 %	15,4 %
asynchronous online learning	12,8 %	23,9 %	49,1 %	14,2 %
attending construction sites	11,7 %	26,6 %	50,1 %	11,6 %
brainstorming	28,9 %	32,1 %	18,6 %	20,4 %
case study	13,6 %	27,2 %	32,5 %	26,7 %
class discussion	29,4 %	38,5 %	28,1 %	4,0 %
class presentations	21,3 %	31,9 %	29,7 %	17,1 %
classroom teaching	20,8 %	40,3 %	28,4 %	10,5 %
combination of theory and practice	40,5 %	29,2 %	17,8 %	12,5 %
educational conference	5,6 %	29,1 %	34,7 %	30,6 %
cooperative technologies	23,0 %	37,0 %	34,5 %	5,5 %
dialogues	21,7 %	31,2 %	29,5 %	17,6 %
drawing and modelling exercises	14,8 %	32,1 %	30,6 %	26,5 %
e-learning and m-learning activities	24,4 %	33,6 %	22,1 %	19,9 %
expert seminar	8,1 %	17,3 %	50,4 %	24,2 %
face-to-face students' exchanges	11,1 %	28,2 %	38,5 %	22,2 %
face-to-face discussion	35,8 %	37,6 %	24,1 %	2,1 %
field trips	9,7 %	28,9 %	39,4 %	22 %
flipped classroom	12,0 %	29,9 %	45,7 %	12,4 %
focus groups	13,1 %	31,7 %	32,5 %	22,7 %
game-based learning	21,9 %	37,6 %	20,4 %	20,1 %
graduation project	26,7 %	40,1 %	19,6 %	13,6 %
instructor's feedback	3,8 %	18,9 %	50,6 %	26,7 %
interactive lectures	7,6 %	20,1 %	43,5 %	28,8 %
interactive simulations	12,9 %	27,8 %	37,9 %	21,4 %
interdisciplinary activities	28,0 %	32,9 %	27,8 %	11,3 %
interview	13,9 %	39,4 %	20,5 %	26,2 %
learning diaries	2,7 %	19,6 %	50,5 %	27,2 %
microlectures	7,6 %	25,9 %	43,1 %	23,4 %
MOOCs	14,7 %	39,9 %	32,2 %	13,2 %
peer learning	3,8 %	23,5 %	39,3 %	33,4 %
presentation of real-life situation	17,2 %	29,4 %	33,9 %	19,5 %
project-based learning	23,0 %	33,1 %	28,1 %	15,8 %

quiz	9,5 %	30,5 %	32,2 %	27,8 %
role play	7,9 %	17,9 %	40,6 %	33,6 %
school-enterprise cooperation	23,7 %	32,9 %	29,5 %	13,9 %
scientific research	29,0 %	40,8 %	12,9 %	17,3 %
self-assessment	19,5 %	34,7 %	28,8 %	17,0 %
self-study	30,6 %	32,5 %	11,7 %	25,2 %
storytelling	14,3 %	29,3 %	31,6 %	24,8 %
study visits	21,8 %	28,6 %	21,9 %	27,7 %
synchronous online learning	20,6 %	30,0 %	29,4 %	20,0 %
teamwork	39,6 %	38,7 %	12,7 %	9,0 %
traditional lectures	29,6 %	36,5 %	11,9 %	22,0 %
use of smartcommunication programs	21,4 %	38,9 %	20,4 %	19,3 %
use of spatial composition models	18,6 %	29,5 %	30,7 %	21,2 %
videlectures on real cases	10,2 %	31,8 %	26,4 %	31,6 %
virtual learning activities	28,5 %	30,6 %	28,0 %	12,9 %
virtual laboratory	20,7 %	22,8 %	30,5 %	26,0 %
work with textbook	21,8 %	34,7 %	24,4 %	19,1 %

Source: based on survey results.

The findings demonstrate that most teachers prefer using activity simulation (33,7 %), class discussion (38,5 %), classroom teaching (40,3 %), face-to-face discussions (37,6 %), graduation project (40,1 %), MOOCs (39,9 %), school-enterprise cooperation (32,9 %), use of smart communication programs (38,9 %), and work with textbook (34,7 %) despite of rare drawbacks they bring. At the same time a number of methods are used quite rarely. They include the following: case study (26,7 % of teachers avoid using it), educational conference (30,6 %), instructor's feedback (26,7 %), interactive lecture (28,8 %), learning diary (27,2 %), quiz (27,8 %), study visits (27,7 %), storytelling (24,8 %), and virtual laboratory (26,0 %).

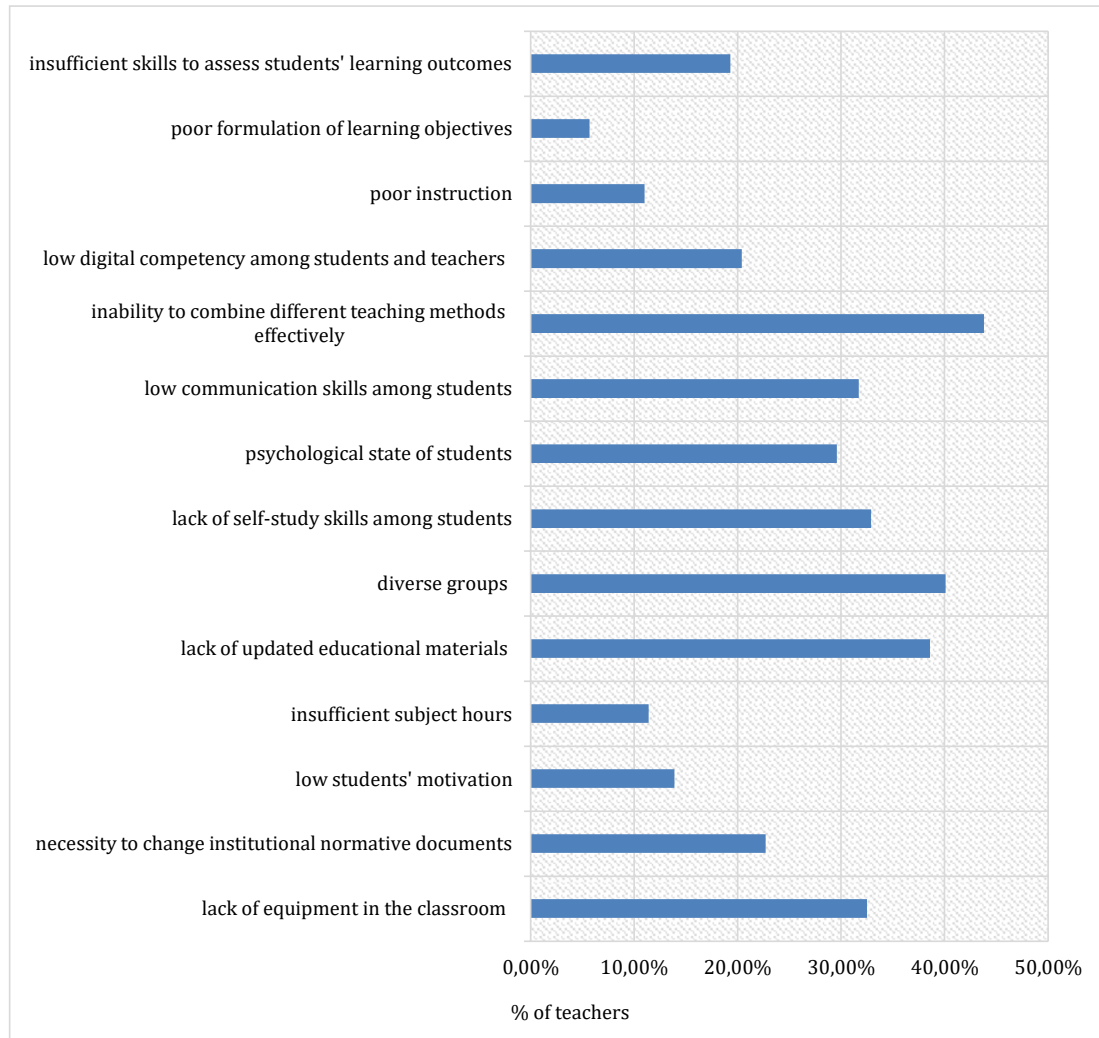
Analyzing the use of teaching methods, we have found that many of techniques are not implemented because the teachers face a number of difficulties. Figure 2 shows the analysis of difficulties the teachers face while teaching the disciplines of the architectural and artistic profile.

The results demonstrate that the teachers face a number of difficulties in the educational process and this fact makes the teaching less effective. The difficulties that occur the most often include the following: lack of equipment in the classroom and insufficient educational environment (32,5 %), lack of updated educational materials and necessity to design new teachers' guidelines on the basis of existing requirements (38,6 %), diverse groups and problems with explanation of new material in accordance with curriculum (40,1 %), teachers' inability to combine different methods in the classroom (43,8 %), lack of self-study skills among students and their low competency to perform learning activity independently (32,9 %), low communication skills among students that cause to poor performance of

interactive exercises like discussions, brainstorming, presentations, and project-based learning (31,7 %), low digital competency of teachers and students (20,4 %).

Figure 2

The Difficulties Facing in the Process of Teaching the Disciplines of the Architectural and Artistic Profile

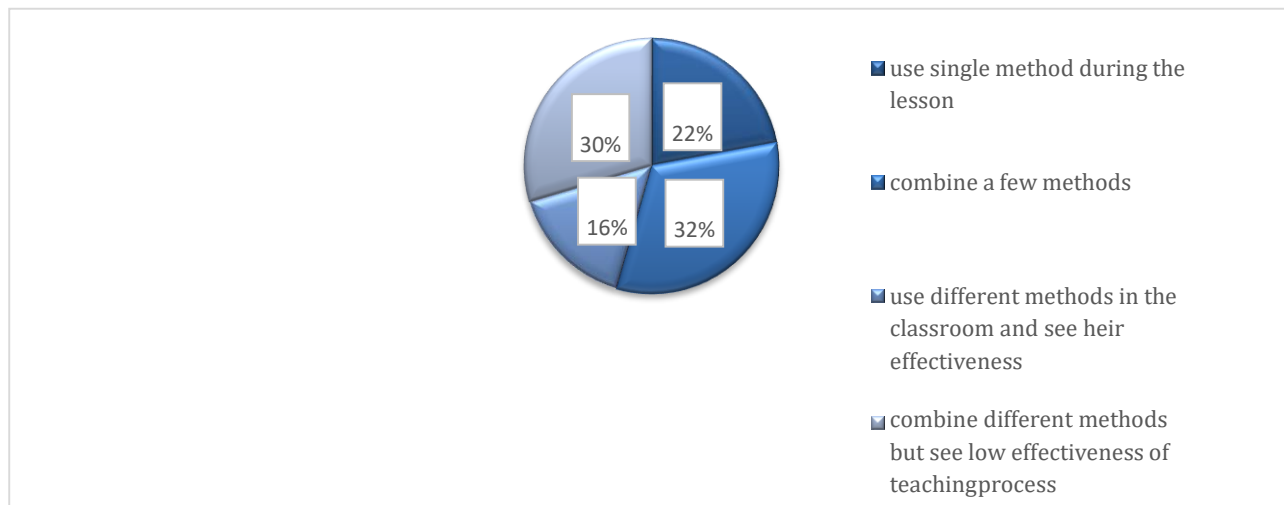


Source: based on survey results.

The survey found that the most teachers face difficulties with combining the teaching strategies or methods. This fact made us to study the number of teachers who use single method or combine different methods in the classroom. The findings show that 22 % of teachers use single method during the lesson, 32 % combine a few methods in the educational process; only 16 % use different methods in the classroom and consider they are used effectively and improve the educational process significantly, and 30 % of teachers combine different methods but see the low effectiveness of teaching process. Figure 3 demonstrates the teachers' readiness to combine different methods while teaching the disciplines of architectural and artistic profile. These results demonstrate that the single method cannot enhance the educational process and to make teaching the disciplines of the architectural and artistic profile effective and qualitative; the teachers must combine different methods and use them depending on the students' needs, the peculiarities of educational environment, the curriculum used at the higher educational institution and the requirements of employers.

Figure 3

The Analysis of Teachers' Readiness to Combine Different Methods



Source: based on survey results.

Discussion

The review of concerned literature and the close-open survey conducted among the teachers of Libyan higher educational institutions showed that a great number of different teaching strategies and methods are used in the educational process. The teachers are armed with traditional face-to-face activities like lecture or seminar, innovative interactive methods including pore play, brainstorming, interactive lecture, or project-based learning.

Similarly, recently digital technologies like virtual learning, online learning, use of MOOCs, are extensively used. In addition, a great attention is paid towards school-enterprise cooperation, onsite visits, and mutual projects with professionals, presentation of real-life situation, scientific trips, etc.

The findings show that the use of teaching methods depends on many factors (Lotfabadi & Mousavi, 2022; Shafter & Cheptoo, 2020; Zaed & Chen, 2021). They include students' needs and learning performance, their individual psychological characteristics and readiness to accomplish different types of activities, students' motivation to learning activity and future profession, the structure of curriculum and interdisciplinary links, employer's requirements, teachers' mastery, technological equipment of educational environment, availability of teachers' guidelines and requirement to follow them strictly, cooperation with industry and possibility for students to visit construction sites and solve real-life situations. All of the teaching methods have their advantages and can be used under certain conditions within the educational process (Bibi et al., 2022; Makowska, 2019).

According to Allanyazov (2021), a teaching method should be productive, informative and satisfying as to enhance the educational process and to improve students' learning outcomes. Table 2 shows the analysis of the methods used in teaching of the disciplines of the architectural and artistic profile and outlines their advantages for enhancement of the teaching process.

Table 2

The Analysis of Methods in Teaching of the Disciplines of the Architectural and Artistic Profile

Methods used in teaching of the disciplines of the architectural and artistic profile	Advantages of the used methods
Activity simulation	Helps exploring possible scenarios of real-life situation; contributes to self-assessment; allows applying theoretical and practical knowledge as well as interdisciplinary links
Asynchronous online learning	More flexible for the students and the teachers; allows the students learning on their own pace; helps teachers to build comfortable schedule, is cost-effective
Attending construction sites	Provides good practice; helps analysing real-life situations
Brainstorming	Is an easy and quick class activity; contributes to the formation of teambuilding and problem-solving skills; creates effective student-centered activity; improves communication skills, encourages creativity
Case study	Involves the students in research projects and allows organising professional discussion; encourages critical thinking; contributes to the formation of creativity, the decision-making, and the professional flexibility
Class discussion	Helps to the knowledge exchange; motivates to do home assignments; develops communicative skills; decision making, analytical thinking
Class presentations	Improves self-education skills; facilitates creativity and critical thinking
Classroom teaching	Provides social interaction; helps organising real time learning; facilitates the collaboration
Combination of theory and practice	Demonstrates the ability to use knowledge and skills in order to solve professional tasks; facilitates interdisciplinary links, improves analytical skills
Educational conference	Allows both students and teachers to demonstrate their competency and mastery; develops critical thinking, planning, management, and creativity
Cooperative technologies	Improves leadership and decision-making, conflict management skills; facilitates teambuilding; develops personal responsibility for own activities; enhances self-confidence; improves communication skills

Dialogues	Develops communication skills; improves knowledge and experience; helps to improve teambuilding; enhances efficiency of explanation of theoretical material
Drawing and modelling exercises	Enhances the knowledge in the discussed topics; is used as practical exercise to complement theoretical activities; develops professional architectural competency; enhances artistic imagination
E-learning and m-learning activities	Optimization of educational process; increases flexibility and self-discipline; improves digital competency; motivates to learning activity; develops decision-making skills; contributes to adaptability in learning; fewer space is required
Expert seminar	Provides the possibility to study experts' experience; motivates to future professional activity
Face-to-face students' exchanges	Provides new experience; improves motivation to learning; develops communication skills and teambuilding; develops creativity; improves foreign language knowledge
Face-to-face discussion	Builds more effective communication; increases knowledge; forms peer learning skills; improves teambuilding and creativity; develops problem-solving and decision-making
Field trips	Enhances knowledge exchange; improves motivation to future profession; forms new approaches to problem-solving; develops creativity
Flipped classroom	Improves students' engagement; uses the time efficiently; activates students' learning; develops self-discipline
Focus groups	Allows applying creative approaches; develops communication skills; increases knowledge
Game-based learning	Improves students' creativity and imagination; makes learning more enjoyable and relevant to students
Graduation project	Helps to demonstrate interdisciplinary knowledge and skills; assesses the readiness to professional activity; develops analytical skills; improves professional independence

Instructor's feedback	Helps to understand students' needs; improves assessment
Interactive lectures	Improves traditional lecture, makes it more interesting and enjoyable; helps to engage all the students; develops concentration and critical thinking skills
Interactive simulations	Facilitates students' cognitive activity; improves learning outcomes; forms professional flexibility; gains new experience
Interdisciplinary activities	Integrates all the knowledges and skills in order to solve professional tasks more effectively
Interview	Develops flexibility and communication skills; helps assessing more objectively; students are able to demonstrate their knowledge
Learning diaries	Forms new approaches to the assessment and self-assessment; helps to revise the material
Microlectures	Make the traditional lectures interesting; develops concentration; helps to acquire both theoretical and practical knowledge
MOOCs	Provides access to the course; makes the material interactive; helps to assess the knowledge immediately; develops course flexibility; summarizes the information learned
Peer learning	Builds teambuilding; helps to revise the material; forms leadership skills; improves communication skills
Presentation of real-life situation	Gains new integrated experience; builds interest and motivation; provides self-assessment; helps to study additional material on the interesting topics
Project-based learning	Provides deeper engagement with educational content; build interaction between students; encourages problem-solving skills; develops teambuilding; helps to engage with enterprises and industries; improves collaboration and communication skills
Quiz	Helps to check the knowledge quickly and effectively; helps to concentrate on learning; is fun and interesting; helps to learn small details on the topic

Role play	Reproduces real-life professional situations; develops decision-making and communication skills; increases motivation to learning activity
School-enterprise cooperation	Introduces real-life scenarios; provides contact with real construction site and materials; explains how all the elements work; forms interaction with environment
Scientific research	Improves self-study; builds motivation and interest; deepens professional knowledge and skills; forms problem-solving skills
Self-assessment	Encourages to reflect their learning performance; improves learning outcomes; develop objectivity and critical thinking
Self-study	Encourages to study more effectively; inspires motivation and curiosity; enhances self-confidence; facilitates problem-solving; contributes to time-management skills
Storytelling	Helps to summarize all the material in interesting way; contributes to creativity and communication skills
Study visits	Improves teambuilding, the work, develops communication skills, problem solving skills and decision making that are only obtained through life experience
Synchronous online learning	Allows to interact with presents and with each other; the students can discuss the problem and find the solution together; the teacher can answer the question in real time; improves time-management, communication skills and flexibility
Teamwork	Improves communication skills; develops self-confidence; builds leadership skills; enhances collaboration in the group; makes studying more interesting; gives the possibility to share ideas equally;
Traditional lectures	Helps to create new ideas; provides all the material in concise structure; is supported with necessary technical aids; is economical; helps to cover lots of material; gives control over the audience in the classroom; develops concentration and analytical thinking
Use of smart communication programs	Simplify the educational process; facilitate to less formal communication between the participants of educational process; improves teambuilding

Use of spatial composition models	Improves professional competence; helps to simulate architectural and artistic problem-solving
Video lectures on real cases	Optimizes the education process; allows to invite outstanding lecturers; helps to repeat the video and to learn the material deeper
vVirtual learning activities	Improves digital skills; helps to use various methods; encourages to continuous learning; increases the interest to professional activity
Virtual laboratory	Develops new approaches to solve problems; provides digital experience; form new integrated professional competency; motivates to professional activity
Work with textbook	Provides deep knowledge; easy to use; provides self-study skills

Source: based on literature review and survey results.

The findings show that a small amount of teachers use a single method while teaching the disciplines of the architectural and artistic profile in Libyan higher educational institutions. This means than in order to make the educational process effective and qualitative it is necessary to combine different teaching strategies and methods. This approach demands some changes in the classroom and efficient implementation of combined methodology needs introduction of favourable conditions of the educational environment. It was found that teachers are required to take a number of measures dealing with organization, methodology, pedagogical psychology, and curriculum content (Baig et al., 2020; Pllana, 2021; Ruggiero, 2021) to make the educational process more efficient. These measures are the following:

- 1) Combine different teaching methods considering students' needs, peculiarities of educational environment, and employer's requirements;
- 2) Choose productive, interesting, and informative methods to enhance students' learning outcomes;
- 3) Correspond the teaching methods with learning objectives and educational content;
- 4) Build curriculum considering the latest advancements in the architectural and artistic field;
- 5) Plan the lesson in advance to effectively implement the methods. If it is possible, provide some methods to perform the same activity;
- 6) Improve digital technology in order to use computer application more effectively;
- 7) Use of various computer applications to facilitate the educational process including Autodesk, Adobe Photoshop, Adobe Illustrator, Microsoft Office, GIS, Blender 3D, Design Builder, Sketch up and consider them in the curriculum;

- 8) Conduct research projects, facilitate mutual projects with professionals in the field to gain real- life experience and form problem-solving skills;
- 9) Apply activities and projects that are close to reality and more practical;
- 10) Facilitate students' participation in real projects in the industry and also organize their involvement in the community projects to help the locals;
- 11) Integrate the educational process with professional activity;
- 12) Facilitate students' interaction while learning that means using interactive activities extensively, including games and teamwork;
- 13) Apply social media and smart communication programs to simplify the educational process and to motivate the students to learning activities;
- 14) Introduce interdisciplinary links to form integrated professional competency;
- 15) Take part in international projects and encourage students to join face-to-face exchanges to gain new experience;
- 16) Encourage self-study skills and motivate to continuous learning;
- 17) Pay attention to new trends in architectural and artistic work and introduce them in the curriculum;
- 18) Concentrate on clear and accurate instruction; provide the students with the preparatory phase if it is necessary;
- 19) Involve students in feedback activities and recommend carrying out self-assessment activities while doing different tasks;
- 20) Pay attention to combine theory and practice;
- 21) Develop environmental awareness, respect to social values and heritage through the educational materials;
- 22) Use a number of activities for revision the material like quiz, group discussion, storytelling, project-based learning;
- 23) Consider that the methods used in the process of teaching must form soft skills as well (such as communication skills, creative thinking, decision-making, leadership, time-management, professional flexibility, adaptability to changing environment, teambuilding, etc.).
- 24) Use foreign advancements in the field of architectural or artistic education in order to make the teaching more effective;
- 25) Provide a number of electives to meet students' needs and abilities;
- 26) Adopt advanced teaching approaches and strategies, include innovative technologies such as simulations or BIM.

