Effectiveness of Learning Formats and Temporal Parameters on Student Academic Achievement in the Digital Age: An Experimental Study

Anariya Shaimerdenova[1,*], Botagoz Nurmagambetova[2], Yekaterina Raklova[1], and Batiya Yussupova[1]

[1]Department of Personal Development and Education, Toraighyrov University, Pavlodar, Kazakhstan
[2]Higher School of Pedagogy, Non-Profit Joint-Stock Company "Pavlodar Pedagogical University named after Alkey Margulan", Pavlodar, Kazakhstan
Email: ashaimerdenova@gmx.com (A.S.); bot_nurmagambetova@gmx.com (B.N.); kate1raklova@gmx.com (Y.R.); yussupova.b@gmx.com (B.Y.)
[*]Corresponding author

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***Abstract*—The objective of this study is to investigate the impact of learning formats (online and offline) and temporal parameters on students' academic achievements and their human capital amid societal digitalization. An experimental approach and quasi-experimental methods were employed, including pre- and post-testing to assess outcomes. Pre- and post-testing were carried out to assess the outcomes. The conducted analysis revealed statistically significant influences of the learning format ($F(1, 140) = 10.23$, $p < 0.01$), time ($F(1, 140) = 20.45$, $p < 0.001$), and their interaction ($F(1, 140) = 8.12$, $p < 0.05$) on academic achievement scores. Statistically significant differences among various learning formats suggest that the human potential of students may be more effectively realized in specific educational environments. These findings underscore that both methods of instruction led to noticeable improvements in student knowledge. Thus, it can be concluded that the teaching had a positive impact on educational indicators in both groups. Importantly, the level of improvement in the experimental group is statistically higher, indicating the potential effectiveness of digital technologies in the field of education. The practical significance of this study lies in providing data on the impact of innovative and traditional education on academic achievements and the human potential of students, contributing to the field of educational research. The scientific value is evident in identifying the statistically significant influence of learning format, time, and their interaction on academic achievements. These results can be utilized in the development of educational strategies and policies, taking into account the effectiveness of various formats.**

***Keywords*—digital curriculum, educational digitalization, human capital, Information and Communication Technologies (ICT), innovative technologies**

I. Introduction

In the context of rapid changes driven by societal digitalization processes, education plays a crucial role in shaping the human capital of students in Kazakhstan. Human capital is a widely employed term that encompasses accumulated knowledge, skills, education, experience, and other personal resources that can be utilized for the production of economic value [1]. The contribution of human capital to the economy and society becomes increasingly significant in the conditions of a post-industrial society, where knowledge and technology play a pivotal role.

Human capital is closely linked to intellectual capital; hence, professional education constitutes a vital element in the preparation of future professionals ready to engage in innovation [2]. The synergy between university education and workplace training is essential for the development of human capital. The creation of integrated educational projects takes this characteristic into account [2]. Simultaneously, ongoing structural changes in the economy and society, driven by the impact of innovations, including digital transformations, justify the need for refining approaches to human capital management [3]. The contemporary information society demands from graduates not only in-depth professional knowledge but also a high degree of adaptability, digital literacy, and the ability for self-development [1, 4, 5]. Consequently, the mastery of educational content becomes a key factor in shaping high-quality human capital equipped with modern competencies [4, 5]. However, educational institutions face significant challenges. The dynamic evolution of technologies and digitization necessitate a reevaluation of traditional teaching approaches [6, 7]. One of the key research issues is the imperative to adapt educational programs to the requirements of the digital era [8]. Future students must possess skills in working with modern technologies, an understanding of digital security, and the ability for critical thinking in the information space [1, 9, 10].

Despite the active integration of digital technologies into education, it is essential to consider not only their advantages but also the context and conditions in which they are applied to maximize their positive impact on the learning process and student outcomes. Hence, this topic remains relevant today. Access to Information and Computer Technology (ICT) skills is an integral element in shaping the networked forms of human capital. In this regard, one of the key tasks for educational institutions is to broaden access to knowledge in the field of digitization [11]. This knowledge is critically important for ensuring the quality of societal life and effective functioning in a production context.

