Online-Journals.org

iJIM International Journal of Interactive Mobile Technologies

iJIM | eISSN: 1865-7923 | Vol. 19 No. 2 (2025) | OPEN ACCESS

https://doi.org/10.3991/ijim.v19i02.51129

PAPER

Evaluation of the Level of Network Communicative Culture among Teachers and Students

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ABSTRACT

This study aims to assess the level of network communication culture among teachers and students to determine their abilities and skills in the field of network communications. Structured questionnaire surveys were utilized as one of its primary methods for data collection in this study. The data obtained confirms the widespread recognition of digital technologies among students and teachers. The high level of internet usage among students (70%) and active engagement in online chats (73%) underscores the significance of access to online resources and various communication tools in the educational process. Educators also actively utilize digital tools, although some report low (10%) or moderate (25%) levels of knowledge and express a need for additional training and support. The results emphasize the importance of effective time and resource management for teachers, as well as the convenience and accessibility of digital tools for students. Some students suggest replacing face-to-face contact with digital tools and emphasize the importance of interpersonal communication. The attained results can be integrated into the existing knowledge framework within the domains of education, psychology, pedagogy, information technology, and sociology, thereby facilitating a deeper understanding of the impact of digital technologies on educational processes.

KEYWORDS

accessibility of digital tools, digital etiquette, digital technologies, interpersonal communication, learning effectiveness, network communicative culture, smart-university

1 INTRODUCTION

In the era of rapid technological advancement and the digital transformation of society, the nature of communication within educational environments is undergoing fundamental changes [1]. The assessment of the level of network communication culture between instructors and students is becoming critically important to ensure effective interaction and enhance the quality of the educational process [2, 3]. This topic is emerging as central to educational discourse, requiring thorough analysis and

Abdigapbarova, U., Yeshenkulova, D., Shalabayeva, L., Aitenova, E., Zhiyenbayeva, N., Tapalova, O. (2025). Evaluation of the Level of Network Communicative Culture among Teachers and Students. *International Journal of Interactive Mobile Technologies (iJIM)*, 19(2), pp. 143–167. https://doi.org/10.3991/ijim.v19i02.51129

Article submitted 2024-07-14. Revision uploaded 2024-10-20. Final acceptance 2024-10-24.

the development of innovative approaches. The significance of this study is driven by several key factors. First, the digitalization of education presents unprecedented opportunities for expanding access to knowledge and improving the learning experience. At the same time, it introduces new challenges related to the need to adapt traditional pedagogical methods to online environments [4]. Second, the increasing role of virtual communication raises questions about its impact on the quality of interpersonal relationships and the overall effectiveness of the educational process.

Previous research in this field has highlighted several important aspects. Specifically, it has been found that an over-reliance on digital forms of communication can lead to a weakening of deep human connections and an increased sense of isolation among participants in the educational process [5, 6]. These factors may potentially negatively affect the quality of learning and the psychological well-being of both students and educators. On the other hand, the effective use of network technologies opens up new horizons for education, particularly in the context of globalization and intercultural communication [7–9]. Despite the substantial body of research on digital education, significant gaps remain in understanding the processes involved in the formation and development of network communication culture in higher education. Specifically, the interaction between instructors and students in the digital space and its impact on the effectiveness of the learning process remain underexplored [10]. Furthermore, the question of how this culture influences the development of professional competencies and the readiness of future specialists to work in the digital economy remains unresolved [11]. Investigating these aspects is critically important, as it will allow for the development of more effective educational strategies that take into account the specificities of the digital environment and the needs of modern students. The results of this study may also serve as the foundation for creating an optimal digital environment in higher education institutions, contributing not only to the improvement of education quality but also to the development of soft skills necessary for a successful career in the 21st century [12, 13].

In preparing individuals for the challenges of the digital era, a comprehensive educational approach plays a crucial role, extending far beyond the simple acquisition of technical skills. This approach is a powerful tool for shaping the competencies necessary for successful functioning in today's digital society. Modern educational programs provide tools for mastering effective Internet communication, encompassing not only technical aspects but also understanding the nuances of online communication in various contexts. These programs contribute to the development of a culture of respect and empathy in the digital space, teaching individuals to engage in productive online discussions and resolve conflicts in virtual environments. Equally important is the cultivation of an understanding of ethical issues in online communication. The educational process lays the foundation for ethical behavior in the digital world, including respect for privacy, intellectual property, and responsibility for one's online actions. Furthermore, modern education plays a key role in developing the skills necessary for effective interaction within online communities, which is becoming increasingly important in the context of globalization and the rise of remote work and learning [13].

Thus, the contemporary educational process serves not merely as a means of knowledge transfer but as an instrument of social transformation, preparing individuals for active, ethical, and productive participation in digital society and laying the groundwork for the development of digital culture. Given the aforementioned, the aim of this study is a comprehensive assessment of the level of network communication culture among instructors and students, the identification of key aspects of their interaction in the digital space, and the development of an innovative model

of a Smart University with an effective digital environment. This study is aimed at addressing existing gaps in the understanding of digital communication processes in education and creating a foundation for improving the quality of education in higher education institutions amidst digital transformation.