27) Assess the curriculum on regular basis and change the teaching approaches depending on learning objectives.

Thus, the effectiveness and quality in the teaching process of architectural and artistic disciplines in Libyan higher educational institutions depends on the choice of appropriate strategies and methods. One found that relevant combination of various teaching methods can significantly improve the educational process. The use of combined methodology depends on different objective and subjective factors including students' needs, learning objectives, peculiarities of educational environment, employer's requirements, and pedagogical mastery of teachers. The used methods must be productive, informative, and satisfying. Correspondingly, the teaching methods must be selected considering their interactivity, innovation, use of technology, orientation towards real-life situation. Moreover, the methods must contribute to the improvement of integrated professional competency on the basis of interdisciplinary links and formation of soft skills necessary for professional activity in the changing environment.

Conclusions and Implications

Intensive social, economic and cultural transformations bring significant changes in architectural education. In the Libyan context, architects and urban planners must pay special attention to the development of environmental, social and economic dimensions of new construction projects. That is why architectural education in Libya requires special attention and needs continuous development because of the changing nature of architectural practice and technological modifications. Today the Libyan higher education sector suffers from a number of difficulties like the absence of proper planning and the use of ineffective teaching strategies. Due to this, Libya's education system must be rapidly modernized basing on technological advancements and progressive educational programmes.

The research differentiates some approaches to the organization of architectural education. They include the traditional approach, the school-enterprise cooperation, the digital training, and the international cooperation. Each of these approaches provide a number of teaching strategies and methods. The teachers in Libyan higher educational institutions use different teaching strategies and methods. The methods include traditional face-to-face methods as well as innovative methods based on digital technologies. It was found that computer-based approaches for educational process organization have been recently widely used due to the COVID-19 pandemic and the gradual digitalization of society. The findings demonstrate that most teachers prefer using activity simulation, class discussion, classroom teaching, face-to-face discussions, graduation project, MOOCs, school-enterprise cooperation, use of smart communication programs, and work with textbook despite of rare drawbacks they bring. At the same time rare methods include case study, educational conference, instructor's feedback, interactive lecture, learning diary, quiz, study visits, storytelling, and virtual laboratory.

One found that the teachers avoid using a number of innovative methods because they face some difficulties like the lack of equipment in the classroom and insufficient educational environment, the lack of updated educational materials and the necessity to design new teachers' guidelines on the basis of existing requirements, diverse groups and problems with explanation of new material in accordance with curriculum, teachers' inability to combine different methods in the classroom, the lack of self-study skills among students and their low competency in independent learning activity performing, low communication skills among students that cause poor performance of interactive exercises like discussions, brainstorming, presentations, and project-based learning, low digital competency of teachers and students.

In addition it was found that a small amount of teachers use a single method while teaching the disciplines of the architectural and artistic profile in Libyan higher educational institutions. This means that in order to make the educational process effective and qualitative it is necessary to combine different teaching strategies and methods. This proves that the selection of effective teaching methods for classroom activities or students' self-study must follow certain requirements. These requirements include: interactivity, student-centered learning, innovation, cooperative technologies, high productivity, informative content, the use of computer technologies. Also, the use of combined methodology depends on students' needs, learning objectives, peculiarities of educational environment, employer's requirements, and pedagogical mastery of teachers, and interdisciplinary links.

The research contributed to the elaboration of recommendations for the teachers of architectural and artistic disciplines in order to apply the combined methodology in the educational process.

References

- Al Sharif, A. E. R. (2022, September). State of art and perspectives of universal design: The Libyan approach. In *Transforming our world through universal design for human development: Proceedings of the Sixth international conference on universal design (UD2022)* (Vol. 297, pp. 20–27). IOS Press. <https://doi.org/10.3233/SHTI220816>
- Alatrash, S., & Gurdalli, H. (2018). Mosque architecture in the Islamic civilization in Libya. *Journal of Near Culture*, 1(2), 87–100. <https://dergi.neu.edu.tr/public/journals/6/pdf/makale-7-soaad-alatrash.pdf>
- Allanyazov, M. B. (2021). Innovative teaching methods of architecture terminology in higher education. *EPRA International Journal of Research and Development*, 6(5), 530–532. <https://doi.org/10.36713/epra2016>
- Ata, A., & Ganoun, A. (2020). COVID-19 pandemic and its impact on education in Libya. *Libyan Journal of Medical Sciences*, 4(3), 97–98. https://journals.lww.com/ljms/Fulltext/2020/04030/COVID_19_Pandemic_and_Its_Impact_on_Education_in.1.aspx
- Baig, M. I., Shuib, L., & Yadegaridehkordi, E. (2020). Big data in education: A state of the art, limitations, and future research directions. *International Journal of Educational Technology in Higher Education*, 17, Article 44. <https://doi.org/10.1186/s41239-020-00223-0>
- Bakoosh, H. M. M., Arslangazi, H., & Asilsoy, B. (2021). Comparison of temperature and humidity among traditional underground and modern house in Gharyan, Libya. *International Journal of Advanced and Applied Sciences*, 8(3), 1–11. <http://science-gate.com/IJAAS/Articles/2021/2021-8-3/1021833ijaas202103001.pdf>
- Bayhan, H. G. & Karaca, E. (2020). Technological innovation in architecture and engineering education - an investigation on three generations from Turkey. *International Journal of Educational Technology Higher Education*, 17, Article 33. <https://doi.org/10.1186/s41239-020-00207-0>
- Bibi, A., Ahmed, A., Shaista, & Murad, H. (2022). Different teaching-learning strategies have their advantages and disadvantages. *Journal of Xidian University*, 16(6), 531–539. <https://doi.org/10.37896/jxu16.6/056>

- Elabbar, A. A. (2021). Reforming the Libyan education system: Seven articulated years via a strategic planning pyramid. *London Journal of Research in Humanities and Social Sciences*, 22(14), 11–25. https://journalspress.com/LJRHSS_Volume22/Reforming-the-Libyan-Education-System-Seven-Articulated-Years-via%20a-Strategic-Planning-Pyramid.pdf
- Ghonim, M., & Eweda, N. (2019). Instructors' perspectives on the pedagogy of architectural graduation projects: A qualitative study. *Frontiers of Architectural Research*, 8(3), 415–427. <https://doi.org/10.1016/j.foar.2019.01.007>
- Goray, N. K., & Patra, B. (2021). Online teaching strategies in architectural design studio. *International Research Journal of Engineering and Technology*, 8(6), 1040–1044. <https://www.irjet.net/archives/V8/i6/IRJET-V8I6191.pdf>
- Lotfabadi, P., & Mousavi, S. A. (2022). Adaptation of architectural education pedagogy in addressing COVID-19 pandemic. *Journal of Educational Technology and Online Learning*, 5(4), 1094–1105. <http://doi.org/10.31681/jetol.1150608>
- Maatuk, A. M., Elberkawi, E. K., Aljawarneh, S., Rashaideh, H., & Alharbi, H. (2022). The COVID-19 pandemic and E-learning: Challenges and opportunities from the perspective of students and instructors. *Journal of Computing Higher Education*, 34, 21–38. <https://doi.org/10.1007/s12528-021-09274-2>
- Makowska, B. (2019). Innovative methods in teaching improve the creativity of landscape architecture students. *World Transactions on Engineering and Technology Education*, 17(3), 343–348. [http://www.wiete.com.au/journals/WTE&TE/Pages/Vol.17,%20No.3%20\(2019\)/22-Makowska\(1\)-B.pdf](http://www.wiete.com.au/journals/WTE&TE/Pages/Vol.17,%20No.3%20(2019)/22-Makowska(1)-B.pdf)
- Pllana, D. (2021). Combining teaching strategies, learning strategies, and elements of super learning principles. *Advances in Social Sciences Research Journal*, 8(6), 288–301. <https://doi.org/10.14738/assrj.86.10366>
- Pons-Valladares, O., Hosseini, S. M. A., & Franquesa, J. (2021). Innovative Approach to Assist *Architecture Teachers in Choosing Practical Sessions. Sustainability*, 14, Article 7081. <https://doi.org/10.3390/su14127081>
- Ruggiero, R. (2021). Learning architecture in the digital age. An advanced training experience for tomorrow's architect. *TECHNE – Journal of Technology for Architecture and Environment*, (2), 139–143. <https://doi.org/10.13128/techne-10698>
- Sasi, E. A. (2019). Exploring problematic issues of housing design in hot humid climate: Libyan case. *GRID-Architecture Planning and Design Journal*, 2(1), 1–24. <https://doi.org/10.37246/grid.460881>
- Selim, A. (2021). Architecture education in (COVID-19) pandemic analytic study for (Online learning for building construction courses). *Journal of Architecture, Arts and Humanistic Science*, 2(6), 363–381. <https://doi.org/10.21608/mjaf.2020.50515.2072>
- Shaqour, E. N. (2021). Using modern teaching strategies to improve architectural design studio pedagogy in West Bank. *Mansoura Engineering Journal*, 46(1), 46–53. <https://doi.org/10.21608/bfemu.2021.158858>

- Shafter, M. E. A. & Cheptoo, R. (2020). State of higher education in Libya: A game change administrative approach. *Shanlax International Journal of Education*, 8(3), 19–23. <https://doi.org/10.34293/education.v8i3.2305>
- Shareef, S. S., & Farivarsadri, G. (2020). An innovative framework for teaching/learning technical courses in architectural education. *Sustainability*, 12(22), Article 9514. <https://doi.org/10.3390/su12229514>
- Soliman, S., Taha, & Sayad, Z. E. (2019). Architectural education in the digital age. Computer applications: Between academia and practice. *Alexandria Engineering Journal*, 58, 809–818. <https://doi.org/10.1016/j.aej.2019.05.016>
- Steinø, N., Dabaieh, M., & Ben Bih, K. (2020). Post-conflict reconstruction in the Middle East and North Africa region: A bidirectional parametric urban design approach. *International Journal of Architectural Computing*, 18(3), 296–313. <https://doi.org/10.1177/1478077119899584>
- Tahir, H. F. B., Aysu, M. E., & Arin, O. (2022). The use of traditional courtyard design in Libyan housing as a way for a sustainable design. *Global Scientific Journal*, 10(7), 1633–1647. https://www.globalscientificjournal.com/researchpaper/The_Use_of_Traditional_Courtyard_Design_in_Libyan_Housing_as_a_Way_for_A_Sustainable_Design.pdf
- Zaed, O., & Chen, Z. (2019). A methodological approach to excellence in BIM oriented architectural education. In *Doctoral workshop on contemporary advances in research methodology in construction management*. Glasgow: Caledonian University. https://strathprints.strath.ac.uk/70958/1/Zaed_Chén_ARCOM2019_A_methodological_approach_to_excellence_in_BIM_oriented_architectural_education.pdf
- Zaed, O., & Chen, Z. (2021). Developing excellent architectural education for best practices in Libya. *Journal of Pure & Applied Sciences*, 20(3), 1–5. <https://doi.org/10.51984/jopas.v20i3.999>
- Zaed, O., Chen, Z., Grant, M., Dimitrijevic, B., & Bareka, A. (2021). Developing a BIM integrated curriculum framework for undergraduate architectural education in Libya. In *The second national conference for developing higher education institutions in Libya*. <https://bwu.edu.ly/nchel2021/wp-content/uploads/SNC21-025.pdf>
- Zhou, M. (2020). Architecture students' innovation ability training multi-dimensional practice platform construction. In D. Xuemei, H. Chunyan, & Z. Yuling (Eds.), *Proceedings of the 6th International conference on humanities and social science research (ICHSSR 2020): Volume 435 – Advances in Social Science, Education and Humanities Research* (pp. 638–642). Atlantis Press. <https://doi.org/10.2991/assehr.k.200428.140>

DOI: <https://doi.org/10.57125/FED.2023.25.03.09>

How to cite: Yolida, B., & Marpaung, R. R. T. (2023). The Media Puzzle Assisted Guided Inquiry Model: Its Use of Students' Critical Thinking Skills. *Futurity Education*, 3(1), 128–138. <https://doi.org/10.57125/FED.2023.25.03.09>

The Media Puzzle Assisted Guided Inquiry Model: Its Use of Students' Critical Thinking Skills

Berti Yolida*

Doctor of Education Study Program, Faculty of Teacher Training and Education, Lampung University, Indonesia, <https://orcid.org/0000-0001-6458-8630>

Rini Rita T. Marpaung

Biology Education Study Program, Faculty of Teacher Training and Education, Lampung University, Indonesia, <https://orcid.org/0000-0002-9423-4662>

***Correspondence email:** berti.yolida@fkip.unila.ac.id.

Received: January 12, 2023 | **Accepted:** February 28, 2023 | **Published:** March 25, 2023

Abstract: The aim of this research was to photograph the application of the guided inquiry model (GIM) with puzzle media to students' critical thinking skills (CTS). The used design was the enrollment of pretest posttest non-equivalent control group. The research sample was VIIB class students as the experimental class and VIIC class as the control class who were selected through cluster random sampling technique. The research data was presented in the form of quantitative data, namely the average pretest, posttest, and N-gain values which were then analyzed by statistical t-test with a significance level of 5% using SPSS 22. The results showed that the GIM model media puzzle has a significant effect on students' CTS with an average of N -the experimental class gain was higher (0.45) while the control class (0.22), and sig. 0.00 < 0.0. Thus, it can be concluded that learning science using GIM with puzzle media has a significant effect on students' CTS.

Keywords: critical thinking skills, effect, guided inquiry learning model, puzzle media, students.

Introduction

The current era of globalization opens opportunities and challenges for humans in order to develop their potential. This century requires reliable life skills that will become a provision for students in their lives. One of them is the critical thinking skills (CTS). These skills allow students making logical conclusions so they can solve their problems (Association of American Colleges and Universities, 2005; Dwyer et al., 2014). CTS can make quality people because they play a very important role in a person's ability to solve different problems. Students with this ability can rationally face problems with existing challenges (Feldman, 2010). If in the absence of CTS provision, students are unable to retrieve, process, and utilize the available information to face the challenges of everyday life, then critical thinking skills become a necessity in the learning process. The classroom learning is the implementation of the curriculum. In the curriculum, students are required to be active, creative, and innovative to solve problems faced at school (BNSP, n.d.). In order to fulfill the demands of the curriculum, students are directed toward learning that hones appropriate skills. Fulfillment can be carried out in all subjects, including learning science. Science as a subject requires scientific processes. The process of learning science can also be taught through scientific inquiry so that thinking skills develop and passive learning becomes active. Schools need to develop students' learning experiences directly in the form of knowledge, process skills, and a scientific attitude (Rusman, 2015). The learning consists of a collection of knowledge about nature that teaches objects, phenomena, and processes in nature in a systematic way. The nature of science contains thinking methods and investigate knowledge about technology and its development in society (Chiappetta & Koballa, 2015). Meanwhile, (Gizzi, 1972) formulates three main elements in science, namely attitude, process methods and products. The discovery process includes the students ability to learn as the core of thinking skills which is a description of learning science (Kunandar, 2007).

Research Problem

Currently, students are required to have this century skills including CTS. Meanwhile, the CTS of students in Indonesia is still low as shown by its achievements below other countries based on the results of the Program for International Student Assessment (PISA) survey released by the Organization for Economic Co-operation and Development (OECD) (Dhiva Syabila, 2021; OECD, 2022). Innovation is needed in learning so that traditional learning cannot fulfill the required skills. The use of puzzle media through guided inquiry learning allows for a CTS increase in student. For students the science is a means to develop scientific skills, attitudes and values, preparing students to become part of a society that has insight into science and the application of technology, and even about how science is conceptualized. Students acquire not only knowledge, but as well as thinking skills that can be effectively used in order to solve everyday life problems. One form of thinking skills is CTS, the critical thinking is one of the skills that students need in solving problems. Critical thinking is an intellectually active process that builds concepts, uses information and analyzes it based on observations and experiences as a reference for action (Tawil & Liliyasi, 2013). CTS is reflective in nature, thinks rationally so that it can focus on making problem solving decision (Kurniawati et al., 2014). The critical thinking allows students to analyze their thoughts and draw the right conclusions when making decisions. Construction of knowledge becomes more meaningful when educators train students in order to criticize, identify, evaluate and solve problems correctly. However, the reality of learning in schools does not develop

students' CTS. The learning process directs students to memorize and collect information without further understanding the information. This means that after graduation, students can only explain the theory, but also lack the application level (Arsyad, 2015).

Research Focus

The guided inquiry learning for Indonesia is one part of efforts in order to improve and develop learning. GIM reinforced with puzzle media is expected to answer the challenges of learning today, in the 21st century and in the future. In order to increase CTS, Indonesia recommends student-centered learning models and guided inquiry assisted by media puzzles needed to improve junior high school students' learning. The guided inquiry is an active learning model that can engage students in taking an active role in their learning while also improving their critical thinking skills. Anam (2016) explains that the GIM is a form of inquiry-based learning where there are stages in the learning process that can train students' CTS. Data collection experiments, analyzes to test hypotheses, and drawing conclusions based on the performed data and analyzes. Through this learning, students actively solve problems and find answers to asked questions. Media is used for educators' assistance in communicating learning and achieving learning objectives. The used medium in this study is a puzzle medium. Puzzles are media that play by installing or matching specific boxes or pieces to eventually form a specific pattern that contains information (Yuliani, 2008). Students are actively involved in learning by using puzzle media, because they can directly compose puzzles and discuss them with their colleagues. The puzzle media can improve writing skills (Amalia & Napitupulu, 2022), it is suitable for use as learning media (Sanjaya et al., 2019; Yulanda & Nurjannah, 2022), the guided inquiry-oriented puzzle media can improve learning outcomes (Karuniawati et al., 2022a; Karuniawati et al., 2022b). This study emphasizes the importance of using the GIM as an appropriate model in teaching science, aided by puzzle media that can improve CTS and increase good activities in learning so that the achievement of 21st century skills is accomplished.

Research Objectives

The purpose of this study was to photograph the effect of using puzzle media through GIM in increasing students' CTS. In addition, an overview of students' critical thinking is explained in this article.

Research Questions

The research questions developed in this study are:

- 1.How does the use of puzzle media through GIM affect students' CTS?
- 2.What is the description of students' critical thinking to face the demands of the 21st century?

Research Methodology

The focus group was all students of class VII SMP Negeri 15 Bandar Lampung, Indonesia. The sample – the class VII B was the treatment class and the class VII C as the control class. The sampling was tested using a cluster random sampling technique. This research is a quasi-experimental study with pretest posttest nonequivalent control group (Table 1).

Table 1

Pretest Posttest Nonequivalent Control Group Research Design

Group	Pretest	Independent Variable	Posttest
E	Y1	X	Y2
C	Y1	-	Y2

Source: (Adnan et al., 2020).

Explanation:

Y1 : Pretest;

Y2 : Posttest;

E : Experimental Class; C : Control Class;

X : Treatment using GIM assisted by a media puzzle;

- : Treatment using the discussion method.

The types of data seized in this quantitative research: the quantitative data is in the form of data on students' CTS test results from the pretest, posttest, and worksheet on the subject matter of environmental pollution; the data collection techniques by means of tests to measure CTS. The used data are pre-test and post-test results, as well as excerpts from student worksheets. Critical thinking tests refer to indicators (Ennis, 1996) they were limited to giving simple explanations, concluding, providing further explanation, strategies, and also tactics. Students' critical thinking were described in providing simple explanations and advanced explanations of the problems given in learning. In addition, students can develop strategies and tactics in solving the problems given and efforts to react to them so that in the end students can logically conclude about learning material and are expected to be applied in their lives.

The data analysis method was a quantitative data analysis technique using SPSS version 22. The used analysis N-Gain data, the sample data normality test used Kolmogrov-Smirnov and homogeneity test through the Levene Test. The N-Gain results use the following formula.

$$N - Gain = \frac{\text{posttest score} - \text{pretest score}}{\text{maximum score} - \text{pretest score}} \times 100$$

(Meltzer, 2002).