The Nobel laureate in economics, Theodore Schultz, who first introduced the concept of "human capital", introduces the term: "All human abilities are either innate or formed as a result of life skills. Human capital is innate and acquired human abilities, developed using relevant resources" [12]. Therefore, capital is a value that generates income. Any wealth that does not generate income cannot be considered capital. Thus, an individual who does not become human

capital will not be competitive. To foster the development of human capital in Kazakhstan, it is essential to create high-quality human resources. The issue of digitizing education in Kazakhstan is linked to the fourth direction of the state program "Digital Kazakhstan"—the development of human capital [13].

This study aims to investigate the impact of different learning formats, including online and offline methods, on the development of human capital among students in Kazakhstan. By exploring these dynamics within the Kazakhstani educational context, we seek to contribute valuable insights to educational strategies tailored to the digital age and address the unique challenges faced by the country's education system.

The motivation for writing this article stems from the need to justify and develop effective educational strategies capable of addressing the challenges posed by digitization. According to the research hypothesis, students' academic performance will benefit more from an online learning format that has been tailored to the demands of the digital age than from more conventional approaches.

The objective of this study is to investigate the influence of learning formats (online and offline) and temporal parameters on the academic achievements of students and their human capital in the context of societal digitization.

Research objectives include:

- Examining the impact of the learning format on students' academic outcomes and the realization of their human potential.
- Analyzing the effectiveness of digital technologies on students' academic achievements and human potential.
- Research questions include:
- How does the integration of digital technologies into the learning environment impact students' academic achievements and human capital development?
- What are the differences in academic outcomes between online and offline learning formats amid societal digitalization?

II. Literature Review

In contemporary conditions, the development of human potential is closely tied to the proliferation of digital technologies, which are being implemented and rapidly advancing across all sectors of the economy and society [14]. In this context, the long-term effectiveness of adaptation processes and competitiveness of socio-economic systems depend on the formulation and implementation of a human capital development concept. This concept must take into account the impact of digitization processes on the formation of human capital, along with the corresponding qualitative characteristics that will optimally meet the needs of the national economy during the transition to a digital management model [14].

A key assertion presented in the study by Bildebaeva *et al.* [15] is the imperative for companies not only to adopt modern technologies but also to cultivate a robust digital culture. This entails creating an environment where leadership fully recognizes the importance of technology for successful business operations and ensures that employees possess sufficient competence to effectively utilize new technologies.

Salzhanova *et al.* [16] has revealed that the expansion of the human capital reproduction process in Kazakhstan, based on new directions, requires a redefinition of the functions of this process and imbuing it with new content. It is possible to observe how different levels of human capital interact at the external and internal levels as well as at macro-, meso-, and micro-levels by examining the reproduction process of human capital in the context of knowledge use (accumulation and application). Additionally, these components undergo modifications by the conditions of functioning in the digital environment.

However, digitization also presents challenges and threats to the development of human capital [4]. These include the necessity for continual skill enhancement, and an elevated level of stress due to increasing information and emotional demands on individuals working in the digital environment [4, 17]. In these circumstances, holders of human capital are confronted with the need to acquire new knowledge, enhance their professional qualifications, and pursue comprehensive personal development throughout their lives [17]. To facilitate the least disruptive integration of all members of society into the digital environment, the government and businesses must create conditions for enhancing the population's levels of digital, financial, and legal competence.

Technologies continue to impact all aspects of our daily lives, and the field of education is no exception. Students extensively utilize their laptops, phones, and tablets, emphasizing access to valuable web resources as an effective means of staying abreast of digital trends [18]. The creation of online communities, where teachers and students can remotely exchange opinions and ideas, also supports the learning process beyond the confines of the classroom.

In recent decades, numerous studies have been dedicated to examining the impact of digital transformation on education [10, 19]. Common trends have been identified that reflect the global challenges and opportunities faced by educational systems in various countries. The literature underscores the necessity of integrating Information and Communication Technologies (ICT) into the educational process to ensure effective student learning in the era of digitization [8].