To achieve our study objective, several tasks have been set: to analyze the current level of network communication culture among instructors and students using quantitative and qualitative methods; to identify the key aspects of their interaction in the digital space, with a focus on communication effectiveness and the quality of education; to critically assess existing approaches to the formation of this culture in higher education institutions and evaluate their limitations; and, based on the collected data, to develop an innovative Smart University model with an effective digital environment. Our study has the potential to significantly influence the development of digital education and provide practical recommendations for improving the quality of education and preparing students for work in the digital economy.

2 LITERATURE REVIEW

Discussions regarding the level of networking culture between teachers and students constitute a pertinent and significant aspect of modern education, especially in the context of increasing digital activity [6]. Research in this area indicates that the use of technology can both enhance and deteriorate the quality of relationships in educational institutions. This raises concerns among researchers and practitioners who seek to understand how these changes affect teaching and interaction [14].

Worldwide, there is a growing interest in studying the impact of technology on educational processes and communication in online environments. Various studies conducted in different countries focus on the cultural, social, and psychological aspects of digital communication in educational institutions. For example, in Asia, attention is directed toward how technology influences traditional teaching methods, while in Europe, more emphasis is placed on developing digital skills to enhance the quality of education [15].

In addition to the positive aspects, this study also identified contradictions in theory, methodology, and practice. Divergent perspectives on assessing online communication culture can lead to disparities in research findings. Some studies highlight the negative impact of digital activity on interpersonal relationships [16], while others reveal the potential of technology to improve communication and learning [17].

Theoretical and methodological conflicts in research evaluating online communication culture are complex issues that may arise due to different viewpoints on the influence of technology and communication in education. Some researchers focus on the negative aspects of digital activity and emphasize the possibility of losing deep interpersonal relationships due to the pervasive influence of technology [18]. This underscores the risk of isolation and loss of emotional closeness that may arise from the fascination with digital forms of communication. On the other hand, there is a plethora of research asserting that technology can enhance communication. These researchers highlight positive aspects of digital communication, such as expanding the circle of communication, increasing access to information, and creating new opportunities for collaboration and knowledge exchange [19].

In addition to various perspectives on the impact of technology, there are also highly diverse methods of assessing online communication culture. Some studies employ qualitative methods such as interviews and focus groups to understand participants' personal experiences and perceptions [20]. Others prefer quantitative

approaches, such as surveys or statistical analysis, to measure general trends and patterns in the use of digital technologies [21]. These methodological differences hinder the comparison of results and the development of a common approach to assessing online communicative culture. Standardizing methods can be challenging due to the diversity of technology usage and the multitude of cultural, social, and personal factors influencing communication practices [22]. However, the diversity of methods and approaches deepens the understanding of the issue, enabling researchers to examine it from various angles and uncover new aspects of the impact of digital activity on communication and interaction.

Gaps in research concerning the assessment of network culture underscore the importance of further development and expansion of academic analysis in this field. One of the main shortcomings is the limited number of interdisciplinary studies that consider both psychological and sociological aspects of this topic [23]. Psychological studies may focus on internal aspects of perception and behavior in the online environment, while sociological studies can identify the influence of digital activity on broader social trends and structures [24]. Integrating these two approaches can lead to a deeper understanding of how digital technologies impact communication in the educational environment [2].

The absence of standardized assessment methods also presents a significant challenge for researchers and practitioners in this area. The lack of universally accepted standards and indicators complicates the comparison of results from different studies and the achievement of consensus regarding assessment methods. This can lead to varying conclusions and hinder the development of effective networking culture enhancement strategies [5].

Furthermore, the limited number of longitudinal studies constrains our understanding of the long-term impact of the digital environment on communication skills and relationships in educational institutions. Such studies help identify trends and patterns in communication culture that evolve in response to the rapid changes in the technological environment. They also aid in identifying potential risks and benefits of the long-term use of digital technologies in education [25]. Overall, overcoming these gaps requires efforts from researchers and practitioners in the fields of education and communication. Interdisciplinary approaches, the development of standardized assessment methods, and longitudinal studies will significantly enhance the understanding of network communication culture and facilitate the development of more effective strategies for cultivating network communication culture in the digital era.

In configuring the system for fostering network communication culture and developing digital etiquette, educational institutions aim to create an environment conducive to effective collaboration and interaction online. This entails implementing strategies aimed at promoting positive communication norms, defining rules of conduct online, and enhancing digital literacy among community members. Thus, institutions can optimize the integration of participants into online communities, ensuring their engagement, respect, and support during interactions [26].