Hypothesis testing uses an independent sample t-test in order to investigate the significance of the difference in the mean of the two groups in the study. The independent sample t-test serves to determine the average difference between the two focus groups in the study with test criteria. If the p-value < 0.05 then H0 is rejected and if the p-value ≥ 0.05 then H0 is accepted.

Research Results

GIM with puzzle media can improve the CTS of seventh-grade junior high school students. Middle school students who are transitioning from elementary school like playing puzzle media while studying.

This can be seen in the comparison between the pretest, posttest, and N-gain scores in the following table.

Table 2

The Tabulation Results of Pretest, Posttest and, N-gain Values

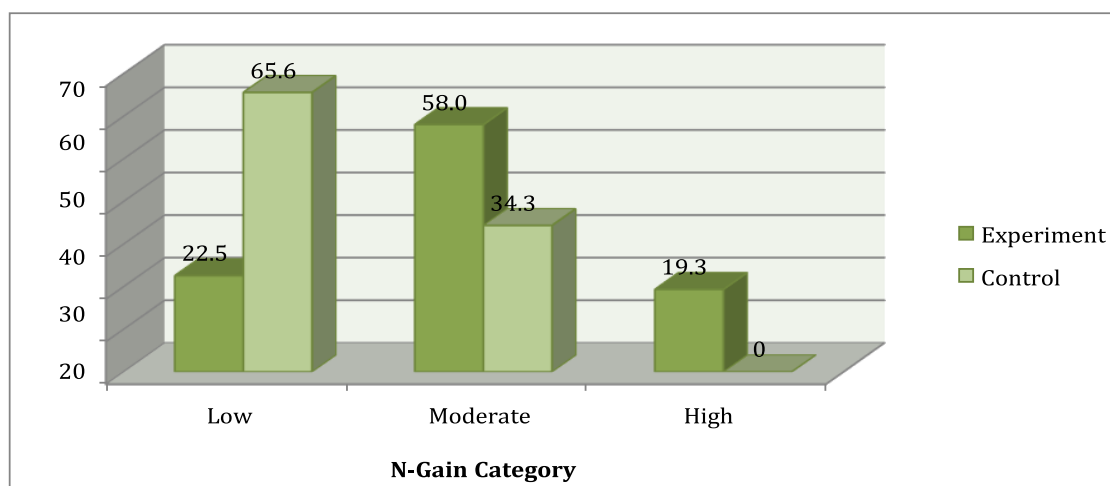
Class	Average Pretest	of	Average Posttest	of	N-Gain	Interpretation
E	54,78		78,3		0,45	Moderate
K	47,54		60,26		0,22	Low

Based on the table above, it can be seen that the CTS of students in the experimental class has "moderate" criteria while the comparison class has "low" criteria. The percentage distribution of N-Gain CTS in the experimental class and the control class can be seen in the following figure 1.

The distribution of N-gain values for CTS in the experimental class is mostly found in the moderate criteria of 58.06 with as many as 19.36 students reaching the high criteria. Thus, the CTS of students who learn using the GIM with puzzle media are higher than those of students who learn using the discussion method.

Figure 1

Distribution of N-Gain Values for CTS



The results of the T test in Table 3 also show that the use of the GIM with puzzle media on the subject matter of environmental pollution greatly influences the improvement of students' CTS.

Table 3

Results of the N-gain Statistical Test Tabulation

Class	Normality	Homogeneity	Independent Sample t-test
E	Sig. 0,58 > 0,05	Sig. 0,34 > 0,05	Sig. (2tailed) 0,00 < 0,05
C	Sig. 0,56 > 0,05		

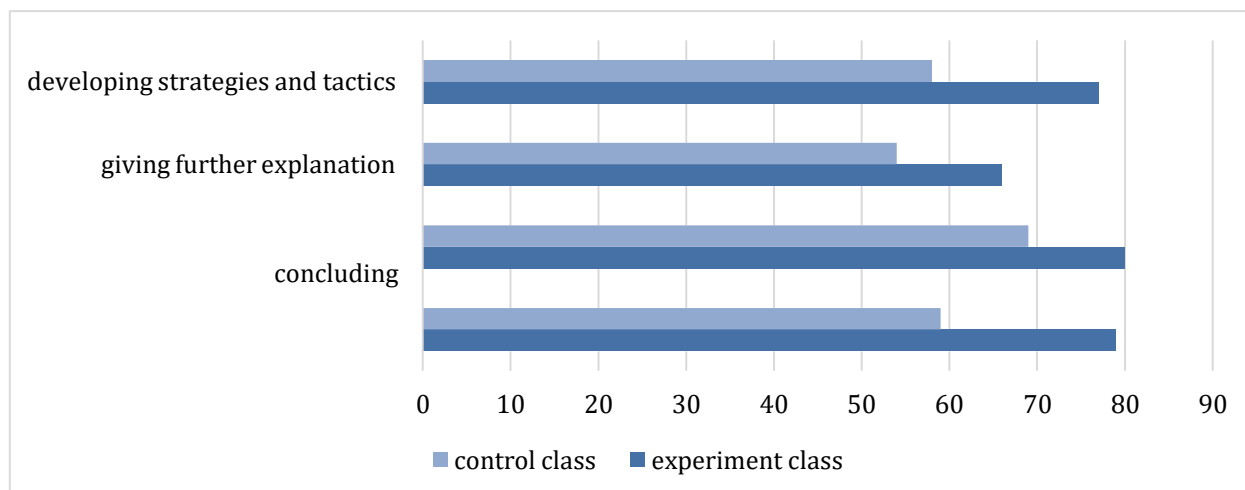
Note. E = Experiment, C=Control

The results show that the samples come from participants that are normally distributed in both the experimental class and the control class. The homogeneity testing using the Levene Test on pretest, posttest, and N-gain students' CTS revealed that the tested data has a homogeneous variant. After testing the normality and homogeneity of the data, the Independent Sample t-Test was carried out in order to test the significance of the difference in the average of two classes between students in the experimental class and the control class, the results were sig. $0.00 < 0.05$. It means that the CTS of students between the experimental class and the control class significantly differ. The use of guided inquiry can develop student learning outcomes, learning experiences, and critical thinking (Duran & Dökme, 2016; Luska, 2022; Murnaka et al., 2019; Nisa et al., 2018; Wang et al., 2016).

Through GIM using puzzle media, students are guided to observe the images given and identify problems. This stage builds basic skills by practicing critical thinking on indicators, providing brief explanations when educators conduct questions and answers while studying, and discussing problems related to the facts presented. In addition to problem identification, students are guided to formulate problems based on those in the worksheet. A worksheet based on guided inquiry stimulates students to think critically (Yasin et al., 2019). At the problem formulation stage, educators ask and answer questions while students are studying, directing them to formulate problems related to the presented facts, thus providing brief explanations related to learning indicators in developing critical thinking skills. After formulating the problem, students are also encouraged to formulate hypotheses. Educators guide students by reviewing what they have learned so far and relating it to what they will learn. At the hypothesis formation stage, students learn by formulating hypotheses and providing further explanations that enable them to provide hypotheses to reconstruct their arguments. Students' self-confidence in being directly involved in the learning process can influence interest in learning biology and ultimately be related to students' thinking processes (Jeffery et al., 2016). A comparison of critical thinking achievements in the experimental and control classes is presented in the following figure.

Figure 2

Comparison of Each Indicator of CTS



Source: authors own development.

Discussion

Each of the critical thinking indicators has increased. The most developed skill is the ability of students to provide simple explanations and organize the use of strategies and tactics in solving problems. This is due to the guided inquiry the learning model encouraging students to discuss concepts and theories that they have discovered for themselves, checking the results of discussions with the literature, proving the correctness of the results with the proposed hypotheses, and encouraging students to present their results. At the hypothesis-testing stage, strategies and tactics, which are indicators of CTS, are finally explained and provide further explanation. Even though the indicators providing further explanation, the experimental class experienced the lowest increase, but the increase was superior to the control class. Students' activeness and writing critical answers have an impact on better critical thinking skills (Gupta et al., 2015; Putra et al., 2018; Styers et al., 2018). The use of the guided inquiry model helps students examining more in-depth content about environmental pollution.

In the learning process, educators encourage students to be active learners. Interesting learning encourages students to actively participate in learning, including using puzzle media. The media puzzle is an educational game that develops CTS by having players compiles answers from words to answer predetermined questions. The use of media in the form of jigsaw puzzles helps students understand the concept. In addition, one emphasizes that very fun activities such as compiling puzzles allow students to reach their potential and train their CTS. Through an active learning, it is necessary to familiarize students with critical thinking so that they can independently solve their own problems (Pursitasari et al., 2020).

The last activity in GIM with puzzle media is formulating conclusions. During this phase, educators assist students in learning to conclude the results of investigations using puzzle media. In terms of critical thinking students are trained in strategic and tactical aspects, practice concluding, and design further or more in-depth explanations. Using guided inquiry allows students to make discoveries that require their high-order thinking skills, such as critical thinking, so that student achievement increases. in the learning process (Murnaka et al., 2019). The critical thinking is an important part of science education as it teaches students how to think as providers in their lives (Vieira & Tenreiro-Vieira, 2016). Therefore, science learning must be able to improve students' thinking skills. The guided inquiry can

involve students in discovering, drawing conclusions, and reporting findings so as to improve students' CTS and problem solving (Irwanto et al., 2018; Maxwell et al., 2015; Yasin et al., 2019).

This finding implies that the inquiry learning needs to be prioritized in science learning at all levels of education, especially in junior high schools. Therefore, students need to get the opportunity to think about facts and concepts, and then the teacher provides guidance on how to criticize existing phenomena, determine good solutions to problems, and provide critical explanations. Furthermore, they are used for strategies and tactics development using their ideas, and ending by concluding exposure to existing phenomena until they can reflect on their findings.

Conclusions and Implications

The conclusion of this study is that the use of GIM models assisted by media puzzles can improve students' CTS on environmental pollution material. In learning science, it is very important to inculcate thinking skills, including critical thinking. These skills will help students now and, in the future, as they face the challenges of the twenty-first century. The learning using GIM through puzzle media can be an alternative to improve students' CTS. A combination of learning models with the right media is a solution to achieve 21st century skills, one of which is the application of the GIM using puzzle media, especially for junior high school students.

Acknowledgements: I would like to thank Indri Sri Maryani for her contribution for this publication.

References

- Adnan, G., Rukminingsih, & Mohammad Adnan Latief. (2020). *Metode penelitian pendidikan: penelitian kuantitatif, penelitian kualitatif, penelitian tindakan kelas*. Erhaka Utama. <https://repository.ar-raniry.ac.id/id/eprint/14062/>
- Amalia, D., & Napitupulu, S. (2022). Development of picture puzzle media to improve narrative writing skills for Grade IV students at SD 101899 Lubuk Pakam. *EduGlobal: Jurnal Penelitian Pendidikan*, 1(2), 120-130. <https://www.jurnal-lp2m.umnaw.ac.id/index.php/EduGlobal/article/view/1185>
- Anam, K. (2016). *Inquiry-based learning*. Pustaka Pelajar.
- Arsyad, A. (2015). *Instructional media raja*. Grafindo Persada.
- Association of American Colleges and Universities. (2005). *Liberal education outcomes: A preliminary report on student achievement in college*. https://web.lemoyne.edu/chin/SLA%20webpage/Resource%20page%20links/AACU/LEAP_Report_FINAL.pdf
- BNSP. (n.d.). *Standards and basic competency for SMA/MA education unit level curriculum elementary and secondary education*.
- Chiappetta, E. L., & Koballa, T. R. (2015). *Science instruction in the middle and secondary schools: Developing fundamental knowledge and skills* (8th ed.). Pearson.
- Dhiva Syabila, R. (2021, November). *Lack of literacy and critical thinking ability in Indonesia society* [Conference paper].

https://www.researchgate.net/publication/355926497_Lack_of_Literacy_and_Critical_Thinking_Ability_in_Indonesia_Society

- Duran, M., & Dökme, İ. (2016). The effect of the inquiry-based learning approach on student's critical thinking skills. *Eurasia Journal of Mathematics Science and Technology Education*, 12(12), 2887–2908. <https://doi.org/10.12973/eurasia.2016.02311a>
- Dwyer, C. P., Hogan, M. J., & Stewart, I. (2014). An integrated critical thinking framework for the 21st century. *Thinking Skills and Creativity*, 12, 43–52. <https://doi.org/10.1016/j.tsc.2013.12.004>
- Ennis, R. H. (1996). Critical thinking dispositions: Their nature and assessability. *Informal Logic*, 18(2), 165–182. <https://doi.org/10.22329/il.v18i2.2378>
- Feldman, D. A. (2010). *Critical thinking: Strategies for decision making*. Indeks.
- Gizzi, V. G. (1972). Carin, Arthur A., and Robert B. Sund, Teaching science through discovery, Second Edition, Columbus, Ohio: Charles E. Merrill Publishing Co. 1970 (625 pages). *Science Education*, 56(2), 280–281. <https://doi.org/10.1002/sce.3730560228>
- Gupta, T., Burke, K. A., Mehta, A., & Greenbowe, T. J. (2015). Impact of guided-inquiry-based instruction with a writing and reflection emphasis on chemistry students' critical thinking abilities. *Journal of Chemical Education*, 92(1), 32–38. <https://doi.org/10.1021/ed500059r>
- Irwanto, Saputro, A. D., Rohaeti, E., & Prodjosantoso, A. K. (2018). Promoting critical thinking and problem solving skills of preservice elementary teachers through process-oriented guided-inquiry learning (POGIL). *International Journal of Instruction*, 11(4), 777–794. <https://doi.org/10.12973/iji.2018.11449a>
- Jeffery, E., Nomme, K., Deane, T., Pollock, C., & Birol, G. (2016). Investigating the role of an inquiry-based biology lab course on student attitudes and views toward science. *CBE Life Sciences Education*, 15(4), Article 61. <https://doi.org/10.1187/cbe.14-11-0203>
- Karuniawati, S., Utomo, S., & Setiadi, G. (2022a). Pengaruh model pembelajaran guided inquiry berbantuan puzzle picture terhadap hasil belajar ipa siswa [The effect of puzzle picture-assisted guided inquiry learning on students' natural science learning outcomes]. *JURNAL PAJAR (Pendidikan Dan Pengajaran)*, 6(5), 1449. <https://doi.org/10.33578/pjr.v6i5.8548>
- Karuniawati, S., Utomo, S., Setiadi, G., & Pratama, H. (2022b). The influence of puzzle picture assisted guided inquiry learning model on learning outcomes of natural sciences. *Uniglobal Journal of Social Sciences and Humanities*, 1(1), 37–43. <https://doi.org/10.53797/ujssh.v1i1.6.2022>
- Kunandar. (2007). *Implementation of curriculum planning concept in the Indonesian educational system towards teachers' professionalism*. Raja Grafindo Persada.
- Kurniawati, I. D., & Diantoro, M. (2014). Pengaruh pembelajaran inkuiri terbimbing integrasi peer instruction terhadap penguasaan konsep dan kemampuan berpikir kritis siswa [The effect of peer instruction integrated guided inquiry learning on concepts acquisition and critical thinking of students]. *Jurnal Pendidikan Fisika Indonesia*, 10(1), 36–46. <https://journal.unnes.ac.id/nju/index.php/JPMI/article/view/3049>

- Luska, K. L. (2022). A multioutcome, guided inquiry-based liquid-liquid extraction laboratory for introductory organic chemistry. *Journal of Chemical Education*, 99(12), 4124–4133. <https://doi.org/10.1021/acs.jchemed.2c00396>
- Maxwell, D. O., Lambeth, D. T., & Cox, J. T. (2015, June). Effects of using inquiry-based learning on science achievement for fifth-grade students. In *Asia-Pacific Forum on Science Learning & Teaching*, 16(1), Article 2. https://www.eduhk.hk/apfslt/v16_issue1/cox/page3.htm
- Meltzer, D. E. (2002). The relationship between mathematics preparation and conceptual learning gains in physics: A possible “hidden variable” in diagnostic pretest scores. *American Journal of Physics*, 70(12), 1259–1268. <https://doi.org/10.1119/1.1514215>
- Murnaka, N. P., Almaisurie, Q., & Arifin, S. (2019). Method on guided inquiry learning to improve students’ critical thinking abilities in facing the industrial revolution 4.0. *International Journal of Scientific and Technology Research*, 8(9), 439–441.
- Nisa, E. K., Koestiari, T., Habibulloh, M., & Jatmiko, B. (2018). Effectiveness of guided inquiry learning model to improve students’ critical thinking skills at senior high school. *Journal of Physics. Conference Series*, 997, Article 012049. <https://doi.org/10.1088/1742-6596/997/1/012049>
- OECD. (2022). *Are students ready to take on environmental challenges?*. PISA, OECD Publishing. <https://doi.org/10.1787/8abe655c-en>
- Pursitasari, I. D., Suhardi, E., Putra, A. P., & Rachman, I. (2020). Enhancement of student’s critical thinking skill through science context-based inquiry learning. *Jurnal Pendidikan IPA Indonesia*, 9(1), 97–105. <https://doi.org/10.15294/jpii.v9i1.21884>
- Putra, B. K. B., Prayitno, B. A., & Maridi, M. (2018). The effectiveness of guided inquiry and INSTAD towards students’ critical thinking skills on circulatory system materials. *Jurnal Pendidikan IPA Indonesia*, 7(4), 476–482. <https://doi.org/10.15294/jpii.v7i4.14302>
- Rusman. (2015). *Integrated thematic learning. Theory, practice and assessment*. PT Raja Grafindo Persada.
- Sanjaya, O. C., Habisukan, U. H., Kurratul’Aini, Tastin, & Hapida, Y. (2019). Development of puzzle media as a biology learning media on Eubacteria material in Sma/Ma. *Prosiding Seminar Nasional Pendidikan Biologi*, 2(1), 95–99. <http://103.84.119.236/index.php/semnaspbio/article/view/484>
- Styers, M. L., Van Zandt, P. A., & Hayden, K. L. (2018). Active learning in flipped life science courses promotes development of critical thinking skills. *CBE Life Sciences Education*, 17(3), Article 39. <https://doi.org/10.1187/cbe.16-11-0332>
- Tawil, M., & Liliyasi. (2013). *Complex thinking and its implementation in science learning*. Badan Penerbit Universitas Negeri Makassar.
- Vieira, R. M., & Tenreiro-Vieira, C. (2016). Fostering scientific literacy and critical thinking in elementary science education. *International Journal of Science and Mathematics Education*, 14(4), 659–680. <https://doi.org/10.1007/s10763-014-9605-2>

- Wang, J. J., Rodríguez Núñez, J. R., Maxwell, E. J., & Algar, W. R. (2016). Build your own photometer: A guided-inquiry experiment to introduce analytical instrumentation. *Journal of Chemical Education*, 93(1), 166–171. <https://doi.org/10.1021/acs.jchemed.5b00426>
- Yasin, M., Jauhariyah, D., Madiyo, M., Rahmawati, R., Farid, F., Irwandani, I., & Mardana, F. F. (2019). Development student's worksheet based on guided inquiry to improve students mathematical critical thinking skills. *Journal for the Education of Gifted Young Scientists*, 7(4), 1345–1369. <https://doi.org/10.17478/jegys.598422>
- Yulanda, D. F., & Nurjannah. (2022). Pengembangan media puzzle bergambar berorientasi problem based learning pada tema Cita-Citaku Kelas IV SD. *EduGlobal: Jurnal Penelitian Pendidikan*, 1(3), 221–232. <https://www.jurnal-lp2m.umnaw.ac.id/index.php/EduGlobal/article/view/1445>
- Yuliani, R. (2008). *Games that increase children's intelligence*. Laskar Aksara.

How to cite: Ostanina, A., Bazyl, O., Tsviakh, O., & Dovzhuk, N. (2023). Formation of Digital Competence in Higher Education Students as a Basis for the Transformation of Education of the Future. *Futurity Education*, 3(1), 139–149. <https://doi.org/10.57125/FED.2023.25.03.10>

Formation of Digital Competence in Higher Education Students as a Basis for the Transformation of Education of the Future

Alina Ostanina

Teacher of biology and chemistry Odesa Gymnasium No. 103 of the Odesa City Council, Holder of the academic title of Doctor of Philosophy in the field of education Municipal institution of higher education "Odesa Academy of Continuing Education of the Odesa Regional Council", Ukraine, <https://orcid.org/0000-0001-8542-044X>

Olena Bazyl*

PhD in Physical and Mathematical Sciences, Senior Teacher Department of Applied Mathematics and Complex System Sumy State University, Faculty of Electronics and Information Technologies, Sumy, Ukraine, <https://orcid.org/0000-0002-2644-5361>

Olha Tsviakh

Doctor of Philosophy in the field of Biology, Senior Lecturer of the Department of Physical Culture and Sports of V.O. Sukhomlynskyi National University of Mykolaiv, Ukraine, <https://orcid.org/0000-0002-1119-2170>

Natela Dovzhuk

PhD in Pedagogical Sciences, Assistant Department of Physiology, Medical psychological faculty Bogomolets National Medical University, Kyiv, Ukraine, , <https://orcid.org/0000-0002-0468-9322>

***Correspondence email:** o.bazyl@elearning.sumdu.edu.ua.

Received: January 22, 2023 | **Accepted:** March 11, 2023 | **Published:** 25 March 2023

Abstract: The education informatization together with the rapid spread of computer technology actualizes the need for thorough information training of future teachers. The purpose of the study is to analyze the applicants for higher education digital competence based on the features of modern education. In the work were used general scientific methods: analysis, synthesis, deduction. By means of prediction method, further opportunities for the development and improvement of the digital competence of students are characterized. The study contains a systematic literature review on the development of digital competence in higher education students, published over the past decade. Based on a full-text analysis of 20 articles published in known databases, the study identifies the need for developing digital literacy skills in undergraduates. The results define the role and importance of digital competence for future specialists' formation, outline the structure of digital literacy, highlight the main tasks of digital competence: the creation of digital content, digital culture of communication and cooperation, formation of information control and interpretation skills, etc. Although the digitalization of education is active in Ukraine, but the study highlights the possibilities of its development: improving the legislative framework, state support for the implementation of digital products, the development of digital educational content, the development of innovative material and technical base, etc. To conclude, the effectiveness of the development of digitalization of education is provided by the continuity, consistency, and coherence of preparation for the digital transformation. At the same time, digital competence is a necessary condition for the formation of the teacher of the future: they should be able to analyze information, work in network communities to design and form a digital educational environment in order to form a new generation of progressive teachers.