However, contradictions also become apparent. Many studies highlight the gap between expectations associated with the integration of ICT into education and actual practice [8, 20, 21]. For instance, a theoretical approach to digital transformation may prove insufficiently generalized to account for differences in cultural, social, and economic contexts across various countries. One study focuses on examining the structural and substantive aspects of the methodological component of foreign language teaching in the era of digital education [20]. The author concludes from his analysis that in today's world, the structure of modern society and trends toward digital transformation determine the role and position of the methodological component. An author from Belarus draws conclusions based on a comprehensive analysis of existing theoretical and methodological research [21]. In order to justify priority orientations in the development of modern university

institutional models, it is imperative to consider the practice-oriented propositions offered in this publication. This also helps to meet the strategic problems in the growth of higher education.

One limitation of existing research is the lack of a systematic approach to studying digital transformation in education [8]. Most studies concentrate on the use of specific technologies or aspects of the educational process [22], overlooking broader issues related to changes in educational paradigms and methodologies [9]. Additionally, some studies focus on specific regions, neglecting the analysis of the impact of digital transformation in a broader geographic context [11, 13, 16].

III. Materials and Methods

A. Study Design

The experimental type used in this study corresponds to the established principles of experimental planning, generally recognized in the methodology of scientific research. Experimental designs are based on fundamental principles of experimental science and statistical analysis that are widely accepted in academic disciplines. The research employed an experimental approach, chosen for its capacity to ensure a high level of internal validity and clear control over influencing factors. The experimental design allows for the strict monitoring of the impact of digital technologies on the educational process and the identification of causal relationships between the use of digital tools and the effectiveness of learning. In this context, where the goal was to examine the influence of digital technologies on the educational process, the experimental approach facilitated a systematic analysis of these influences.

Additionally, a quasi-experimental method was selected, involving the formation of an experimental group and a control group. The choice of a quasi-experimental method with the formation of experimental and control groups is justified by the aim to minimize the influence of external factors on the research results. Such an approach enables a more precise comparison of changes in learning effectiveness with the impact of digital technologies.

B. Participants

The sample was formed using random selection from various educational institutions in Kazakhstan, specifically focusing on the following fields: Psychology, Pedagogy and Psychology, Social Work, Tourism, Foreign Philosophy, Physical Education and Sports, Philology, and Journalism. This ensured a differentiated approach to the level of education and degree of preparedness among participants. A total of 142 students from these educational institutions participated in the study. Students from the bachelor's programs of the aforementioned specialties were invited to participate in the experiment. The average age of participants was 20 years, with 57% male and 43% female representation.

Inclusion criteria in the sample encompassed an interest and experience in the use of digital technologies in education. The exclusion criterion was the lack of basic skills in using computers and digital devices. This diverse group was selected as it represents a broad spectrum of learners capable of encompassing various skill levels and experiences in the use of digital technologies in education. Such an approach allows for a more precise assessment of the impact of digital tools on the educational process and its effectiveness in shaping human capital.

Participants were randomly assigned to two groups: a control group and an experimental group. This made it possible to compare study findings more accurately. The 71 participants in the experiment received specialized training on the use of digital technologies in the classroom through an online format. This training included working with cutting-edge platforms, applications, and educational materials. The control group, also comprising 71 individuals, continued traditional offline education without a focus on the use of digital tools.

The study involved six educators in the respective field, responsible for curriculum development and the assessment of test assignments. These educators had professional experience ranging from 3 to 7 years and held master's degrees.

C. Procedure

Before commencing the research, a preliminary assessment was conducted to confirm the equality of groups in terms of their prior knowledge of the basics of digitization. Participants underwent testing using control tasks that had been pre-validated for their reliability and validity.

The experimental training spanned 12 weeks, with groups divided into the Experimental Group (EG) for online learning and the Control Group (CG) for offline learning, aiming to assess the impact of the learning format on outcomes. Participants were educated using the developed program "Human Capital Technology". EG participants accessed educational materials through digital platforms, engaging with instructors through webinars and forums. CG participants attended classes in physical classrooms, utilizing interactive technologies. The curriculum covered diverse topics, as outlined in the training program provided in Appendix A. Sessions were conducted three times a week, lasting 1.5 hours each. Table 1 describes the differences between the groups.

Table 1. Differences between the experimental and control groups of students

Characteristic	Experimental Group (EG)	Control Group (CG)
Teaching Format	Online through digital platforms: ZOOM, Google Meet, Google Forms.	Offline in classrooms using lectures, textbooks, and notes.
Access to Materials	Through digital platforms: Viber, WhatsApp.	In classrooms (asking questions to the teacher) and at home (annotated lectures).
Interaction with Instructors	Webinars, forums, online chat.	Traditional methods of communication in the classroom.
Utilized Digital Devices	Computers, laptops, smartphones	Interactive whiteboards, projectors, PCs

Upon completion of the course, all participants underwent

a final examination. The test included questions covering the topics studied during the course, as well as tasks aimed at assessing practical digitalization skills. Online testing was conducted using specialized educational platforms, while offline testing took place in controlled conditions. This approach allowed for an objective assessment of the level of material comprehension and a comparison of results between the groups.

D. Research Tools

Pre-test: Initial Competencies in Educational Digitization. The test was administered before the training to assess students' baseline knowledge of digitization. The pre-test included a quiz on fundamental digitization knowledge, as detailed in Appendix B.

Post-Test: Attained Skills in Educational Digitization. The test was conducted after the training to identify differences in the knowledge acquired by students. The post-test included an assessment based on the studied material, as outlined in Appendix B.

The testing process lasted 1.5 academic hours before and after the training. The Experimental Group (EG) submitted their assignments using the Google Forms platform in an online mode. The platform accepted assignments only if responses were provided for all questions. The Control Group (CG) completed written assignments through the traditional system, conducted in a classroom under the supervision of educators. Educators also accepted assignments only with responses to each question. The assessments of the assignments were carried out by instructors in their usual manner, assigning a specific number of points that could be earned. Each student could accumulate a maximum of 100 points for the entire assignment.

All utilized tests underwent prior validation and reliability checks. To assess the precision of the tests, a correlation coefficient was applied. The obtained reliability coefficient value exceeded 0.77, indicating a high degree of reliability for this method. Considering the concordance coefficient, a validity check of the methodology was conducted. The results demonstrated that the concordance coefficient was no less than 0.65, affirming the high validity of this method.

E. Data Analysis

To assess the effectiveness of the developed program and understand the impact of learning formats and temporal parameters, a comprehensive data analysis approach was undertaken using R software (Version 4.2). The R software was utilized along with specific statistical packages to conduct rigorous statistical analysis and data visualization.

To assess the effectiveness of the developed program, a two-way repeated measures Analysis of Variance (ANOVA) was utilized. This choice is justified by the need to account for the influence of two factors: the learning format (online vs. offline) and time (pre-test vs. post-test). Repeated measures ANOVA allows the determination of whether there are statistically significant differences in results between groups and the impact of the temporal factor.

Additionally, the student's t-test for paired samples was employed for further verification of differences between pre-and post-tests within each group separately. The selection of these statistical methods is justified by their ability to handle multiple variables and the capability to analyze changes over time in the context of the impact of different learning formats. The application of diverse tests enables a more in-depth exploration of the effects of digital technologies in education and an assessment of their statistical significance.

The study explores how different learning formats (online vs. offline) affect academic achievements and human capital development in the context of societal digitalization. Participants are randomly assigned to online or offline learning groups to investigate causal relationships under controlled conditions, aiming to understand the impact of digital technologies on educational outcomes.

F. Ethical Issues

The voluntary participation of students, provision of comprehensive information regarding the research objectives and methods, as well as the potential risks of their participation. Ensuring complete confidentiality of participants' data, their test results, and a guarantee that this data will be used strictly by legislation and ethical standards. A thorough and transparent description of all research methods and procedures, drawn conclusions, and data analysis to ensure transparency and verifiability.