Keywords: digital competence, education seekers, informative technology; components; digital literacy, challenges, education.

Introduction

Research Problem

The rapid development of public goods, digital technologies, and learning innovations require each specialist in the field of education to acquire special professional knowledge and skills, and the institution of higher education - to review approaches to the formation of students professional competence. The use of digital technologies contributes to the effectiveness of the educational process at all levels and the formation of professional competence of future teachers. Pedagogical institutions of higher education face the task of implementing such an organization of the learning process, which will be able to create conditions for specialists training who easily learn and quickly adapt to changing conditions and content of work, who are interested in continuous education; who skillfully use modern computer technologies in their own professional activities, freely navigate in the information space, possess knowledge, professional skills and skills in searching, processing, and storing data. Given this, the problem digital competence formation among future teachers as a necessary condition for ensuring a competitive specialist in the modern labor market becomes urgent. Thus, there is a need to form the ability of applicants to systematically use information technologies, because the presence of digital competence allows them to be successful in professional activities that are carried out in the informational space, to search, to consciously use information, to quickly make decisions, to form important life competencies. Due to today's conditions, where there is a rapid pace of development of digital technologies, the number of various devices that simplify the life of a modern person is constantly increasing, affecting all areas of life, including education.

Research Focus

The recent years events have brought unprecedented improvements to educational activities in the world in general and in Ukraine in particular, making online education not only necessary, but also in some cases the only possible way to ensure the continuity of the educational process, the implementation of educational programs and pupils and students access not only to educational materials, but also to learning as such. The impossibility of conducting education in the classical way in classrooms at desks presented educators with an unprecedented challenge: to find a meaningful way to continue education online. The sudden need for digital solutions in the field of education has led to the emergence of various digital networks and online platforms, their role consist in providing the educational process is currently difficult to overestimate. However, without delving into the history of digitalization of education, it is worth noting that some 15 years ago, online courses and elements of distance education in Ukraine were few, if not advanced.

Research Aim and Research Questions

Increasing the level and quality of knowledge, the formation of competences, in particular the ability to acquire information and effectively use it in professional activities is the main task of the education reform of a competitive country. At the same time, the development of professional knowledge and competences of future teachers, creativity, competitiveness, mobility, ability to independence, self- determination and self-education is a significant feature of the modern higher school. The digital competence is one of the traits that must be possessed by a person who can successfully adapt to the constantly changing conditions of life. The formation of digital competence is based on the idea of continuity of education, the driving force of which is students' awareness of the need to move to the next level of overcoming the discrepancy between the level of mastering theoretical knowledge and practical skills. The principle of continuity is based on the idea of ensuring its movement from ignorance to full assimilation of knowledge, self-learning, and the formation of competencies.

Research Methodology

The theoretical and methodological basis of the study of digital competences have become the fundamental provisions of modern theory, the work of leading Ukrainian and foreign scientists and practitioners in the field of higher education, the future development of education, the digitalization of the society and the competencies that people can achieve.

In this article general scientific research methods were used, namely: system analysis, synthesis, deduction (analyzing personal educational environment). First, using system analysis and synthesis one analyzed the digital competences and their implementation. Next, to show education environment impact on abstract person one used deduction and to illustrate the environment formation under individual efforts one used induction.

The method of forecasting was also important. Based on forecasting method, further opportunities for the development and improvement of digital competence of higher education applicants were reflected. The axiological method was also used. By means of this method, the basic values and skills that the digital education of the future will develop were attracted. Through this method, the competencies that will be needed in the digital society are also characterized. These competences are supposed to be a worthy response to the challenges of globalization.

The study was implemented in several stages. The first one outlined the meaning of digital competence, characterized the main components and structure of digital literacy, the second one investigated the current considerations on the role and place of digital competence in the future teacher training system, described the main prospects and ways of development of digital literacy. In the last stage, the results of the study are made.

Research Results

The skill to use digital technologies at work is gradually becoming necessary for most specialties and professions. Digital literacy in the modern information (digital) society is one of the main competencies. Educators are role models of the new generation. Therefore, they must demonstrate exemplary digital competence in order to equip those who receive education with the appropriate tools and skills; to be the most active actors of the digital society and encourage pupils and students to do so.

In a broad sense, digital literacy is a person's skill to use digital tools in the smallest possible way with benefit for oneself and professional activity.

Digital competence is interpreted as a dynamic combination of knowledge, abilities, skills, ways of thinking, attitudes, and other personal qualities in the field of information, communication and digital technologies, which determines the ability of a person to successfully socialize, to carry out professional and/or further educational activities using such technologies (Yevstratiev, 2020). According to the European framework of digital competence of educators, the digital competence of a teacher in the broad sense sees the ability to use digital technologies not only to improve learning, but also for professional interaction with colleagues, students, parents and other stakeholders; for personal professional development and collective good, as well as continuous innovations in the organization of training.

Talking about Ukraine, it is necessary to mention that nowadays there are six key areas within digital competence. They cover various aspects of the professional activity of educators: – professional involvement; – digital resources; – organization of learning; – assessment; – expansion of educational opportunities; – formation of digital competence of education seekers. Being competent in the field of digital education, teachers should take into account the general educational environment in which educational meetings take place on online platform. Therefore, a significant part of the digital competence of teachers is, before giving students the opportunity to take an active part in life and education in the digital era.

Another aspect of their digital competence is the use of all the advantages of digital technologies in order to improve pedagogical activities as well as to advance organizational strategies (Fostikova, 2020). The use of digital technologies is effective in improving the effectiveness of communication with higher education students, their parents, and third parties. Digitization of education promotes cooperation, development and improvement of organizational communication strategies in assistance with other educators, exchange of knowledge, opinions and experience of innovative pedagogical practices (Chekan et al., 2017).

Digital competence involves the ability to individually and collectively reflect, give a critical assessment and ensure the active development of one's own digital pedagogical practice, one's own educational community and a digital-friendly educational environment. The need to use digital sources and resources for continuous professional development is undeniable at the moment, because at the

disposal of a modern teacher there are many digital educational resources that he can use in the educational process.

One of the key digital competency skills that any modern educator needs to develop is to embrace such a variety of online platforms, digital learning materials and tools; effectively identify the resources that best suit his own pedagogical goals and the learning goals of specific higher education students and match these resources to his own teaching style; structure digital learning materials, establish connections between them and modify them; add and develop own digital resources to support personal continuous learning.

At the same time, the teacher must responsibly use digital content and manage it, involving respecting copyright and promoting it during the use, modification and sharing of resources, as well as taking care of the protection of confidential content and data, for example - the results of digital exams or other student evaluations. The next component of digital competence is the ability to select digital resources, which consists in the ability to identify, evaluate and select digital resources that are adequate for specific teaching and learning purposes. For this, the teacher must take into account the realities of a specific educational task, its context and parameters, choosing digital resources for its implementation.

Modification of digital resources involves the skill and ability to modify and expand existing resources with an open license or resources that allow this.

To create or co-create new digital educational resources, the teacher must take into account the specific educational goal, pedagogical approach and target audience when designing digital resources and planning their use in the initial process (See Table 1).

Table 1

The Structure of the Digital Competence

The name of the competence	The description the component
Information literacy	View, search and filter data, information and digital content; Evaluation of data, information and digital content; Data, information and digital content management; Interaction using digital technologies.
Communication and cooperation	Exchange using digital technologies; Involvement of citizenship with the help of digital technologies; Collaboration using digital technologies.
Creation of the digital content	Development of digital content; Integration and processing of digital content; Copyright and licenses; Programming.

Security	Device protection; Protection of personal data and confidentiality; Protection of health and well-being; Environmental Protection.
Solving problems in the digital space	Solving technical problems; Determination of needs and technological responses; Creative use of digital technologies; Identifying gaps in digital competence.

Source: created by authors.

The management, protection and sharing of digital resources require the teacher to be able to organize digital content and create adequate ways to access it for higher education students, parents, stakeholders and colleagues. To effectively protect digital content, the educator must respect and comply with confidentiality and copyright; understand the rules for the use and creation of open licenses for digital products and open educational resources, including compliance with the rules of proper reference and citation (Vuorikari, 2016). Considering the chosen pedagogical strategy or approach, the formed digital competence of the teacher also consists in the effective organization of the use of digital technologies at various stages and in different conditions of the educational process (Ovcharuk et al., 2018). The real potential of digital technologies is to shift the focus of learning from teacher-driven processes to learner-driven processes. In this way, the role of the digitally competent educator is transformed into one of mentoring, mediation, and mentoring for learners in their increasingly autonomous learning endeavors. In this sense, digitally literate educators must be able to develop new digitally enabled ways to mentor and support learners, individually and collectively, and to initiate, support and monitor both self-regulated and collaborative learning activities.

Digital competence occupies a key place in the system of professional and general competences, is the basis for professional development in any field of activity of a modern specialist. For example, an important characteristic of becoming a future specialist in the field of education is digital competence, which is part of the ten basic competencies prescribed in the Concept "New Ukrainian School" (Ministry of Education and Science of Ukraine, 2016). Therefore, the digital competence is recognized as one of the key competences of a modern person and occupies a leading place in their list. The main tasks of the digital competence can be described with such main tasks of the digital competence as: common activity, creation of the digital content, cooperation and communication, the control over the information, solving of the problems and satisfaction of the needs.

Thus, at the current stage of the development of digital technologies, the concept of "digital literacy" should include a number of such aspects as the organization of work in the digital space; security in the digital environment; analysis and synthesis of the received information, the ability to use the acquired knowledge in professional and private life; communication and respect for all participants in the process of interaction in the digital space. In addition, digital literacy becomes the basis for the development of human information culture (Kuchyn et al, 2022). That is, the digital competence of an individual today can act as the "new literacy" of a modern person, where the vast majority of social relations "transition" into the digital dimension.

It is important to note that "digital competence" as a concept related to the formation and application of ICT is undergoing a transformation along with the deepening of scientific research in this area. It is worth emphasizing that, for the most part, scientists who study the digital competence of a

person and its manifestations in professional and private life focus on the subjective characteristics of this concept in the context of their research (Bouton et al., 2021). That is, the content of the definition of this complex concept is reduced to the goals and needs of a specific researcher, which in turn leads to biased and misleading results, where the very concept of "digital competence" is interpreted too narrowly or too broadly.

Today, such collisions in the defined concept of "digital competence" give even greater relevance to research, which aims not to adjust to the obtained results, but primarily to the content analysis of multiple definitions of this concept and systematization in accordance with the current realities of the development of education and technology in the digital space. Another important aspect related to digital competence and its formation is its reflection in the content of education and the system of effective training of education seekers, because it is no secret that now there are many opinions and positions of different scientists regarding the competence related to "digitalization » of all areas of human social life (Calmer, 2021). Next, let's consider different definitions of digital competence by leading scientists in the field of pedagogical and other sciences. Ovcharuk (2019) gives a consolidated definition of digital competence as "the proven ability to work individually or collectively, using tools, resources, processes and systems that are responsible for accessing information (information and data) and its evaluation, to apply such information to solve problems, creation of information-oriented solutions, products and systems, as well as for obtaining new knowledge.

Discussion

As the results of the study show, digital literacy (given the current educational trends) is the main key in the system of preparation of the teacher of the future. Many researchers agree with this statement. According to Tytova & Mereniuk (2022), the growth of digital literacy in the future will be intensive, and especially among the representatives of higher education applicants (primarily teachers). At the same time, in the study of Laufer et al. (2021) digital literacy is almost the most important competence of the specialist of the future. In addition, the possibilities of the digitalization of education are well-known in current research. For example, Ben-Amram and Davidovitch (2021) highlighted the potential applications of this form of learning in the realities of large-scale digital use.

However, it is worth noting the importance of digital technology for the development of critical thinking and creativity. In the first case, the contemporary youth has the greatest access to information in the history of mankind, so it is important to pay special attention to the process of critical perception of the received information (Gupta et al., 2021). In order to develop these skills, it is possible to introduce special subjects (intended to give knowledge and skills in the field of analysis and use of received information) in educational institutions. Regarding the development of students' creativity, modern digital technologies and educational tools create opportunities for creativity, development and implementation of own ideas without investing significant resources, today almost everyone has gadgets that can satisfy these needs, their intelligent use in the educational process can significantly enrich the arsenal of effective ways of building national education. This opinion is shared by Ifenthaler et al. (2020).

In the context of students' development of digital competence and in the process of intensive development of education, it is necessary to analyze the design of a student's personal educational environment (PLE). Under the personal educational sphere of a person, it is necessary to understand a part of the global information educational space, used and created by the subject of activity in it on the basis of available means of communication on individual needs and opportunities to ensure the dual

nature of life- realization of one's personality in the chosen profession and continuous self-education throughout life. PEE is a set (construct) of resources of the global Internet, which each student fills independently from the proposed or randomly selected resources of the network, based on their preferences, thereby forming an individual design of educational tools (Kergel et al., 2022). The filter of PLE elements is produced by the student on the basis of his own values; is based on a certain level of subjectivity of the student.

Modern researchers note that PLE creation provides an opportunity to construct their own knowledge necessary to adapt to the current labor market, the use of open educational online platforms and other resources of the global Internet (Andros, 2022). The construction of a PEE dictates the need for the development of digital competence, since the PEE is initially formed spontaneously, but after a while, when the subject has a sufficiently large number services and tools of the personal environment, the question of selection, ordering and systematization in their application, which requires digital skills and critical thinking, which means that building a PEE allows you to acquire knowledge skills at all digital competence levels. The development of digital competence and the construction of a PEE are interdependent processes: without a certain level of digital competence, rational construction of a PEE, but only with the help of a PEE is it possible development of a higher level of digital competence, as this process is associated with the acquisition of activity and personal experience.

Speaking about the prospects for the use of digital technologies in domestic social relations, whether it is the education, it is necessary to clearly understand what are the strengths and weaknesses of this complex entity, what are the resources for their development, etc. In the context of the above, when considering issues related to the Central Committee of an individual, it is worth mentioning such an important indicator of the country's readiness for the development and implementation of information and communication technologies in social relations, as the Network Readiness Index (WEF-INSEAD Network Readiness Index (NRI)). Since 2001, the World Economic Forum (WEF) has published an annual report "Global Information Technologies", its purpose was to measure the drivers of development in IR technologies around the world using the Network Readiness Index (NRI) (Kaplan, 2022).

The obtained results with the help of NRI make it possible to determine the prior areas of development in order to more fully use IR technologies for the sociological development of the state. It is important to note that the place in this rate can be an indicator of society readiness and the state to participate in the development of IR technologies. In this ranking, Ukraine ranks 59th according to the data of the KNOEMA website, which shows a significant increase in dynamics compared to 2025.

But despite the positive dynamics of the introduction of digital technologies into domestic social relations according to the NRI, Ukrainian society must make a lot of efforts to further implement digital technologies in all spheres of his life. The main opportunities to improve the situation could be: improvement of the domestic legal framework related to the functioning and professional activities in the digital space, state support for the implementation of real digital products through approbation in the education sector, compiling training resources and platforms to develop digital educational content, use of innovative material and technical base, etc. (See Table 2).

Table 2

Opportunities to Develop Digital Competence

The main opportunities for the development of digital competence

Improvement of the domestic legal framework related to the functioning and professional activities in the digital space
State support for the introduction of real digital products through their testing in the public sector and education
Formation of educational resources and platforms for the development of digital educational content
Implementation of innovative computer learning methods
Use of innovative material and technical base
Development and implementation of distance learning
Formation of a digital educational environment

Source: authors' development.

Thus, major opportunities to improve digital competence in the future include: improvement of the domestic legal framework related to functioning and professional activity in the digital space, which also needs improvement and integration with international legal institutions regarding intellectual property law, which very often negatively affects the motivation to “get” digital products to the market; state support for the introduction of real digital products through their approbation in the public sector and in education in particular; improvement requires "real" training of both IT specialists and ordinary users, it is necessary to explain and motivate in an understandable way to improve their own digital skills, which in the future can become the basis of the digital culture of the individual (Zhernovnykova 2020). According to the WEF report mentioned above, the development of a country's information and digital environment directly determines its competitiveness in the plan and in general. According to the above- mentioned WEF report, the development of the country's information and digital environment directly determines its competitiveness in plan and in general.

Conclusions and Implications

As a basis for assessing the digital literacy of future teachers of humanitarian specialties, one used the foreign researchers' experience, whose approach is based on the assessment of such indicators as:

- Informative competence (knowledge, abilities and skills, responsibility related to the search, understanding, organization, archiving of digital Pedagogy formation of a creative personality in higher and secondary schools of information and its critical understanding; creation of information objects using digital resources, compliance with copyright during citation);

- Computer skills (ability to install the necessary programs and applications in accordance with the tasks of professional and everyday life);

- Media competence (understanding the diversity of information sources, forms, channels of its distribution, the ability to find new information, check its completeness and reliability, to be critical of information messages);

- Communicative skills (knowledge, abilities, skills necessary for communication through various channels (e-mail, chats, blogs, forums, social networks, messengers, etc.), awareness of the presence of special ethics and norms of communication in the digital environment);

- Technological skills (free use of digital tools depending on the platform/interface of knowledge, the ability to effectively and safely use technical software tools to solve various tasks; understanding of technological trends, readiness to work with new modern technologies, applications, gadgets, etc.).

In the conditions of confronting educational and social challenges, contemporary reality actualizes the need for digital transformation of all spheres of human life reality Digital competence formation among future teachers of humanitarian specialties is of particular importance. Certainly, the effectiveness of this process is ensured by the continuity, systematic approach, and integrity of the process preparation for digital transformation. Digital devices and mobile technologies are integral attributes of a modern student, therefore future teachers of humanitarian disciplines with a goal effective implementation of professional activities must have knowledge about the capabilities of computer technology and mobile devices, understand the role digital educational environment, to be able to analyze information, design and create own educational environment, work in network pedagogical communities, improve qualifications through self-education on online courses.

References

- Andros, M. (2022). Information and communication competence of teachers in the era of digitization of education: Ukrainian discourse. *Actual Problems in the System of Education: General Secondary Education Institution – Pre-University Training – Higher Education Institution*, 1(2), 240–252. <https://doi.org/10.18372/2786-5487.1.16732>
- Ben-Amram, M., & Davidovitch, N. (2021). School and home as study spaces: Attitudes of teachers, parents, and students to e-learning during the COVID-19 period: The case of Israel. *International Journal of Educational Methodology*, 7(4), 715–731. <https://doi.org/10.12973/ijem.7.4.715>
- Bouton, E., Tal, S. B., & Asterhan, C. S. C. (2021). Students, social network technology and learning in higher education: Visions of collaborative knowledge construction vs. the reality of knowledge sharing. *The Internet and Higher Education*, 49, Article 100787. <https://doi.org/10.1016/j.iheduc.2020.100787>
- Calmer, J. M. (2021). Teaching with the 21st-century competencies: The impact of psychology and philosophy on teacher work to identify and manifest meaningful learning. In H. Dhir (Ed.), *Handbook of research on barriers for teaching 21st-century competencies and the impact of digitalization* (pp. 87–105). IGI Global. <https://doi.org/10.4018/978-1-7998-6967-2.ch005>
- Chekan, O., Barna, K., & Ivanova, V. (2017). Formation of future nursery teachers' professional competence by means of information and communications technologies. *Science and Education*, 30(4), 57–62. <https://doi.org/10.24195/2414-4665-2017-4-10>
- Ifenthaler, D., Isaias, P., & Sampson, D. (2020). *Orchestration of learning environments in the digital world*. Springer. <https://doi.org/10.1007/978-3-030-90944-4>
- Kuchyn, Y. L., Reva, T. D., Stuchynska, N., Mykytenko, P., Kucherenko, I., & Chkhalo, O. (2022). Digital competence as a necessary component of the professional competence of pharmaceutical industry employees. *Archives Of Pharmacy Practice*, 13(1), 82–87. <https://doi.org/10.51847/8ortvmwgro>
- Fostikova, V. (2020). Modern requirements for digital competencies of civil servants. *Public administration aspects*, 8(s1 SI), 133–135. <https://doi.org/10.15421/152061>
- Gupta S. L., Kishor N., Mishra N., Mathur S., & Gupta U. (2021). *Transforming higher education through digitalization: Insights, tools, and techniques*. CRC Press. <https://doi.org/10.1201/9781003132097>
- Kaplan, A. (Ed.). (2022). *Digital transformation and disruption of higher education*. Cambridge University Press.

- Kergel D., Paulsen M., Garsdal J., & Heidkamp-Kergel B. (2022). *Bildung in the digital age: Exploring Bildung through digital media in education*. Routledge. <https://doi.org/10.4324/9781003158851>
- Laufer, M., Leiser, A., Deacon, B., Perrin de Brichambaut, P., Fecher, B., Kobsda, C., & Hesse, F. (2021). Digital higher education: A divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality. *International Journal of Educational Technology in Higher Education*, 18(1), Article 51. <https://doi.org/10.1186/s41239-021-00287-6>
- Ministry of Education and Science of Ukraine. (2016). *New Ukrainian school*. <https://mon.gov.ua/eng/tag/nova-ukrainska-shkola>
- Ovcharuk, O. (2019). Digital competence of the teacher: International trends and frameworks. *New Pedagogical Thought*, 100(4), 52–55. <http://npd.roippo.org.ua/index.php/NPD/article/view/66>
- Ovcharuk, O., Ivanyuk, I., Hrytsenchuk, O., Ivanyuk, I., Kravchyna, O., Malytska, I., & Soroko, N. (2018). European experience in the development of the digital competence of the teacher in the context of modern educational reforms. *Information technologies and teaching aids: electronic. of science professional type*. 3 (65), 316–336. <https://journal.iitta.gov.ua/index.php/itlt/issue/view/94/showToc>
- Tytova, N., & Mereniuk, K. (2022). Digital literacy of future teachers in the realities of large-scale military aggression (Ukrainian experience). *Futurity Education*, 2(3), 43–54. <https://doi.org/10.57125/FED/2022.10.11.33>
- Vuorikari, R., Punie, Y., Carretero, S., & Van den Brande, L. (2016). DigComp 2.0: The digital competence framework for citizens. Update phase 1: The conceptual reference model. *Luxembourg Publication Office of the European Union*. <https://doi.org/10.2791/11517>
- Yevstratiev, S. (2020). Digital competences in the training of junior bachelors in agronomy. *Educological Discourse*, (3), 185–205. <https://doi.org/10.28925/2312-5829.2020.3.11>
- Zhernovnykova, O. A., Peretiaha, L. Ye., Kovtun, A. V., Korduban, M. V., Nalyvaiko, O. O., & Nalyvaiko, N. A. (2020). The technology of prospective teachers' digital competence formation by means of gamification. *Information Technologies and Learning Tools*, 75(1), 170–185. <https://doi.org/10.33407/itlt.v75i1.3036>

How to cite: Chikuvadze, P. (2023). Gender-related policy guidelines' impact on rural female students' participation in sciences at advanced level. *Futurity Education*, 3(1), 150–165.
<https://doi.org/10.57125/FED.2023.25.03.11>

Gender-Related Policy Guidelines' Impact on Rural Female Students' Participation in Sciences at Advanced Level

Pinias Chikuvadze

*Research Fellow, Office for International Affairs, University of the Free State, South Africa,
<https://orcid.org/0000-0002-8569-0009>*

***Correspondence email:** chikuvadzepinias@gmail.com.

Received: February 4, 2023| **Accepted:** March 14, 2023| **Published:** March 25, 2023

Abstract: The number of rural female students participating in sciences at the Advanced Level in Zimbabwe, is conspicuously under-represented. It is in this context that this study was centred among others issues on identifying policy guidelines that are used to initiate rural female students' participation in sciences. In addition, this paper aims to show how these guidelines have been used to instigate rural female students' participation in sciences. These laid the ground for the paper to establish the impact of these policy guidelines on rural female students' participation in sciences at the Advanced Level. This idea was grounded in a methodological approach comprised of the transformative paradigm, and qualitative approach. The sample comprised of thirty participants who were purposively selected from rural female students doing sciences or other subjects at the Advanced Level. A content analysis was used in order to collect data generated through the document analysis, the focus group discussions, and in-depth personal interviews. One of the major highlights was that though there existed various gender-related policies guidelines (i.e., international treaties, national and school-based), participants had limited knowledge about them. In, addition, this study revealed that though these guidelines were in existence their application in promoting the participation of rural female students in sciences at Advanced Level was still not systematic. Thus, there existed a gap between policy intentions and the reality on the ground pertaining to the promotion of rural female students' participation in sciences.

This was more pronounced in the selected rural secondary schools where female students are under-represented in sciences at Advanced Level. Hence, the conclusion that though policy guidelines were recognized, they are yet to have an impact on rural female students' participation in sciences at Advanced Level. This creates the need to encourage rural female students to take a centre stage in all activities earmarked at empowering them.

Keywords: Advanced level, gender-related policy, participation; rural, female student, sciences

Introduction

In Zimbabwe, the participation of females in science education is a priority, realised and implemented from primary school to tertiary level through an all-inclusive approach. This is grounded in a philosophy of integrating gender-related policy guidelines in science learning process. The integration of these guidelines in science education allows for the creation of equal opportunities for all students irrespective of one's gender and social background. Thus, this creates the platform for rural female students to participate in the so-coined 'male dominated' sciences at Advanced Level. Though there have been efforts to engage females in the fight against injustices in different spheres of society, i.e., education, it is not clear how such commitments have been translated into the policy (Hill et al., 2010). Most of the studies (Chauraya, 2023; Marongedza et al., 2023; Vurayai, 2023) looked at gender issues in education covering areas like females' performance in science examinations, cultural barriers impeding their participation in education, etc. It's against this background that this paper aims to demonstrate the need to fight against inequalities in sciences at Advanced Level from a policy perspective. In this argumentation, the feminist and social learning thoughts acted as the basis for interrogating rural female students' under-representation in sciences (Biology, Chemistry, Pure Mathematics, Physics, and Statistics) at the Advanced Level.

Research Problem

In Zimbabwe's rural secondary schools like in most under-developed countries, the number of female students participating in sciences at the Advanced Level remains significantly low (Amirtham & Kumar, 2023; UNESCO Institute for Statistics, 2012). This so, despite the existence of gender-related policy guidelines, targeted at facilitating the advancement of females in the so-coined 'masculine' education and training fields (i.e., science, engineering, and mathematics) (Asongu et al., 2023; Gudyanga et al., 2015). It is in this regard that this paper shows the identified gap guided by the following question: How have gender-related policy guidelines impacted rural female students' participation in sciences at Advanced Level?

Research Focus

Gender-related guidelines have become one of the key directions for Zimbabwe's socio-economic transformation. Thus, it's a key component of the national policy guidelines on strengthening the ideals for equal access to opportunities in different spheres (i.e., education). Therefore, gender-related guidelines form part of the pillars for sustainable innovative development. In this sense, the participation of rural female students in sciences at the Advanced Level, accords them with the opportunity to be involved in the current and future demands of industry 4.0. It's through these guidelines those rural female students' dreams into reality when it comes to their participation in sciences at the Advanced Level.

Research Questions

From the above main research question the following sub-questions were derived:

1. What gender-related policy guidelines have been used to initiate rural female students' participation in sciences at Advanced Level?

2. To what extent have these policy guidelines been used to initiate rural female students' participation in sciences at Advanced Level?

Review of Related Literature

The economic and industrial achievements motivated most countries to embrace research and innovation in their education and training programmes (Jie, 2016). Consequently, research and innovation are the ripostes to the challenges being faced by most developing countries. However, the numbers of rural female learners involved in research and innovation activities at the pre-university level and above are suggestively low (Allen & Eisenhart, 2017). In Africa before the coming of Europeans, indigenous communities had already developed their education system; although it differed from one community to another had some similarities (Seroto, 2011). Hence, on the agenda of most countries, the education is considered a basic human right that is placed high on the governance agenda to link the division between social and cultural aspects in day-to-day interactions) (Ranganath et al., 2011). These treaties buttressed the need for underprivileged societies to place the issue of human rights at the core of their pursuit for the transformation of females' participation in education and training (Schwandt & Underwood, 2016). This resonates with the global move geared towards female empowerment anchored on most policymaking processes (Ogbeba et al., 2014). Thus, this promotion is considered as a conduit towards ending poverty, inequality, hunger, and violence; thereby embracing the principle of 'Education for All' (Mhembwe, 2019).

It is in this context Zimbabwe endorsed a policy position in all spheres of life, i.e., education that supports the empowerment of all students (Chikuvadze, 2022). It is in this context that education was assumed to have an immense contribution towards the elimination of poverty, and ignorance, and spur productivity (Reilly et al., 2017). However, it is widely acknowledged that rural male students' participation in sciences at Advanced Level surpasses that of female students with a similar background (Mandiudza, 2021). This is against the background that the science and technology atmosphere is at times considered male-dominated and highly detached (Morganson et al., 2010). Therefore, this calls for a renewed focus on rural female students' participation in education as well as ensuring that they receive high-quality and relevant education, which positions them for success in life (Sibanda, 2023).

Research Methodology

General Background

This paper draws its methodological lineages to non-linear accounts around the concept and structure of the 'gender stereotyping' semantics. The rationale for selecting the transformative paradigm and qualitative approach was the need to take seriously the critique of the language of 'gender stereotyping' in sciences at the Advanced Level (Creswell & Creswell, 2018). This facilitated a reflection on the sensitivity to issues concerning rural female students' participation in sciences at Advanced Level. This assisted in the generation of rural female students' experiences concerning gender policies' influence on their participation in sciences at the Advanced Level. Since the article aims to capture rural female students' experiences in sciences at Advanced Level, the study was conducted with the

participants in their natural setting (Opoku & James, 2021). This created the foundation for the capture of relevant information leading to a detailed narration of the salient issues (Olsen, 2011). In addition, it encapsulated the discussion of multiple realities in this study (Nikodemus, 2017).

Participants

For this study, thirty participants were purposively selected due to their participation either in sciences or other subjects at Advanced Level. From this angle, it gave the researcher an opportunity for an in-depth look at the issue under investigation. These selected participants were all females with ages ranging from 17–20 years and from different rural secondary schools with the selected province in Zimbabwe offering sciences and other subjects at Advanced Level involved in face-to-face interviews. These interviews were grounded in issues to do with the rural female students' conception of the influence of gender policies on their participation in sciences at the Advanced Level. Thus, their inclusion in this study was influenced by the need to include participants with varied experiences due to their diverse backgrounds to increase the latitude around the issue under investigation. The sample, though small was determined by data saturation (Coolican, 2004). In addition, two focus group discussions comprised of eleven participants each were formed. Thus, the first group was made up of participants pursuing science subjects (1–11) and the second one was composed of participants pursuing other subjects (12–22). Although it was not in the researcher's initial plan, four administration staff members in their different capacities were engaged in brief discussions and this enhanced the authenticity of data sourced from the rural female students. Therefore, the researcher's choice of participants was based on the belief that they had acquired enough experience around the issue under discussion.

Instrument and Procedures

In interrogating the issue at the centre of this study, the researcher was at the centre of data generation assisted by document analysis, and interviews (i.e., personal interviews and focus group discussions) (Tabassum & Nayak, 2021). These methods were included with the view to complementing each other (Daniel, 2016). During data generation, the selected participants interfaced with the researcher on their own (Tshelane, 2013). Themes that guided data generation through document analysis and interviews were centred on issues to do with the impact of gender-related policy guidelines on rural female students' participation in sciences at the Advanced Level.

Data Analysis

Data were analysed in a format that enabled the researcher to move forward and backward, in the attempt to capture the participants' experiences concerning the issue under investigation (Amao & Gbadamosi, 2015). This created the basis around which the researcher checked the trustworthiness of the generated data about the themes guiding the study. This calls for the use of interpretive content analysis with the view to triangulate information sourced from policy documents with what had emerged through interviews conducted. Thus, the researcher went over each personal interview and focus group discussion to ascertain and pick out statements acceptable to the defined themes. From these, the researcher was in a position to group the captured experiences according to their themes, and this led to the answering of the research question outlined earlier on.

Research Results

This section is geared towards deliberating the empirical answers to the issue under investigation. From the above statistics, it can be noted that there was near gender equivalence in the lower secondary school (i.e., Ordinary Level).

However, at the upper secondary level (i.e., Advanced Level), the enrolment was still skewed towards male dominance in sciences. Thus, there was a low rate of participation in sciences at the Advanced Level. This trend exists, despite the presence of policy guidelines targeted at promoting the participation of females in different spheres of life. It is in this context that subsequent sections attempt to interrogate the impact of gender-related policy guidelines on rural female students' participation in sciences at the Advanced Level.

Table 1

Enrolment Statistics of Rural Students in Sciences at Targeted Secondary Schools

Year	Enrolments					
	Lower secondary level			Upper secondary level		
	Total	(%) Male	(%) Female	Total	(%) Male	(%) Female
2020	1200	51,9	48,1	110	74,2	25,8
2021	1450	51,6	48,4	125	61,2	38,8
2022	1366	51,5	48,5	158	70,1	29,9

In this section, the researcher does not only perceive policy guidelines as having the decree but as an upshot of a process that legitimizes certain epitomes and clarifications. It was in this context that in the study the researcher requested from the school administration gender-related materials (i.e., policy circulars, etc.) guiding operations involving rural female students at selected secondary schools. A female teacher (Senior Lady C) responsible for handling rural female students' concerns says *"For all the years I have been teaching at this particular school, I don't remember coming across the so-called school-based gender-related policy material. If there are any, there should in either the school head or deputy's office. Due to my interaction with colleagues in the teaching fraternity, I managed to get soft copies of some key national policy documents."* This inclines towards what was presented by Interviewee 13 (Female student doing Advanced Level sciences) who reported that *"Through our discussions in the Guidance and Counselling lesson I learned that there was a school gender-based policy guideline(s). I heard that it had something to do with the empowerment of vulnerable girl-child. But I cannot go beyond this in terms of the contents of the document."* This source of information during the study exposed that laudable progression towards equal opportunities in sciences at Advanced Level might be possible only if female students are under the guidance and protection of considerate policy guidelines. Therefore, the researcher noted that this gender equality insurgency has been subdued due to transformational incapacitation as a result of regressive beliefs within the patriarchal society. This tends to influence the continual existence of gender-related gaps in sciences at the Advanced Level. In this context the way these gender policies are implemented seems to be at cross purpose with their intentions, hence this

clarifies the contradiction in that despite these gender-related policy guidelines being put in place to get rid of gender inequalities in spheres such as education, the gender gap remains or continues to widen.

It is against this background that this trance of gender equality in sciences at the Advanced Level remains far-fetched since there are various forms of shortcomings. Therefore, it can be underscored that at times policy guidelines are not put into action as intended. This in a way has a bearing on their comprehension of what should be put into practice. In this regard, Interviewee 28 (A female student doing other subjects at Advanced Level) noted that *"Yes, I have heard of the existence of some policies [constitution, gender policy] around issues to do with gender [equality] but their fruits on the ground are non-existent. At our school, some of these issues are dealt with during the guidance and counselling sessions."* Resultantly, this leads to the widening of the existing gap between the goals of gender policy guidelines and what obtains in sciences at the Advanced Level. This might in a way go against the concerns of projected beneficiaries of these guidelines. This is further worsened by the top-down approach to the policy-making process, which results in procedures not being contextualised to the targeted society's beliefs. In support, Interviewee 15 (Female student doing Advanced Level sciences) says *"What are these so-called policies [affirmative action, school-based gender guidelines] for? Who benefits from them? Do they benefit us as a rural female student in our quest to participate in male-dominated subjects either at form 4 [Ordinary Level] or form 5 [Advanced Level]?"*

In this context, the participant's opinions are a hint to the existing policy barriers in tackling the vicious inequalities perpetuated by the societal hierarchy in rural settings. This thwarts rural female students' participation in crafting tools to overcome their insubordination. All this is happening 42 years after the attainment of independence and where gender policies have been changed to make possible rural female students' advancement in education. On the issue that gender-related policy documents were not readily available Interviewee 23 (Female student doing other subjects Advanced Level) affirms that *"In my interactions with other girls pursuing their tertiary education in urban areas, it dawned on me that we can be enrolled in sciences with lesser points than our male counterparts. I am yet to verify the authenticity of this privilege."* In the same vein Focus Group Discussion Participant 1 (Female student doing Advanced Level sciences) highlights *"Through rumours, yes I have heard that there [new] policies that enacted to empower the girl-child. However, I am yet to come across either the soft or hard copies of these documents."* In addition, Interviewee 19 (A female student doing other subjects at Advanced Level) says *"At this school, there is no one or school-based policy guidelines motivating us to pursue sciences at sciences at Advanced Level and beyond."* From these revelations, it is perceptible that there is something indisputably scarce about the processes of the gender-related policy guidelines conceptualised and implemented in marginalized secondary schools. In this context, Focus Group Discussion Participant 22 (Female student doing Advanced Level sciences) reveals that *"As for young rural females, there is a need to be at the centre of the gender policies crafting process is it at school, community, etc. As things stand, we are left out of all these activities. In most instances, the community looks at us only as recipients."* Another setback in the inculcation of equality and equity culture in marginalised schools is that the current National Gender Policy was for the period 2013–2017, with its evaluation set for the last quarter of the final year, but to the best of my knowledge, no report has been produced yet about its success and failure. This, therefore, is a clear basis to drive home the point that one of the intended beneficiaries (rural female students) in this case was neither consulted nor had any access to the revised gender policy document resulting in the participation of rural female students in sciences at the Advanced Level.

The Education Act and Rural Female Students' Participation in Sciences at Advanced Level

This section interrogates participants' contributions towards how the policy guidelines i.e., Education Act fosters equal opportunities in their participation in sciences at the Advanced Level. In this regard, Interviewee 10 (Female student doing Advanced Level sciences) notes that *"I heard that these gender policies are made in such a way that they advance our interests as rural females. However, I always wonder why the policymaking process is not inclusive."* Thus, though the Education Act has been amended several times, it still falls far short of being a true reflection of society's educational aspirations and does not take on board an all-compassing evidence-based gender policymaking approach. In this regard, policy makers need now to take into cognizance that perpetuated social inequalities can be detrimental to rural female students' participation in sciences at Advanced Level. On this basis, there is a need for an Amended Education Act, which incorporates the voices of the society spoken through the contemporary constitution, with specific reference to the rights of all students in marginalized schools. In these settings, we believe that even in the absence of an evaluation report; the government through the ministries responsible for education and training ought to organize gender equality advocacy meetings from the grassroots (rural school) cascading up to the national level. However, at times meetings that are called for at the school level understudy are seen in most cases as embedded in politics.

In this context, the consultative process ends up being polarised along political party lines, as those considered being against the policies or manifestos of the ruling party not attending for fear of victimization. In this regard, Focus Group Discussion Participant 13 (Female student doing Advanced Level sciences) says *"In our village developmental activities are in most cases politicised. In other words, they are dominated by the ruling party, thereby making it difficult for those parents with a different political opinion to attend for example school meetings. In some instances, those who are courageous enough to attend or participate are called 'names.'" Further to this contribution, Focus Group Discussion Participant 3 (Female student doing other subjects at Advanced Level) highlights that *"The absence from crucial meetings by our parents results in them not being aware of happenings at school, let alone hindering their children's progression in areas that they could have supported, for example, participation in the so coined 'masculine' science."* From this, it can be deduced that the supposed gender-neutral policy guidelines are somewhat expected to be functional in a hostile political environment in most rural areas. This is a clear reflection of the existence of a polarised society, thereby making it difficult for its populace to reach a consensus in terms of policy procedure comprehension, interpretation, and implementation in spheres such as education and training. This line of action that mainly focuses on advancing the interests of those in power, in a way disadvantages rural female students' participation in sciences at the Advanced Level. Hence this is a clear indication that society is abandoning aspects of inclusivity as far as information sourcing for the crafting of gender-related policy guidelines is concerned. Therefore, School Head B notes that *"The gender policy crafting initiatives if not properly handled can be doubted by the intended beneficiaries from the onset. Hence, the need for wide consultation and all-hands on the deck approach to enable the eradication of bad habits in the policy-making process."**

From the above findings, it can be argued that though the state is committed to embracing the aspects of inclusiveness in its policymaking processes, the opposite still exists on the ground. Thus, some of these interactions might have an agenda with masked significance. Therefore, at times rural schools end up being political grounds, with school heads for fear of victimization ending up implementing the crafted guidelines at times with limited acquaintance and resource materials. However, there are some instances when attempts are made to engage villagers in the dissemination of gender-related information under the guidance of the village heads and other interested civic organisations. However,

Focus Group Discussion Participant 11 (Female student doing Advanced Level sciences) reports that *"When an invitation is extended to the villagers to attend a meeting to discuss gender issues, it's mostly old mothers who attend."* In support of the above contribution, the Focus Group Discussion Participant 1 (Female student doing Advanced Level sciences) highlighted that "Most fathers in our village consider these gatherings as 'feminine meetings' and have nothing to do with them."