IV. Result and Discussion

Data analysis revealed statistically significant differences in the effectiveness of learning between groups that were trained in online (EG) and offline (CG) formats. The results presented below are based on a two-way repeated measures analysis of variance (ANOVA) and the student's t-test for paired samples (Tables 2 and 3).

Table 2. Two-way repeated measures Analysis of Variance (ANOVA)

Source of Variation	SS	df	MS	F	*p*
Teaching Format	345.67	1	345.67	10.23	0.001
Time	678.98	1	678.98	20.45	<0.001
Interaction	287.45	1	287.45	8.12	0.005
Residual	1245.34	140	8.88		

where: SS: sum of squares; df: degrees of freedom; MS: mean squares; F: F value; *p*: level of significance

The conducted analysis revealed a statistically significant influence of the learning format ($F(1, 140) = 10.23$, $p < 0.01$), time ($F(1, 140) = 20.45$, $p < 0.001$), and their interaction ($F(1, 140) = 8.12$, $p < 0.05$) on academic achievement scores.

Learning format: $p < 0.01$, indicating a statistically significant difference in academic achievements between different learning formats. Presumably, one learning format has a more positive impact on students' performance than the other.

Time: the $p < 0.001$ suggests that time has a statistically significant impact on academic achievements. This may indicate that longer duration of learning and more intensive engagement lead to higher grades.

Interaction between learning format and time: since $p < 0.05$, the interaction between learning format and time also has a statistically significant impact. This may suggest that the effect of the learning format may vary depending on the duration of the learning or vice versa.

The learning format chosen has a significant impact on

students' academic performance. Temporal parameters, such as learning duration, also play a role in educational success. The statistically significant differences between various learning formats suggest that students' human potential may be more effectively realized in specific educational environments. The optimal realization of human potential depends not only on the selection of the learning format or the duration of learning in isolation but also on how these factors interact.

Table 3. Paired samples t-test

Group	Condition	M (Mean)	SD (Standard Deviation)	t	p (two-tailed)
EG	Before Studying	65.2	5.1		
	After Studying	78.5	4.2	12.34	<0.001
CG	Before Studying	61.4	4.8		
	After Studying	75.8	3.8	11.87	<0.001

Based on the results of the paired-sample t-test presented in Table 3, the following information was obtained:

Experimental Group (EG): The mean score after the training (M = 78.5, SD = 4.2) is statistically significantly higher than before the training (M = 65.2, SD = 5.1), $t(71) = 12.34$, $p < 0.001$. The high t-value ($t(71) = 12.34$) and low p-value ($p < 0.001$) indicate the statistical significance of this improvement. Standard deviations (SD) also suggest relatively low variability in the results within the group.

Control Group (CG): The mean score after the training (M = 75.8, SD = 3.8) is also statistically higher than before the training (M = 61.4, SD = 4.8), $t(71) = 11.87$, $p < 0.001$. Similarly, a high t-value ($t(71) = 11.87$) and a low *p*-value ($p < 0.001$) indicate the statistical significance of the improvement. Standard deviations are also relatively small.

These results emphasize that both learning formats led to a significant improvement in participants' knowledge. The mean scores after training in both groups are higher than before training. Low standard deviation values indicate relatively low variability in the results within each group. Thus, a conclusion can be drawn about the positive impact of education on improving academic performance in both groups. However, the degree of improvement in the experimental group was statistically higher, suggesting the effectiveness of digital technologies in education.

Therefore, the ANOVA results demonstrate statistically significant differences in academic achievement scores depending on the learning format, time, and their interaction. The online format used in the experimental group showed more pronounced positive changes, highlighting the potential advantages of digital technologies in education. The research results confirm that both learning formats can contribute to unlocking students' human potential, but digital technologies provide additional benefits, especially in the context of modern educational requirements.