From these opinions, it can be noted that some of the rural males are grounded in patriarchal mindsets since they feel uncomfortable participating in gatherings discussing gender-related issues. Hence, this creates a gap between rural females and males in terms of their contributions toward the formulation of a gender-inclusive society. In this context, the researcher, therefore, argues that the mindset of most rural males if ever deciphered into reality might have a negative influence on rural female students' participation in sciences at Advanced Level. It can be acknowledged that though gender-related policy guidelines can be understood well by both the teachers and students, their elucidations and implementation, tend to drift away from the aspirations of a society divided along gender approaches (i.e., rural females and males). Hence the need to look at gender issues beyond focusing on rural female students' participation in sciences at Advanced Level, but also how social structures empower the marginalised girl-child to achieve their aspirations (Müller, 2006) in different spheres such as Advanced Level sciences. In this regard, Interviewee 3 (Female student doing Advanced Level sciences) reveals that *"If what is outlined in these gender policies is followed in our school, males will not look down upon us in some areas such as sciences."*

Under such a scenario, it becomes a bit difficult for the marginalised schools to embrace gender-sensitive approaches for the advancement of the status of rural female students in sciences at the Advanced Level. In line with this afore-mentioned idea, School Head C highlights that *"I think that these policies should clearly outline the means and ways of achieving the set goals. Without an articulated strategy, their success is next to none."* Through the interrogation of the participants' contributions, it can be acknowledged that to them the existence of gender-related policy guidelines at the targeted secondary schools was kept secret. This, in a way, inhibits the participation of rural female students in the formulation of school-based gender-related policy guidelines. In other words, due to limited information on equality and equity, they cannot contribute meaningfully to the formulation of the school-based guidelines. This concurs with, Interviewee 25 (Female student doing Advanced Level sciences) reports that *"I am in the dark when it comes to guidelines targeting at propelling to participate inclusively in sciences at Advanced Level. In this regard, I am limited in terms of my contribution to issues to do with the creation of a favourable environment for the girl child's participation in sciences at Advanced Level."*

From another angle, on the centralised policy-making process, Focus Group Discussion Participant 6 (Female student doing Advanced Level sciences) had this to say *"It was through this occasion that was organised [guidance and counselling] at our school that I came to know issue to do with children's rights. On this awareness campaign day, some pamphlets were distributed. However, most of the facilitators were from outside our district and were not familiar with our day-to-day challenges. This made our interactions a bit difficult since they were using examples or statistics that were alien to us."* In one of the discussions, a participant says:

"Most of the policymaking decisions concerning us the rural females are mostly arrived at by those in urban areas. This means that our views [as rural female learners] are not considered or captured in the process. Under such conditions, we will always be on the side-lines of the policymaking process." (Focus Group Discussion Participant 8, Female student doing Advanced Level sciences)

It can be revealed that despite the existence of gender-related policy guidelines in some of the selected schools, there seems to be limited information on how best these can be implemented in sciences at Advanced Level. In support, Interviewee 24 (Female student doing other subjects at Advanced Level) highlights that *“As [rural] females at times, we believe that the gender policymaking process can be done in a way that enhances a collective appeal. As opposite to the current format where policies are most crafted by those in higher offices or are influential in communities.* From this argument, the researcher noted that the existing approach to the formulation of gender-related policy guidelines favours the centre-periphery type of decision-making. This makes those in the periphery mostly the rural females to be less dominant in the echelons of authority. Thus, the process needs to be rooted in the emancipatory ideals that are geared towards transforming the status quo in the male-dominated sciences at Advanced Level. However, this continues to be hard to pin down as most of the rural secondary schools visited did not have in place school-based gender policies, aimed at making available answers to national demands relating to issues of gender equality in sciences at the Advanced Level. In this regard, the researcher calls for these secondary schools that were part of the study to craft clear mission statements on gender equality in learning activities. This concurs with a response from one of the participants who indicated that:

“I am new at this school so it’s a bit tricky for me to either confirm or deny the availability of gender-related policy guidelines. I might need some time to confirm with my administration team [Deputy School head/senior master/senior lady] whether these documents are in existence at this school. But if you can scan through that school mission statement, you can notice that issues to do with equality are embraced.” (School Head A)

According to the above-mentioned issue, the School Head D says *“In the year 2002 a ministerial circular guiding school on how best they can motivate female students to participate in the so-called ‘masculine’ subjects. However, that particular record is missing in our policies and circulars. I recommend that you can get in touch with other offices District Education Offices/Provincial Education Offices, there you can a copy of this circular.”* Thus, in this discussion, the participants acknowledged that policy guidelines (i.e., ministerial circulars, the constitution, etc.) are premised on the ideals of promoting equality and equity in various spheres of life such as education. However, from schools that were visited during the study, the conceptualization of issues to do with equality of opportunities when it comes to the participation of female students in sciences at the Advanced Level was cause for concern. In this context, Focus Group Discussion Participant 16 (Female student doing other subjects at Advanced Level) reveals that *“Generally, we have limited information in as far as gender-related policy documents to guide us on subjects’ selection at different levels [Ordinary and Advanced].”* This was so, despite the existence of the policy guidelines (i.e., Circular P77/2006) which advocate for equal opportunities for both female and male students at both the Ordinary and Advanced Levels when it comes to the selection of career options. In this regard Interviewee 30 female (student doing Advanced Level sciences) were interviewed. They gloomily expresses that *“At our school, I do not remember holding any material articulating the possible combinations at Advanced Level. So, we are just making uninformed decisions to come up with some of these combinations [Chemistry, Physics, and Geography] at lower sixth form.”* The above-mentioned contribution was in contrast to the proclamation that awareness campaigns were undertaken to conscientise the rural female students about the existence of various subject choices at both the Ordinary and Advanced Levels.

Therefore, the researcher acknowledged the necessity of a transformative approach targeted at emancipating rural female students from the domineering patriarchal measures in their participation in sciences at the Advanced Level. This is expected to succeed in settings where gender-related policy

guidelines are only figurative, and posturing is an indication that to some extent underscored on paper in the form of policy circulars but side-lined in the procedure.

Discussion

In this study the researcher assumed that there were numerous resemblances among the genders, hence all rural students have equal potential to participate in sciences at Advanced Level (Kirai & Kobia, 2012). However, social relations and externally endorsed boundaries tend to have a bearing on the modifications in the recognition of rural female and male students' potential in education (Dzvimbo et al., 2018). It is against this background that in this section generated data is interrogated through a framework comprised of feminist and social learning theories. This perspective provided the researcher with an opportunity to conduct a comprehensive analysis and discussion of the participants' experiences regarding their participation as rural female students in sciences at the Advanced Level. It is in this context that this discussion is centred on gender-related policies' impact on female students' participation in sciences at Advanced Level. Therefore, gender-related policy guidelines are critically analysed in order to expose the underlying regulative codes in terms of their implementation in education, which are then compared to the participants' captured experiences.

It can be noted that though the idea of being excluded from the gender policy-making process lingers in their minds, despite the existence of various conventions and policies, researchers agree to a larger extent with findings from studies by various researchers (Chikuvadze, 2020; Ngwenya, 2020) who advanced that instituting pertinent gender policies does not guarantee the marginalized female students' participation in sciences at Advanced Level. Therefore, single-handedly these policies are not enough to authorise rural female students, lest dynamic societal practices strengthen their effective portrayal in sciences at Advanced Level. In support, Chauraya (2013); Samkange and Dingani (2013) highlighted that though some female students are aware of the existence of gender-related policy guidelines, not much has been done in terms of their implementation in some marginalised societies. In support Steinmann et al. (2023) noted that though aspects of equality and equity have been giving a lot of prominences in gender-related policy guidelines, these are expected to be implemented in a society deeply grounded in patriarchal beliefs. This is so because some of those who are expected to implement these policy guidelines may feel as being side-lined from as early as the designing phases (Ncube et al., 2014). This is an indication that in the absence of participants' extensive engagement in policy recognition, it is too easy to ignore imperative hints, bringing about an insincere indulgence in these policy guidelines, including the existence of a gap in their realization (Chikuvadze, 2020; 2022).

This goes along with Dekeza and Kufakunesu (2017) who illustrated that it is an accepted piece of evidence that there is an aperture about how these guidelines are comprehended and enacted amongst the cities or towns and marginalised areas, with the gap orientated against the latter. In the same manner, Gudyanga (2016) advances that despite the existence of policy guidelines pledging rural female students' participation in science subjects at the Advanced Level, the reality in marginalised schools tells otherwise. Thus, the intentions of these policy guidelines as far as rural female students' participation in science subjects at the Advanced Level remain a fantasy (Chikuvadze & Jacobs, 2021). This brings out the idea that in its current form, the Education Act does not adequately address the gaps around rural female students' participation in science subjects at Advanced Level (Matsikidze, 2017). From these findings, the researcher noted that marginalised female students have limited participation in policy consultations, although they are the direct beneficiaries of the outcome (Bell & Stevenson, 2006). In the absence of an evaluation, report, which has been made public already, according to UNDP (2017) a revised version of Zimbabwe's National Gender Policy that calls for impartiality, equality, all-

inclusiveness, and collective concern for sustainable advancement was revealed on July 6, 2017. This made it difficult for the already disadvantaged schools to articulate a sound gender policy, which closes the inequality gaps due to the lack of terms of reference, which should have been covered in the inaccessible National Gender Policy (2013-2017) assessment feedback report. Under such a scenario the researchers were made to think that the centralized strategy, which was employed in crafting this National Gender Policy, therefore limited the consultation base for the designers.

Within the requirements of the policy frameworks such as *Education Acts 5/1987, 19/1998(s.15), 22/2001, 2004, and 2006 (Chapter 25:04)*, as amended acknowledge that provide each student has the right to quality education irrespective of one's gender (Chikwiri & Musiyiwa, 2017). These were formulated on the pretext that education was a basic human right; however, Machibaya and Ndamba (2023) reflected that the current gender-related policy regime is an imposition onto the intended benefactors, without a comprehensive consultation basis. This goes against Carter and Fuller (2015) who postulated that social interactions need to emphasize having a common understanding of gender-related thoughts, to enhance an inclusive policy-making process. In this context, if gender-related policy guidelines are not well-articulated in their presentation they seem metaphorical and unconceivable (Mutanana & Bukaliya, 2015). Thus, in situations that have different settings (urban, peri-urban, or rural) the use of a centralised method for policy guidelines formulation propagates the inequalities, instead of transforming the current status core (Tsanga, 2010). Thus, the existence of the gender legal code, which acknowledges the rights and obligations of families and schools, there is a need to underline that it is relatively another issue to have these accepted in sciences at Advanced Level (Munyunda, 2021).

A close inspection of some gender-related policy procedures (i.e., gender policy) has revealed that there are inclusive strategies, which can urge rural female students to participate in the male-dominated sciences at the Advanced Level (Republic of Zimbabwe, Ministry of Women Affairs, Gender and Community Development, 2013). Nevertheless, some of these guidelines have unambiguous pointers to weigh the extent to which set approaches could have been accomplished (Tshabalala, 2013). Hence, there is a need to acknowledge that gender-related policy guidelines are quiet on the approaches that can be employed to minimize the inequalities in sciences at Advanced Level. It is against this background that Chimhowu (2009) postulated the necessity to contextualize gender-related guidelines about social transformation. This calls for rural female students to be well grounded in the gender-related policy guidelines crafting matrix as this tends to enable them to push for the advancement of the underprivileged voices (Shizha, 2006). This discourse can be cemented by Gale (2003) who postulated that in a polarised society, gender-related policy guidelines tend in most cases to stand for the safety of those in charge of the policy-making process.

In this scenario, policymaking generates a give-and-take scenario, where the marginalised rural females are anticipated to recognize those policy guidelines alleged to be advancing their cause (Abusalha, 2023). It is in this context that Cameron et al. (2019) advance the need for a transformative approach, which considers the placement of rural female students on the margins of the policy-making process as a cause for concern. For example, the thrust in the 'Heritage-Based' curriculum framework emphasizes the participation of students notwithstanding one's sex in science and technology learning activities (Republic of Zimbabwe, Ministry of Primary and Secondary Education, 2020).

However, some of these policy circulars, though they are a derivative of the *Education Act (Chapter 25:04)*, their plan lacks specificity in terms of how they anticipate dealing with rural female students' limited participation in sciences at the Advanced Level (Mutekwe & Mutekwe, 2012). In the same vein,

Akafor et al. (2007) in that although gender policies sustenance of rural female students' emancipation, however, no significant transformation has been to when it comes to their participation in sciences at Advanced Level. In addition, Sammons et al. (2023) acknowledged that some of the interventions applied with the view to increase the participation of rural female students in sciences at the Advanced Level were 'simply disjointed.'

Conclusions and Implications

Zimbabwe's initiative towards students' participation in sciences at Advanced Level requires an all-inclusive approach. Hence, the recent years implications to the policy guidelines approve (i.e., the 2013 Constitution, National Gender Policy, Affirmative Action, Education Act, etc.) targeted at encouraging female students' participation in different domains i.e., sciences at Advanced Level. In this regard, it can be acknowledged that Zimbabwe has made significant advances toward inculcating gender aspects in policy guidelines. These guidelines create awareness in rural female students about unfair practices within their patriarchal societies. This acts as the basis for their active participation in the activities concerning the formulation of policy guidelines, meant to authorise them. It is necessary to conclude that though gender-related policy guidelines existed for some time they have no potential to influence the rural female students' participation in sciences at Advanced Level.

Acknowledgments

I acknowledge the valuable contributions of the selected participants in this study. This article is an extract from my PhD thesis.

References

- Abusalha, S. (2023). Towards gender equality in Hungarian universities: BME as a case study. *Periodica Polytechnica Social and Management Sciences*, 1-13. <https://doi.org/10.3311/PPso.20754>
- Akafor, E. E., Akinwale, A. A., & Doyin-Hassan, A. (2007). Feminization of underdevelopment in Nigeria: Some theoretical issues. *Anthropologist*, 9(3), 237-245. <https://doi.org/10.1080/09720073.2007.11891006>
- Allen, C. D., & Eisenhart, M. (2017). Fighting for desired versions of a future self: How young women negotiated STEM-related identities in the discursive landscape of educational opportunity. *Journal of the Learning Sciences*, 26(3), 407-436. <https://doi.org/10.1080/10508406.2017.1294985>
- Amao, S. R., & Gbadamosi, J. (2015). Gender disparities and socio-economic factors on learning achievements in agricultural science in rural and urban secondary schools of Ogbomoso North Local Government Area of Oyo State, Nigeria. *Journal of Education and Practice*, 6(25), 1-6. <https://eric.ed.gov/?id=EJ1078483>
- Amirtham, N. S., & Kumar, A. (2023). The underrepresentation of women in STEM disciplines in India: a secondary analysis. *International Journal of Science Education*, 45(12), 1008-1031. <https://doi.org/10.1080/09500693.2023.2179901>
- Asongu, S. A., Diop, S., & Addis, A. K. (2023) Governance, inequality and inclusive education in Sub-Saharan Africa. *Forum for Social Economics*, 52(1), 43-68. <https://doi.org/10.1080/07360932.2020.1856166>
- Bell, L., & Stevenson, H. (2006). *Education policy: Process, themes and impact*. Routledge.

- Cameron, E. C., Jacquin, K. M., & Heer, R. (2019, November 18–20). *Gender inequality in national laws predicts prevalence of modern slavery across UN countries* [Conference presentation abstract]. 2nd International Caparica Conference in Translational Forensics, Caparica, Portugal. https://www.researchgate.net/publication/337548722_Gender_Inequality_in_National_Laws_Predicts_Prevalence_of_Modern_Slavery_Across_UN_Countries
- Carter, M.J., & Fuller, C. (2015). *Symbolic interactionism*. Sociopedia.isa. https://www.researchgate.net/profile/Michael-Carter-10/publication/303056565_Symbolic_Interactionism/links/57364c7e08ae9ace840af382/Symbolic-Interactionism.pdf
- Chauraya, E. (2013). Gender discrimination in transnational academic mobility of lecturers: A Zimbabwean case. *The Dyke*, 7(3), 85–106. <http://hdl.handle.net/11408/711>
- Chauraya, E. (2023). Gender politics and Zimbabwe universities: Facets, contexts and consequences. *Journal of International Women's Studies*, 25(1), Article 10. <https://vc.bridgew.edu/jiws/vol25/iss1/10/>
- Chikuvadze, P. (2020). *Female pupils' perspective on societal factors influencing their progression in Advanced Level science subjects in Zimbabwe* [Unpublished PhD dissertation]. University of the Free State, Bloemfontein, South Africa.
- Chikuvadze, P. (2022). Transforming rural female learners' under-representation in Advanced Level science subjects in Zimbabwe. *Asian Journal of Education and Social Studies*, 35(3), 1-11. <https://doi.org/10.9734/ajess/2022/v35i3756>
- Chikuvadze, P., & Jacobs, L. (2021, October, 13-15). Cultural perspectives and their influence on rural Zimbabwean female learners' progression in Advanced Level science subjects. In H. van der Merwe, J. Surujlal, & L. van den Berg (Eds.), *Social Sciences International Research Conference Proceedings* (pp. 268–280). <https://commerce.nwu.ac.za/sites/commerce.nwu.ac.za/files/files/SSIRC/SSIRC-2021-Proceedings-27-Oct-2021.pdf>
- Chikwiri, E., & Musiyiwa, J. (2017). Challenges and gaps in children's transition from early childhood development to grade one in Zimbabwe. *International Journal of Educational Administration & Policy Studies*, 9(7), 91–102. <http://doi.org/10.5897/IJEAPS2017.0510>
- Chimhowu, A. (2009). *Moving forward in Zimbabwe: Reducing poverty and promoting growth*. Institute of Environmental Studies. <http://hdl.handle.net/10625/51354>
- Coolican, H. (2004). *Research methods and statistics in Psychology*. Prentice Hall.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design* (5th ed.). Sage.
- Daniel, E. (2016). The usefulness of qualitative and quantitative approaches and methods in researching problem-solving ability in science education curriculum. *Journal of Education and Practice*, 7(15), 91–100. <https://eric.ed.gov/?id=EJ1103224>
- Dekeza, C., & Kufakunesu, M. (2017). Implementation of STEM curriculum in rural secondary schools in Zimbabwe: Limits and possibilities. *Journal of Emerging Trends in Educational Research & Policy Studies*, 8(1), 11–15. <https://hdl.handle.net/10520/EJC-73a352217>
- Dzvimbo, M. A., Zimhondi, F., & Magijani, F. (2018). The dynamics of local public policy processes: An in-depth analysis of the educational system in Zimbabwe. *International Educational Research*, 1(2), 74–83. <https://doi.org/10.30560/ier.v1n2p74>

- Gale, T. (2003). Realising policy: The who and how of policy production. *Discourse: Studies in the Cultural Politics of Education*, 24(1), 51–66. <https://doi.org/10.1080/01596300303026>
- Gudyanga, A. (2016). Zimbabwean female participation in physics: Factors of identity formation considered as contributing to developing: An orientation to physics by female students. *Journal of Education & Practice*, 7(26), 159–171. <https://eric.ed.gov/?id=EJ1115841>
- Gudyanga, A., Kathija, A., & Kurup, R. (2015). Zimbabwean female participation in physics: The influence of context on identity formation. *Cogent Education*, 4(1), Article 1320843. <https://doi.org/10.1080/2331186X.2017.1320843>
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9), 1277–1288. <http://doi.org/10.1177/1049732305276687>
- Hill, C., Corbett, C., & St. Rose, A. (2010). *Why so few? Women in science, technology, engineering and mathematics*. American Association of University Women. <https://eric.ed.gov/?id=ED509653>
- Jie, N. D. (2016). *Towards a framework of education policy analysis, the head foundation*. Pelgrave.
- Kirai, M. N., & Kobia, M. (2012). Effects of social cultural beliefs on women career progression in Kenya's civil service. *International Journal of Advances in Management & Economics*, 1(6), 214–219.
- Machibaya, E., & Ndamba, G. T. (2023). Breaking the glass ceiling: A study of single academic women in one Zimbabwean university. *Journal of African Studies & Development*, 15(1), 14–22. <https://doi.org/10.5897/JASD2022.0667>
- Mandiudza, M. (2021). Factors motivating female students from Masvingo, Zimbabwe – the choice of taking natural sciences at university. *European Journal of Social Sciences Studies*, 6(2), 37–50. <http://dx.doi.org/10.46827/ejsss.v6i2.1001>
- Marongedza, L., Hlungwani, P. M., & Hove, P. (2023) Institutional constraints affecting secondary school student performance: A case study of rural communities in Zimbabwe. *Cogent Education*, 10(1), Article 2163552. <https://doi.org/10.1080/2331186X.2022.2163552>
- Matsikidze, R. (2017). Strengthening legislations as a way to combat sexual harassment at workplace and in universities in Zimbabwe [Commentary on contemporary legal issues]. *The Zimbabwe Electronic Law Journal*. <https://old.zimlil.org/zw/journals/Strengthening%20legislations%20as%20a%20way%20to%20combat%20sexual%20harassment%20at%20workplace%20and%20in%20universities%20in%20Zimbabwe..pdf>
- Mhembwe, S. (2019). Gender equality and women empowerment on sustainable community development in Zimbabwe. *American Journal of Humanities and Social Sciences Research*, 3(1), 66–75.
- Morganson, V. J., Jones, M. P., & Major, D. A. (2010). Understanding women's underrepresentation in science, technology, engineering and mathematics: The role of social coping. *The Career Development Quarterly*, 59(2), 169–179. <https://doi.org/10.1002/j.2161-0045.2010.tb00060.x>
- Müller, T. R. (2006). Education for social change: Girls' secondary schooling in Eritrea. *Development & Change*, 37(2), 353–373. <https://doi.org/10.1111/j.0012-155X.2006.00481.x>
- Munyunda, G. (2021). Re-entry policy implementation effectiveness: A case of secondary schools in Lusaka, District, Zambia. *International Journal of Asian Education*, 2(2), 167–181. <https://doi.org/10.46966/ijae.v2i2.151>

- Mutanana, N., & Bukaliya, R. (2015). Women empowerment and gender related programmes implementation in Hurungwe District, Zimbabwe. *International Journal of Research in Humanities & Social Sciences*, 2(2), 1–12. <https://www.ijrhss.org/pdf/v2-i2/1.pdf>
- Mutekwe, E., & Mutekwe, C. (2012). Manifestations of the gender ideology in the Zimbabwean school curriculum. *Journal of Educational & Instructional Studies in the World*, 2(3), 193–209.
- Ncube, A., Tshabalala, T., Mapolisa, T., & Khosa, M. T. (2014). An evaluation of the extent of involvement of educators in the formulation of national education policies in Matabeleland North Province. *Nova Journal of Humanities & Social Sciences*, 3(4), 1–6.
- Nikodemus, K. S. (2017). *Exploring how Grade 11 Physical Science learners make sense of the concept of rates of reactions through the inclusion of the indigenous practice of making oshikundu: A Namibian case study* [Unpublished master's thesis]. Rhodes University, Grahamstown. <http://vital.seals.ac.za:8080/vital/access/services/Download/vital:21360/SOURCE1>
- Ngwenya, V. C. (2020). Curriculum implementation challenges encountered by primary school teachers in Bulawayo Metropolitan Province, Zimbabwe. *Africa Education Review*, 17(2), 158–176. <https://doi.org/10.1080/18146627.2018.1549953>
- Ogbeba, J., Otor, E., & Iorkyaa, S. (2014). Influence of rural environment on the girl-child's effective study of Biology in Ukum Local Government Area of Benue State. *The International Journal of Social Sciences and Humanities Invention*, 1(8), 722–734.
- Olsen, W. (2011). *Data collection: Key debates and methods in social research*. Sage.
- Opoku, M. J., & James, A. (2021). Pedagogical model for decolonising, indigenising and transforming science education curricula: A case of South Africa. *Journal of Baltic Science Education*, 20(1), 93–107. <https://doi.org/10.33225/jbse/21.20.93>
- Ranganath, S. N., Rao, A. K., & Srinivas, N. (2011). Gender equality in education. *International Journal of Multidisciplinary Research*, 1(6), 325–332.
- Reilly, D., Neumann, D. L., & Andrews, G. (2017). Investigating gender differences in mathematics and science: Results from the 2011 trends in mathematics and science survey. *Research in Science Education*, 49, 25–50. <https://doi.org/10.1007/s11165-017-9630-6>
- Republic of Zimbabwe, Ministry of Primary and Secondary Education. (2015). *Curriculum framework (2015-2022)*. Government Printers.
- Republic of Zimbabwe, Ministry of Women Affairs, Gender and Community Development (2013). *National Gender Policy (2013-2017)*. Government Printers.
- Samkange, F., & Dingani, S. (2010). Beyond the glass ceiling: a gendered and cultural hospitality management discourse on the advancement of women based on integrated research paradigms. In *ECRM2012-9th European Conference on Research Methods in Business Management: ECRM 2012* (pp. 341-348). Academic Conferences Limited.
- Sammons, K., Sylva, K., Hall, J., Evangelou, M., & Smees, R. (2023) Challenges facing interventions to promote equity in the early years: exploring the 'impact', legacy and lessons learned from a national evaluation of children's centres in England. *Oxford Review of Education*, 49(1), 114-135. <https://doi.org/10.1080/03054985.2022.2125371>

- Schwandt, H. M., & Underwood, C. (2016). Engaging school personnel in making schools safe for girls in Botswana, Malawi, and Mozambique. *International Journal of Educational Development*, 46, 53–58. <https://doi.org/10.1016/j.ijedudev.2015.10.008>
- Seroto, J. (2011). Indigenous education during the pre-colonial period in southern Africa. *Indilinga African Journal of Indigenous Knowledge Systems*, 10(1), 77–88. <https://hdl.handle.net/10520/EJC61385>
- Shizha, E. (2006). Legitimizing indigenous knowledge in Zimbabwe: A theoretical analysis of post-colonial school knowledge and its legacy. *Journal of Contemporary Issues in Education*, 1(1), 20–35. <https://journals.library.ualberta.ca/jcie/index.php/JCIE/article/view/208>
- Sibanda, L. (2023). Strategies for achieving equity-based education: Towards an equitable education system. In J. Chitiyo & Z. Pietrantonio (Eds.), *Social justice and culturally-affirming education in K-12 settings* (pp. 133–152). IGI Global. <https://doi.org/10.4018/978-1-6684-6386-4.ch007>
- Steinmann, I., Strello, A., & Strietholt, R. (2023): The effects of early between-school tracking on gender segregation and gender gaps in achievement: A differences-in-differences study. *School Effectiveness & School Improvement*, 34(2), 189–208. <https://doi.org/10.1080/09243453.2023.2165510>
- Tabassum, N., & Nayak, B.S. (2021). Gender stereotypes and their impact on women's career progressions from a managerial perspective. *IIM Kozhikode Society & Management Review*, 10(2), 192–208. <http://doi.org/10.1177/2277975220975513>
- Tsanga, A. (2010). *Towards a democratic and inclusive Constitution of Zimbabwe: The scope for addressing gender equity* [Parliamentary briefing paper]. Friedrich-Ebert-Stiftung. <https://library.fes.de/pdf-files/bueros/simbabwe/07538.pdf>
- Tshabalala, T. (2013). Effectiveness of inclusive education provision (integrated units) in all schools in Zimbabwe schools. *Greener Journal of Educational Research*, 3(9), 424–431. <https://api.semanticscholar.org/CorpusID:146579322>
- Tshelane, M. D. (2013). Participatory action research and construction of academic identity among postgraduate research students. *Journal for Transdisciplinary Research in Southern Africa*, 9(3), 401–429. <https://hdl.handle.net/10520/EJC149276>
- UNDP. (2017). *New national gender policy is launched*. UNDP Publishing.
- UNESCO Institute for Statistics. (2012). *World atlas of gender equity in education*. UNESCO Publishing. <https://unesdoc.unesco.org/ark:/48223/pf0000215522>
- Vurayai, S. (2023). Knowledge democracy and feminist epistemic struggle in African universities. In A. P. Ndofirepi, F. Maringe, S. Vurayai, & G. Erima (Eds.), *Decolonising African Universities Knowledges, Volume 1* (pp. 84–102). Routledge

DOI: <https://doi.org/10.57125/FED/2022.10.11.12>

How to cite: Kostenko, L., Ruda, O. Y., Sofilkanych, M., & Bokshan, A. (2023). Distance Learning as an Integrative Response to Contemporary Challenges. *Futurity Education*, 3(1), 166–178. <https://doi.org/10.57125/FED/2022.10.11.12>

Distance Learning as an Integrative Response to Contemporary Challenges

Liudmyla Kostenko

PhD in Pedagogical Sciences, Professor Department of Vocal and Choral Mastery, Faculty of Pedagogy, Psychology, Social Work and Art, Mykola Gogol State University, Ukraine, <https://orcid.org/0000-0002-9846-2259>

Oksana Ruda*

PhD in Pedagogical Sciences, Assistant Professor Department of Biology, Department of Faculty for Training of Foreign Citizens, Bogomolets National Medical University, Kyiv, <https://orcid.org/0000-0001-6729-083X>

Maryna Sofilkanych

PhD, Dean, Teacher in Transcarpathian Academy of Arts, Faculty of Fine Arts. Department of Culture and Social Sciences and Humanities, Uzhgorod, Ukraine, <https://orcid.org/0000-0002-6793-4807>

Anna Bokshan

Deputy rector, Teacher in Transcarpathian Academy of Arts Department of Culture and Social Sciences and Humanities, Faculty of Fine Arts, Transcarpathian region. Ukraine, <https://orcid.org/0000-0002-5263-2515>

***Correspondence email:** oksanaruda24@gmail.com

Received: February 12, 2023 | **Accepted:** March 18, 2023 | **Published:** March 25, 2023

Abstract: The COVID-19 pandemic has raised the issue of using distance learning as a separate independent model of organizing the educational process. The purpose of the article is to analyze distance learning as a form of organizing the educational process, which is dynamically developing in response to global challenges, from the point of view of an integral approach. Accordingly, the object of the study is modern forms of distance learning as a way of organizing the educational process. To achieve this goal, an analytical research approach was used that allows correlating and identifying effective solutions taking into account the unique features of the educational system: content analysis (32 items of scientific literature were analyzed), prognostic, systemic, structural methods, as well as methods of specification and abstraction. The empirical data for the study were obtained by using a survey method, which involved 100 higher education students. Its main goal was to determine the readiness of students to perceive distance learning not only as a response to the challenges of quarantine restrictions but also as a separate form of educational activity. The results showed that despite the efforts of teachers and the use of modern digital technologies, students had to study a lot of new educational materials on their own. The transition to distance learning has led to an increase in the importance of homework and independent work compared to traditional forms of educational activities. The majority of respondents noted that despite the increase in the share of online tests and other control activities, the average academic performance has not decreased. It was found that the number of students who improved their performance did not differ from those who used traditional forms of education. As a result, many higher education students expressed the opinion that studying remotely was generally easy, despite all the obstacles. Such a positive assessment allows us to interpret distance learning as a promising and independent vector for the development of future education. The conclusions emphasize that a condition for the further development of distance education is the development of digital technologies that form the basis of the technical implementation of distance learning. We believe that distance learning should be perceived as a separate branch of the educational system. The practical significance of the study lies in proving the functioning of distance education as an original form of organization of the educational process.

Keywords: distance education, digitalization, COVID-19, form of education, information, and communication technologies.

Introduction

The quarantine restrictions have had a significant impact on the education sector. Researchers have concluded that the pandemic has had a negative impact on educational systems, including research, academic programs, professional development of staff and jobs in the academic sector, etc. These changes have been felt not only by universities as separate entities, but also by teachers, students, and their parents. As a result of the lockdowns, campuses were closed for education, administrations of higher education institutions abandoned traditional forms of organizing the educational process, and any mass events were canceled due to the threat of the spread of COVID-19. An additional impetus to distance learning was given by digitalization, which has covered all areas of public life, including the means of information transmission, the latest gadgets, and teaching methods.

An alternative form of education was the introduction of distance education, an accessible learning system for the duration of the global disease. This step was perceived as a temporary measure aimed at realizing the possibility of continuing education even in difficult times of quarantine. In the realities of certain countries (primarily Ukraine), distance learning has become an important element of

responding to the challenges of martial law and open military aggression, as distance learning is much safer than staying indoors, even if equipped with bomb shelters or other protective elements.

The tangible freedom offered by distance learning is most fully manifested in the ability to freely choose courses that meet the needs and capabilities of higher education students (teachers can organize their time in the same way). Learning with the use of digital technologies also makes it possible to choose the place and forms of education that best meet current challenges. At the same time, feedback on the effectiveness of distance learning has generally demonstrated its competitiveness. Therefore, the introduction of distance learning methods, along with a partial return to traditional forms of teaching, has opened a relevant discussion about the extent to which distance learning can be a separate form of educational activity.

The problem of the impact of digital technologies on the education system has been studied by many modern scholars. In particular, Cavalcanti et al. (2021) identified the key features of e-learning based on an analysis of modern pedagogical literature. Hamzah et al. (2021) characterized modern methods of organizing digital education. The authors focused on analyzing the use of video materials in teaching. Stoika (2022) described key changes in education based on the introduction of digitalization solutions. Murphy (2022) in their study presented examples of achievements in the system of digital learning and lifelong learning, open education with the support of TEL. The paper concludes with an analysis of what the digitalization of higher education might mean after the COVID-19 period. Key aspects of digital competence development are highlighted in the study by Almås et al. (2021). At the same time, Zhang and Aslan (2021) characterized the role of artificial intelligence in the process of organizing digital learning. The problem of rethinking digital education is highlighted in Peruzzo and Allan (2022). The authors reflect on the effectiveness of digital education, its threats, and opportunities. However, digital learning in the scientific literature is often criticized for lack of student engagement (Aldhafeeri & Alotaibi, 2022; Dhawan, 2020; Laufer et al., 2021; Özmen & Kan, 2022). This is due to the physical absence of teachers and the lack of direct communication with students (Laufer et al., 2021). Critics of digital education also believe that this lack of student engagement is a key factor in the inability of this educational model to positively affect all aspects of the educational process (Aldhafeeri & Alotaibi, 2022). Thus, in a number of studies by Dhawan (2020) and Laufer et al. (2021), digital education is investigated as a kind of temporary mechanism, rather than a total replacement for traditional learning due to the shortcomings that can cause problems with learning and the acquisition of important competencies in students. To test the validity of these beliefs, an experimental study was conducted with 100 students.

Research Problem

According to preliminary calculations, the academic community has established a view of the total number of students covered by distance learning. In particular, before the pandemic, there were only about 6.6 million such higher education students worldwide, while after 2019, this figure rose sharply to 400 million students, which is clearly due to quarantine restrictions (Peruzzo & Allan, 2022). In such circumstances, distance learning can be perceived as a certain norm in the organization of the educational process. However, the future of this area remains problematic, as quarantine restrictions will not last forever, and modern medical development gives grounds for completely overcoming the negative manifestations of COVID-19 (reducing the danger to the level of seasonal flu outbreaks).

The partial return to traditional forms of teaching has demonstrated little enthusiasm among both teachers and students (Williams et al., 2023). This fact alone indicates a lack of popularity of distance

learning. That is, there is a negative perception of it that still needs to be further thought out. Therefore, the advantages and disadvantages of this form of organizing the educational process will affect the future of distance learning as a separate or auxiliary link in the transfer of educational information and the acquisition of the necessary professional skills.

Research Focus

The study focuses on highlighting the prospects for distance learning in the future. First of all, it is about the possibilities of applying this type of knowledge acquisition and pedagogical work in the future, beyond the quarantine realities of the global COVID-19 challenge. First of all, the study has a theoretical basis and aims to highlight the theoretical paradigms of the functioning of the modern educational system in higher education institutions.

Research Aim and Research Questions

The purpose of the article is to analyze distance learning as a form of organizing the educational process that is dynamically developing as a result of responding to global challenges from the perspective of an integral approach.

Research Methodology

General Background

This study applies an analytical research approach that allows correlating and identifying effective solutions taking into account the unique features of the educational system, based on the positive aspects of using distance learning. The research arsenal also includes general scientific methods, such as content analysis, prognostic, systemic, structural methods, as well as methods of specification and abstraction. The study was conducted using a qualitative research approach, which allows us to study the best practices of using distance learning methods in Ukraine. To model optimization solutions, a retrospective and structural analysis of existing regulations in the field of education was conducted.

The research focuses on the problems of the possibility of using distance learning as an independent vector of development of the education sector in general, in particular, based on the collected material in Ukraine, analysis of the existing distance learning system, the main difficulties and challenges that may hinder the open future of this industry.

The empirical part of the study is presented in the form of a survey conducted among higher education students in Ukraine. Based on the material obtained, the effectiveness/ineffectiveness of distance learning, the possibility of using it separately from other means of education (primarily in isolation from traditional or mixed forms of education) were determined.

Sample / Participants / Group

The participants of the experiment were 100 higher education students. Candidates were selected on the basis of anonymity, impartiality, and voluntariness (the respondents' willingness to cooperate and answer the questions honestly).

Instrument and Procedures

The platform for the survey was the Google survey system, which provided remote access to the organization of the experiment, made it possible to attract a wide audience, and guaranteed anonymity

and security for all participants in the research procedure. Information about the survey was disseminated through social media: Facebook, Instagram, and special messengers: Telegram, Viber. This made it possible to reach students from different educational institutions of Ukraine without being geographically tied to a specific region.

The event resulted in 100 completed questionnaires. In accordance with the approved classifications of the chosen research method, it can be determined that the survey was conducted:

- the project was a complete success, as it involved all interested higher education students;
- direct, as all survey participants filled out the questionnaires independently;
- correspondence, because the participants were not present in person when filling out the questionnaires but provided information remotely via the Internet.

This questionnaire consists of open and closed questions. Closed questions ask you to select one (or more) of the answers provided, while open questions allow for free expression of opinion.

Provide answers based on your own experience

- 1.How do you feel about the organization of distance learning?
- 2.Are you satisfied with the way teachers organize distance learning?
- 3.How often do teachers use digital technologies to teach classes?
- 4.How actively did you use independent work?

Select one or more of the following answers

- 5.How did you process new information during distance learning?

- A) Independently, using textbooks and scientific literature
- B) Listening to lectures and attending practical classes in a remote format
- C) Other answer

6.How would you estimate the amount of educational material you have studied during distance learning (compared to traditional learning)?

- A) There were more materials for independent study, and therefore more homework.
- B) There were fewer materials
- C) The amount of training material has not changed

- 7.How often did you use performance monitoring methods?

- A) Constantly completed tests, independent or control work
- B) There were almost no assignments of the control and independent type

C) Such methods were not used at all

8.How do you evaluate your results during distance learning?

A) Improved

B) Worsened

C) Not changed

The materials and statistical data obtained from the survey were processed using analysis, synthesis, and other specified research methods. This made it possible to get an indicative picture of the effectiveness of distance learning, and thus to determine how effective it is as a separate category of educational process organization.

Data Analysis

After conducting a survey among higher education students, the following results were obtained:

1.49% of students said that during distance learning they independently mastered new material from textbooks and additional scientific literature; 45% got acquainted with new material remotely, in particular during lectures or practical classes, using Internet platforms Zoom, GoogleMeet, and others; 80% reported that their teachers regularly used digital technologies to conduct online classes;

2.54% of higher education students reported that during distance learning they were given more material for self-study and homework than usual; 32% of respondents received the same amount as during traditional forms of education, and 9% received less than usual. Another 5% of respondents were undecided;

3.58% of higher education students said that while studying online, they had to constantly complete tests, independent and control works; 36% reported that there were few such works, and 6% of students said that they did not perform such tasks at all;

4.26% of respondents admitted that their grades had improved during distance learning; 62% of respondents had no change in their grades, and 12% of respondents had a clear decline in their grades;

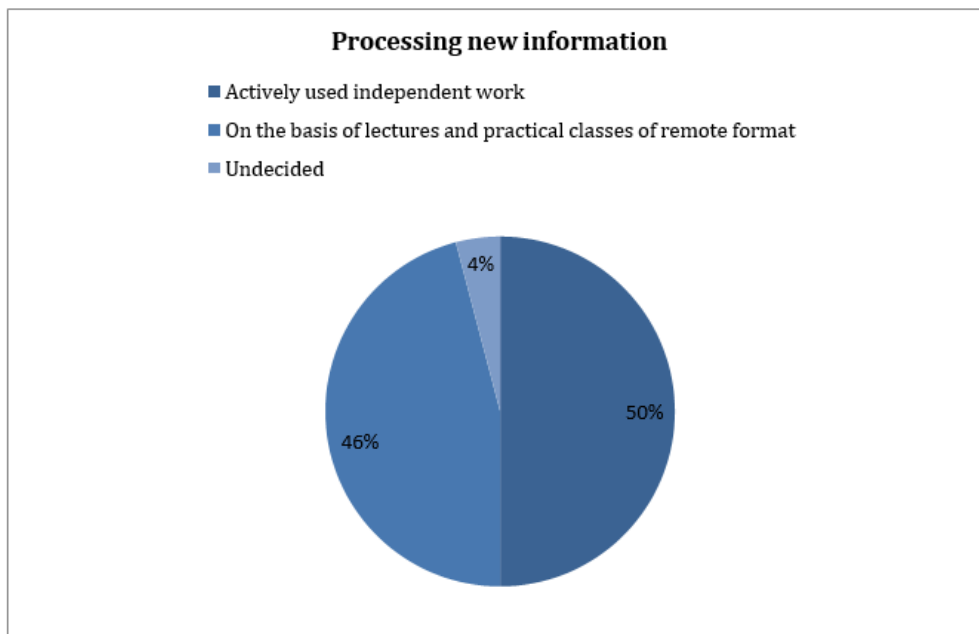
5.The use of distance learning is approved by 71% of the surveyed higher education students; 15% said they were uncomfortable working online, and 14% said they did not see the difference between traditional and distance learning. The study allowed us to demonstrate the attitude of students to the distance learning model as a separate element that can be used separately from other traditional forms of education.

Research Results

The analysis of the data revealed that despite the efforts of teachers and the use of modern digital technologies, students had to study a lot of new educational materials on their own (see Figure 1).