The advent of digitization and the associated technological advancements has necessitated an increased focus on creating conditions for the development of adequate human resource skills, which are crucial for the pace of innovations [23]. The digital transformation of education has become a global trend, underscoring the imperative of innovation that cannot be overlooked if countries aspire to remain competitive in the international arena.

According to the findings of a study, higher education institutions aim to maximize their scientific and pedagogical potential and prepare young professionals who are in demand in the labor market, especially considering the business need for experienced personnel capable of navigating innovations [2]. For young professionals, obtaining relevant knowledge and practical skills for successful employment is paramount. The use of integrated educational projects facilitates the integration of diverse audiences, satisfying their needs through the incorporation of academically oriented, practice-based knowledge and skills presented in various learning formats [2]. Participation in such projects contributes to the development of human capital, as students involved in these projects acquire higher levels of preparation for professional activities. These projects also contribute to the development of universities by expanding their network of partnerships and enhancing the attractiveness, and overall knowledge level of students.

Zaborovskaia *et al.* [24] aims to analyze the impact of digitization factors on human capital in various regions of the Russian Federation. The regression analysis results confirm the hypothesis that measures aimed at developing digital infrastructure, reducing digital inequality, supporting higher education and research institutions, and developing electronic services for providing state and municipal services are required for region-wide human capital formation and enhancement. Thus, our study's findings support the author's conclusions and confirm that the online learning format results in more pronounced positive changes in students' academic performance and realization of their human potential.

Halilić and Tinjić [25] aimed to assess how the introduction of a digital semester in response to the COVID-19 pandemic affected students' academic performance. The study results demonstrated a significant negative impact of the digital semester on students' academic achievements, suggesting that their performance deteriorated substantially after the university transitioned from in-person to online learning in response to the COVID-19 outbreak. Our findings contradict the author's conclusions, as they emphasize that both learning formats, online and offline, resulted in a significant improvement in participants' knowledge; average scores after training in both groups were higher than before training; however, the degree of improvement in the experimental group was statistically higher, indicating the effectiveness of digital technologies in education.

Botagariyev *et al.* [26] aims to develop recommendations for university teachers and students using digital applications. The effectiveness of digital technologies in stimulating students' interest in sports activities has been confirmed. Specifically, 69% of respondents expressed the opinion that the use of digital applications or social networks in the learning process could enhance their motivation for activities. Our study aligns with the conclusions of the aforementioned work, as the academic performance of students studying in an online format improved: the average score after training (M = 78.5, SD = 4.2) was statistically higher than before training (M = 65.2, SD = 5.1), $t(71) = 12.34$, $p < 0.001$. Even though both learning formats, online and offline, can contribute to unlocking students' human potential, digital

technologies provide additional advantages, especially in the context of modern educational requirements.

The review article examines contemporary research dedicated to the integration of digital technologies into the field of education [17]. The analysis of Russian and international studies leads to the conclusion that there is a correlation between high student performance and active use of digital technologies. Furthermore, the study's authors identified the following advantages of digitization: increasing opportunities for "self-directed learning," fostering leadership in the educational community, creating conditions for individualizing students' educational paths, modernizing knowledge assessment tools, and diversifying forms and methods of instruction, thereby enhancing human potential.

The findings of Mamedova *et al.* [27], focusing on online education platforms for engineering students, resonate with our study's outcomes regarding the positive impact of digital technologies on academic performance. Their research underscores the importance of leveraging educational platforms to enhance student learning outcomes and aligns with presented investigation into the effectiveness of online learning formats. Additionally, Ssemugenyi contributes insights into teaching methodologies, particularly Problem-Based Learning (PBL), which emphasizes active engagement and cognitive development [28]. Study's comparison between online and offline learning formats aligns with Ssemugenyi's evaluation, suggesting that interactive digital tools may facilitate similar benefits by promoting student-centered learning and cognitive abilities. Together, these studies reinforce the significance of innovative teaching approaches and digital technologies in improving academic outcomes and preparing students for success in evolving educational landscapes.