Figure 1

Analysis of the Peculiarities of Processing New Information

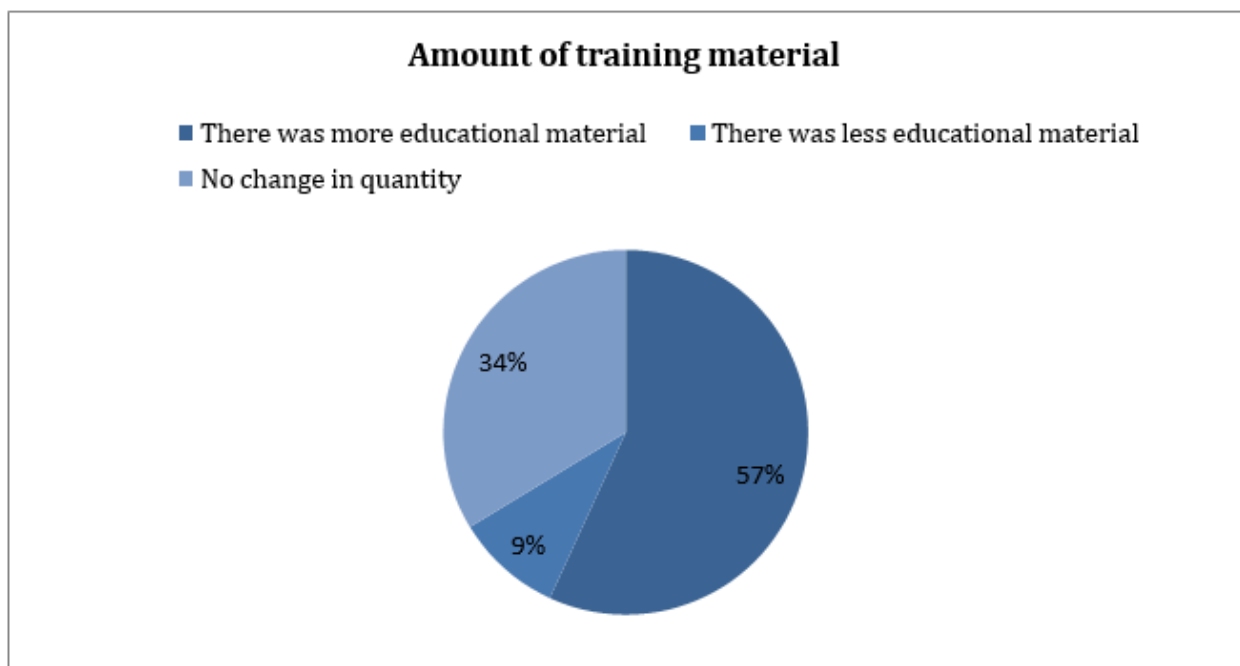


Source: authors' development.

The use of distance learning has led to an increase in the importance of homework and independent work compared to traditional forms of education (see Figure 2).

Figure 2

Assessment of the Amount of Educational Material (Compared to the Traditional Form of Education)

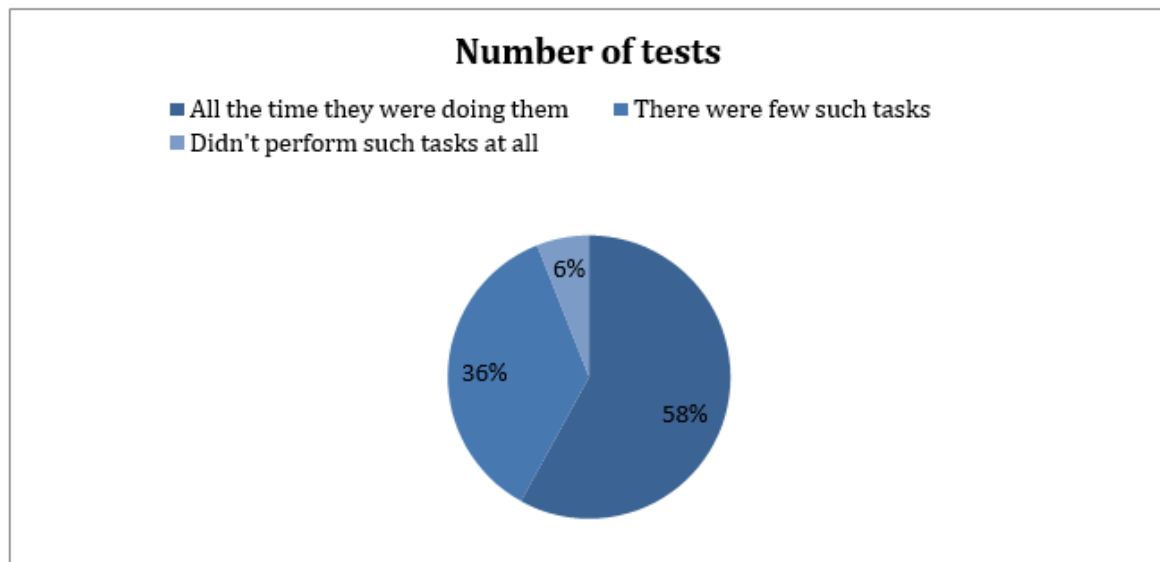


Source: authors' development.

Many respondents also noted that the share of online tests and other control activities has increased significantly. In particular, the majority of higher education students said that they had to constantly complete tests, independent or control works during their online studies (see Figure 3).

Figure 3

Estimation of the Number of Tests

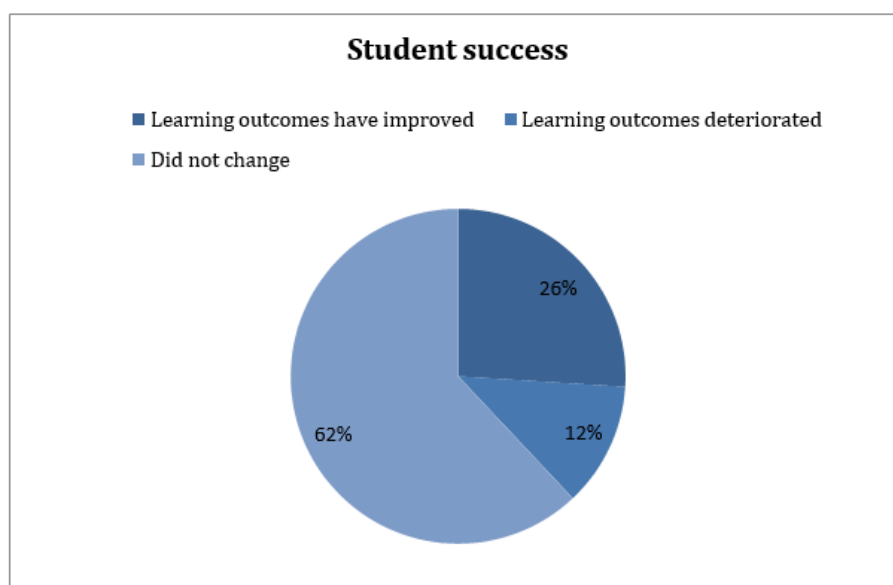


Source: authors' development.

However, even with this factor taken into account, the average academic performance did not decrease, and the number of students with increased academic performance was not inferior to the number of students using traditional forms of education (see Figure 4).

Figure 4

Analysis of Student Performance (Compared to the Traditional Form of Education)

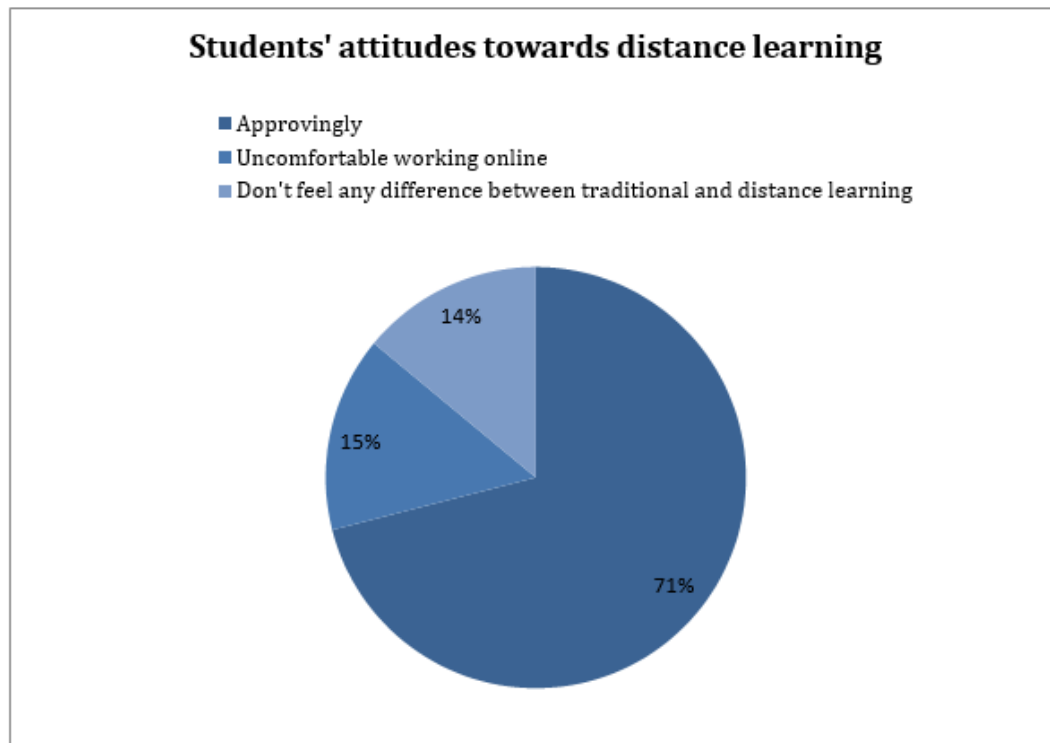


Source: authors' development.

As a result, a large number of higher education students said that studying remotely was generally easy, despite all the obstacles. As a result, most students expressed a favorable attitude towards distance learning (see Figure 4). In addition, most respondents said they were satisfied with the organization of distance learning.

Figure 5

Students' Attitudes Towards Distance Learning



Source: authors' development.

In general, the results of this study are in line with other studies conducted by researchers from different countries (Parsons et al., 2022). For example, Rajab (2018) demonstrated that there is no significant difference in student performance depending on the mode of study (full-time or distance learning). Although his study is unique in that it presents a new context (Saudi Arabia) and is broad in scope (including all courses offered by a large computer science department), his results support previous findings that the delivery method has minimal impact on course performance and grades. The author notes that it is difficult to generalize these findings to all Saudi universities, departments, or higher education institutions in the Middle East. Nevertheless, these findings should convince opponents of e- learning by demonstrating that it produces the same, if not better, results than traditional face-to-face learning (Özmen & Kan, 2022). Even the main problems are common: the threat of isolation, lack of socializing connections, and the need to manage the time that needs to be devoted to the independent part of the task. To these negative effects, researchers also add the danger of prolonged exposure to the monitor, and a possible lack of practical skills, especially in sensitive areas of knowledge (e.g., medicine) (Franco & DeLuca, 2019). In addition, conducting synchronous and asynchronous classes requires self- control and high motivation, which does not always correspond to the reality in which students work.

Researchers also note an important factor of distance learning - the need for self-organization, concentrated work of participants in the learning process in the digital environment (Dhawan, 2020). To develop curricula, teachers create samples of the main and most relevant elements. It has been proven that the effectiveness of using distance learning increases when this process is optimized (Conte et al., 2019). In particular, we are talking about the possibility of forming individual educational trajectories for all participants.

This will significantly increase the competitiveness of future specialists in the labor market by developing additional competencies, including in the case of continuing education. Lifelong learning is also highly effective in the distance form, as it saves time and significantly expands the choice of courses or disciplines (Aldhafeeri & Alotaibi, 2022). Accordingly, the effectiveness of obtaining and assimilating knowledge by higher education students will only increase. As an example, the researchers cite statistical indicators of distance learning of foreign languages using the Duolingo Internet platform. According to registered users from October 2019 to October 2020 (i.e., one calendar year after the announcement of quarantine restrictions related to the COVID-19 pandemic), the number of students taking courses on the platform increased by more than 30 million people. In percentage terms, this growth can be defined as more than 60% (Şova & Popa, 2020). Therefore, under the lockdown, students turned to distance education as a separate element of knowledge formation.

The proposed materials lead to preliminary conclusions that distance education is a separate type of educational process organization, primarily related to the use of modern digital technologies. Its use demonstrates that students receive an appropriate level of training that is comparable to that of traditional education. Many students point out the advantages of online learning. Although it also has some difficulties in use, for some time it was almost the only way to organize university work. This makes it possible to argue that the use of distance learning is promising in the future. At the same time, the COVID-19 pandemic has actualized its implementation, making it a non-alternative for some time (Stoika, 2022). However, in practice, it is known that until 2019, distance learning was actively developing in European universities, although it was less common in practice. Therefore, it is possible to assert the prospects of its use as a separate form of organization of the educational process, which, along with the traditional form of education, will exist in the future of higher education.

Discussion

According to Laufer et al. (2021), distance learning is based on the use of information and digital technologies that allow teachers to deliver learning material to students and provide feedback. It is carried out on specialized educational platforms in real-time (or asynchronously) and requires more concentration from participants, as there is less time for studying (Wedari et al., 2022). Therefore, it is important to conduct an entrance knowledge test to determine the basic level of higher education students and ensure effective teaching methods. According to Yoleri and Nur Anadolu (2022), students need skills in navigating the information space and the ability to express themselves clearly. According to Dhawan (2020) and Kuzminska et al. (2019), pedagogical methods and techniques can vary depending on the means of communication, such as self-study, individual learning, collective learning through forums, discussion groups, debates, and conferences. Distance learning requires participants to concentrate and self-organize in the digital space (Aldhafeeri & Alotaibi, 2022). At the same time, teachers can choose the main and most important elements of the material for the curriculum.

In addition, the global impact of online learning during the COVID-19 outbreak is clear. Due to social distancing measures and quarantine, almost all global activities have been suspended, especially

in the education sector. Education is an important foundation for building a strong society. Consequently, technology has played a crucial role in facilitating the sudden shift to online learning, providing solutions for students who cannot access traditional learning in the current situation (Hamzah et al., 2021). Many researchers have studied the impact of this dramatic change, discussed the role of online learning during the COVID-19 crisis, identified its benefits and challenges, and tried to identify gaps in virtual learning systems (Hamzah et al., 2021; Parsons et al., 2022; Peruzzo & Allan, 2022; Williams et al., 2023).

Despite the many effective tools that virtual classes offer, it is still difficult to compare their effectiveness with traditional classrooms, such as those in medicine, chemistry, or biology, which require direct interaction. Traditionally, the evaluation of learning outcomes has been based on three main components: the organization of learning, publications/research, and services. However, despite the appeal of distance learning, the evaluation system for this educational tool has not received much feedback.

It may be worthwhile to agree with researchers' hypotheses that digital-enabled distance learning can offer equivalent or better-quality education compared to traditional settings without requiring significant resources for implementation and support (Aldhafeeri & Alotaibi, 2022; Pinheiro & Santos, 2022; Rajab, 2018). These findings may contribute to the wider adoption and diffusion of e-learning initiatives. In addition, the potential of information and communication technologies to overcome the challenges posed by conflicts or natural disasters and to provide distance education opportunities for higher education institutions is important. Digital learning technologies have generally proved to be successful methods of delivering classes, which underscores the power of e-learning to fulfill the educational mission of higher education institutions even under the adverse circumstances of a pandemic or open hostilities.

Conclusions and Implications

Thus, the COVID-19 pandemic led to a lockdown and the transfer of the educational process to a remote mode. Distance learning, as a separate type of educational process, had been developing until 2019, but it was during the quarantine restrictions that it began to dominate the educational environment. Accordingly, at the global level, the question arose as to whether it is advisable to consider this area as a separate model that can be used independently of traditional technologies. Based on the study, it was found that distance learning is generally perceived positively among the surveyed students. It has not led to a drop in academic performance, although it requires a special attitude to independent work and self-motivation. Accordingly, such positive practice and perception allow us to interpret distance learning as a promising and independent vector of future education development. These results correlate with the findings of other researchers. An important factor for further development is also the future of digital technologies, which form the basis of the technical implementation of distance learning. The actualization of their use as a result of quarantine restrictions has pointed to promising areas for further evolution. The introduction of technological innovations will draw attention to distance learning in a new way, regardless of how well the negative effects of the global pandemic are overcome. Thus, the use of distance learning has crystallized as a response to the challenge of our time, but COVID-19 has only accelerated this vector of development. Today, distance learning can be perceived as a separate branch of the educational system, the process of further development of which will have distinctive features.

References

- Aldhafeeri, F. M., & Alotaibi, A. A. (2022). Effectiveness of digital education shifting model on high school students' engagement. *Education and Information Technologies*, 27, 6869–6891. <https://doi.org/10.1007/s10639-021-10879-4>
- Almås, A. G., Bueie, A. A., & Aagaard, T. (2021). From digital competence to professional digital competence. *Nordic Journal of Comparative and International Education (NJCIE)*, 5(4), 70–85. <https://doi.org/10.7577/njcie.4233>
- Cavalcanti, A. P., Barbosa, A., Carvalho, R., Freitas, F., Tsai, Y.-S., Gašević, D., & Mello, R. F. (2021). Automatic feedback in online learning environments: A systematic literature review. *Computers and Education: Artificial Intelligence*, 2, Article 100027. <https://doi.org/10.1016/j.caeai.2021.100027>
- Conte, E., Habowski, A. C., & Rios, M. B. (2019). Ressonâncias das tecnologias digitais na educação [Resonances of digital technologies in education]. *Revista Ibero-Americana de Estudos em Educação*, 14(1), 31–45. <https://doi.org/10.21723/riaee.v14i1.11110>
- Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*, 49(1), 5–22. <https://doi.org/10.1177/0047239520934018>
- Franco, P. F., & DeLuca, D. A. (2019). Learning through action: Creating and implementing a strategy game to foster innovative thinking in higher education. *Simulation & Gaming*, 50(1), 23–43. <https://doi.org/10.1177/1046878118820892>
- Hamzah, N., Ahmad, M. F., Zakaria, N., Ariffin, A., & Rubani, S. N. K. (2021). Technical and vocational education students' perception of using learning videos during Covid-19 pandemic period. In *2021 IEEE International Conference on Automatic Control & Intelligent Systems (I2CACIS)*. IEEE. <https://doi.org/10.1109/i2cacis52118.2021.9495895>
- Kuzminska, O., Mazorchuk, M., Morze, N., Pavlenko, V., & Prokhorov, A. (2019). Study of digital competence of the students and teachers in Ukraine. In V. Ermolayev, M. Suárez-Figueroa, V. Yakovyna, H. Mayr, M. Nikitchenko, & A. Spivakovsky (Eds.), *Information and communication technologies in education, research, and industrial applications* (pp. 148–169). Springer. https://doi.org/10.1007/978-3-030-13929-2_8
- Laufer, M., Leiser, A., Deacon, B., Perrin de Brichambaut, P., Fecher, B., Kobsda, C., & Hesse, F. (2021). Digital higher education: A divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality. *International Journal of Educational Technology in Higher Education*, 18(1), Article 51. <https://doi.org/10.1186/s41239-021-00287-6>
- Murphy, V. L., Iniesto, F., & Scanlon, E. (2022). Higher education's digitalisation. In A. Kaplan (Ed.), *Digital transformation and disruption of higher education* (p. 9–21). Cambridge University Press. <https://doi.org/10.1017/9781108979146.004>
- Özmen, E., & Kan, A. Ü. (2022). Problems encountered by distance education staff in the emergency distance education process. *Discourse and Communication for Sustainable Education*, 13(1), 48–62. <https://doi.org/10.2478/dcse-2022-0005>

Parsons, D., Gander, T., Baker, K., & Vo, D. (2022). The post-COVID-19 impact on distance learning for New Zealand teachers. *International Journal of Online Pedagogy and Course Design*, 12(1), 1–16. <https://doi.org/10.4018/ijopcd.295955>

Peruzzo, F., & Allan, J. (2022). Rethinking inclusive (digital) education: Lessons from the pandemic to reconceptualise inclusion through convivial technologies. *Learning, Media and Technology*, 1–15. <https://doi.org/10.1080/17439884.2022.2131817>

Pinheiro, M. M. & Santos, V. (2022). Building the future of distance and online learning: The case of a Portuguese university. In A. Lopes & F. Soares (Eds.), *Online distance learning course design and multimedia in e-Learning* (pp. 114–141). IGI Global. <https://doi.org/10.4018/978-1-7998-9706-4.ch005>

Rajab, K. D. (2018). The effectiveness and potential of e-learning in war zones: An empirical comparison of face-to-face and online education in Saudi Arabia. *IEEE Access*, 6, 6783–6794. <https://doi.org/10.1109/access.2018.2800164>

Şova, R.-A., & Popa, A. F. (2020). Accounting education – Between digitalisation and the COVID-19 pandemic crisis. *CECCAR Business Review*, 1(11), 59–63. <https://doi.org/10.37945/cbr.2020.11.07>

Stoika, O. (2022). The digital transformation of higher education in Hungary. *Continuing Professional Education: Theory and Practice*, (3), 90–95. <https://doi.org/10.28925/1609-8595.2022.3.12>

Wedari, L. K., Fatihah, A. N., & Rusmanto, T. (2022). Zoom application acceptance in online learning: An analysis with the technology acceptance model. *International Journal of Information and Education Technology*, 12(9), 821–830. doi:10.18178/ijiet.2022.12.9.1690

Williams, T. L., Walker, E., Ludlum, M., Edwards, M., & Gregory, K. (2023). Online learning during the Covid crisis: Student views. *Journal of Higher Education Theory and Practice*, 23(2). <https://doi.org/10.33423/jhetp.v23i2.5818>

Yoleri, S., & Nur Anadolu, Z. (2022). Examination of digital literacy skills of undergraduate students according to various variables. *Advanced Education*, 9(21), 121–134. <https://doi.org/10.20535/2410-8286.262190>

Zhang, K., & Aslan, A. B. (2021). AI technologies for education: Recent research & future directions. *Computers and Education: Artificial Intelligence*, 2, Article 100025. <https://doi.org/10.1016/j.caeai.2021.100025>