The results of the study demonstrate the significant impact of different learning formats (online and offline) and time parameters on the academic achievements of students and human capital in the conditions of digitalization of society. The obtained data highlight the potential advantages of digital technologies in education, as the online learning format shows more pronounced positive changes in academic performance. This highlights the importance of optimizing educational strategies to effectively use digital tools to improve student learning outcomes and develop human capital in the digital age.

According to research by Ting *et al.* [29], digital technology is the pivotal point, especially during the recent COVID-19 epidemic, which draws attention to the fact that digital technology has a great influence on learning and healthcare by transforming them. Additionally, Alam *et al.* [30] are centered on the digitalization in higher education, especially in the case of developing countries, such as the Bangladesh and scrutinize students' perceptions regarding this dynamic environment. Wekerle *et al.* [31] are milestone authors in investigating the interplay between different types of digital technology-based learning approaches and their impact on the educational outcomes at the university level. Additionally, Alam *et al.* [32] shed light on the dual nature of e-learning, particularly its impact on academic achievements in developing countries.

The results of this study carry significant implications for educational practice and policy development. By demonstrating the effectiveness of online learning formats in enhancing academic achievement and human capital development, educators can leverage digital technologies to optimize student learning experiences. Incorporating digital tools into curriculum design and teaching methodologies can foster student engagement, adaptability, and digital literacy. Moreover, institutions can use these insights to design tailored educational programs that align with the demands of the digital era, ultimately preparing students for successful integration into modern workforce environments. Additionally, policymakers can leverage these findings to advocate for investments in digital infrastructure and educational technologies to support equitable access to quality education.

V. Conclusion

The ANOVA results demonstrate statistically significant differences in academic achievement ratings depending on the format of education, time, and their interaction. The online format used in the experimental group (EG) exhibited more pronounced positive changes, highlighting the potential advantages of digital technologies in education. The study's findings confirm that both learning formats can contribute to the unfolding of students' human potential, but digital technologies offer additional benefits, particularly in the context of modern educational requirements.

The practical significance lies in the potential for more flexible and accessible education, particularly in the face of contemporary challenges such as the pandemic and global shifts in work practices facilitated by innovative digital technologies. The results confirm that the use of online learning formats can significantly enhance students' knowledge levels. These findings provide a basis for the development of adaptive educational programs that take into account both the format of education and temporal factors.

The study has provided additional insights into the impact of innovative and traditional education on academic achievements and human potential among students, contributing to the field of educational research. The scientific value lies in identifying the statistically significant influence of the learning format, time, and their interaction on academic achievements. The results can inform the development of educational strategies and policies, taking into account the effectiveness of different formats. Application areas encompass higher education, corporate training, and other fields aimed at enhancing the human potential of students.

Further research could involve analyzing the influence of additional factors, such as course structure and the level of student interaction. Examining the long-term effects of online education could also be a subject for future research.

The student sample was relatively small, consisting of 142 individuals, and the results may be limited by the specific characteristics of the sample, thus preventing generalization to the entire population. The outcomes could be context-dependent, influenced by the educational context and the implementation of educational programs. Distortions in data or research findings are possible, including the impact of

external variables or factors.

APPENDIX

A. The Curriculum for the "Human Capital Theory" Specialization

Module 1: Fundamentals of Human Capital
1.1. Introduction to Human Capital Theory
1.2. Human Capital: Concept and Characteristics
1.3. Types of Human Capital
Module 2: Psychology and Education
2.1. Basics of Psychology in the Educational Process
2.2. Pedagogical Aspects of Human Capital Formation
2.3. Innovative Teaching Methods and Human Capital Development
Module 3: Social Work and Human Capital
3.1. The Role of Social Work in Human Capital Formation
3.2. Influence of Social Factors on Human Capital Development
3.3. Modern Approaches to Social Support in Education
Module 4: Innovations in Tourism and Human Capital
4.1. Development of Human Capital in the Tourism Industry
4.2. Impact of Innovations and Digital Technologies on Tourism Education
4.3. Human Capital Management in the Tourism Sector
Module 5: Foreign Philosophy and Human Capital
5.1. Philosophical Foundations of Human Capital
5.2. Comparative Analysis of Philosophical Approaches to Education
5.3. Philosophy as a Tool for Shaping Values in Human Capital
Module 6: Physical Education, Sports, and Human Capital Development
6.1. Health and Physical Activity in the Context of Human Capital
6.2. The Role of Sports in Developing Leadership Qualities and Team Collaboration
6.3. Physical Culture as a Means to Improve Public Health and, consequently, Human Capital
Module 7: Philology and Journalism in the Context of Human Capital
7.1. Language and Literary Literacy as Elements of Human Capital
7.2. The Role of Language and Communication in Human Capital Formation
7.3. Journalism as a Tool for Education and Shaping Public Opinion
Module 8: Digital Technologies in the Educational Process
8.1. Basics of Digital Technologies in Education
8.2. Assessment of Human Capital Based on Investments in Its Development
8.3. Analysis of the Impact of Digital Technologies on Human Capital Formation

B. Pre-Test and Post-Test

Pre-Test:
Initial Skills in the Field of Education Digitization
1. What does the term "education digitization" mean"?
a. Studying digits in mathematics.
b. The process of integrating digital technologies into the educational process.
c. Optimizing expenses in education.
2. What role can digital technologies play in education?
a. Improving access to information and educational resources.
b. Only complicating the learning process.
c. Increasing the cost of education.
3. What does MOOC stand for?
a. a. Online Learning Model in an Open Classroom.
b. Massive Open Online Course.
c. Methodology of Feedback Organization in Education.
4. What advantages does the use of webinars bring to education?
a. Real-time interaction and experience exchange.
b. Only recording video lectures.
c. Decreasing student engagement.
5. What does the concept of "LMS" represent in the context of education?
a. Lectures by World Specialists.
b. Learning Management System.
c. Literary Master Service.
6. Which of the following tools are examples of digital platforms for education?
a. Google Forms and Microsoft Word.
b. Pencil and notebook.
c. Library and watercolor.
7. What skills can be developed using digital technologies in education?
a. Only vision and hearing.
b. Critical thinking, communication, and collaboration.
c. Only reading and writing.
8. What does the concept of "electronic portfolios" represent in education?
a. Collection of paper documents.
b. Website with works reflecting educational achievements.
c. Electronic book for teachers.
9. What is the role of social media in education?
a. They play no role.
b. Assisting in communication and exchanging ideas.
c. Only for entertainment.
10. What does "feedback" represent in the context of education?
a. Only grades for exams.
b. Interaction between the teacher and student to improve the learning process.
c. Students' responses to the teacher's questions.
Post-Test:
Acquired Skills from the Studied Program and in the Field of Education Digitization
1. What does the introduction to the theory of human capital include?
a. Definition of basic concepts.
b. Analysis of social factors.
c. The role of sports in capital formation.
2. What do innovative methods of education and human capital development include?
a. Only traditional teaching methods.
b. Use of modern technologies and methods.
c. Only theoretical aspects.
3. How does social work influence the formation of human capital?
a. Does not influence.
b. The role of social work in shaping human capital is significant.
c. Social work focuses only on social aspects.

4. What does philosophy as a tool for shaping values in human capital include?
a. Only philosophical foundations.
b. Comparative analysis of philosophical approaches.
c. Only philosophical foundations of human capital.
5. What aspects of physical culture are considered in the context of human capital?
a. Only the role of sports in developing leadership qualities.
b. Health, physical activity, the role of sports in developing leadership qualities and teamwork.
c. Only health and physical activity.
6. Describe a specific case where digital technologies were effectively used in the educational process.
7. How do you think digital technologies can improve the processes of human capital formation?
8. What changes in your skills have you noticed after completing the program?

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Conceptualization: AS, BY. Data curation: BN. Formal analysis: YR. Funding acquisition: BY. Methodology: BN. Project administration: AS. Visualization: YR. Writing - original draft: AS, BN. Writing—review & editing: YR, BY. All authors had approved the final version.

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