Referring to the “Concept of Development of Higher Education and Science of the Republic of Kazakhstan for 2023–2029,” an analysis of this document regarding the digital architecture of higher education allows for consideration of various aspects. This includes envisioning the development of education from a local focus on Kazakhstani education to enhancing the demand and competitiveness of Kazakhstani education and its graduates in external markets, transforming three universities into research universities, opening branches of foreign universities in the country, and strengthening the scientific and academic development of Kazakhstani universities. The expected outcomes will be a 70% satisfaction rate with the higher

education and postgraduate education system, as well as a 70% employment rate of graduates in the first year after completing university [27].

Additionally, it is important to note that intercultural communication and the use of modern technologies in education have become central themes in pedagogical research. Pishghadam [28] conducted an in-depth study on the perception of teacher success, trust, and stroke variables among Iranian and Iraqi students. The results demonstrated that students' cultural backgrounds significantly influence the formation of their belief systems and expectations of instructors. Continuing the theme of intercultural interaction, O'Dowd and Dooly [29] focused on tele-collaborative cooperation, or virtual exchange, as a pedagogical approach to foreign language education. They examined various models of virtual exchange and their impact on the development of students' intercultural competence. Deepening the understanding of intercultural communicative competence (ICC), Hoff [30] analyzed Byram's ICC model and its evolution over the past two decades. This work highlights the need for a new theoretical model that meets the demands of intercultural teaching and learning in the 21st century. Barak and Yuan [31] extended the research by exploring the role of project-based learning (PBL) in fostering innovative thinking among international and local students. Their work underscores the importance of considering students' cultural backgrounds when developing educational strategies.

Turning to the digital realm of education, research has focused on the use of social networks for educational purposes. Sharov et al. [32] analyzed the potential of virtual social networks for developing youth social competence. Their survey revealed a growing trend of online communication among students. In the context of public health crises, Greenhow and Chapman [33] investigated the role of social media in overcoming isolation and promoting active learning. They emphasized the importance of integrating social media into remote learning strategies, particularly in response to the COVID-19 pandemic [34].

Thus, the body of research collectively forms a comprehensive understanding of the contemporary challenges and opportunities in the field of education, emphasizing the importance of intercultural competence and the effective use of digital technologies in the learning process. These studies provide valuable insights for educators and curriculum developers, aimed at enhancing the quality and effectiveness of education in an increasingly globalized and technologically advanced world.

3 METHODS AND MATERIALS

3.1 Study Design

The study was conducted using a comprehensive approach that incorporated both quantitative and qualitative data collection methods. The primary research instruments included structured questionnaires, in-depth interviews, and focus groups.

3.2 Sampling

The study on the culture of online interaction between faculty and students was conducted at three universities in Kazakhstan: Eurasian National University, Kazakh National University, and Almaty University of Power Engineering and Telecommunications. A total of 220 students (1st to 4th year) from various disciplines participated in the survey, including Information Technology (80 participants),

Economics and Management (60 participants), Humanities (50 participants), and Technical Sciences (30 participants). The study also involved 104 faculty members from the departments of Information Technology, Economics and Management, Humanities, and Technical Sciences. The age range of participants was as follows: students, from 18 to 23 years old, and teachers, from 30 to 45 years old. The selection of these educational institutions was driven by their diversity and representation in various fields of education and scientific disciplines. Including these three different educational institutions in the sample allowed for obtaining more detailed and comprehensive data on the level of network communicative culture among teachers and students in different areas of education. Such an approach ensured a comprehensive understanding of contemporary trends in the interaction between teachers and students in the digital space across various fields of higher education in Kazakhstan.

The primary instrument for collecting quantitative data was a structured questionnaire designed for both teachers and students, developed based on the theoretical framework of the study (see Appendices A and B). This theoretical foundation included concepts of digital literacy, online etiquette, and effective communication in digital environments. Each section of the questionnaire contained five to 10 questions, assessed using a 5-point Likert scale (ranging from 1 – "strongly disagree" to 5 – "strongly agree"). The scale was adapted from previous studies on digital communication and tailored to the context of higher education in Kazakhstan. The questionnaire was implemented through the Google Forms platform, which facilitated convenient data collection and initial processing. Quantitative data analysis was conducted using the statistical software package SPSS, employing descriptive statistics, as well as correlation and factor analysis methods to identify key trends and relationships between various aspects of online interaction culture.

The interviews consisted of open-ended questions, allowing respondents to elaborate on their experiences with online interactions, the challenges they face, and their vision of an ideal model for digital communication in the educational environment. The interviews were conducted online via the Zoom platform, recorded (with participants' consent), and transcribed for further analysis. Additionally, six focus groups were organized (three with students and three with faculty members), each consisting of eight to 10 participants. The focus groups were conducted online using the Zoom platform and moderated by an experienced facilitator. Topics that emerged from the questionnaire and interview analysis were discussed in the focus groups, providing a deeper exploration of specific aspects of online interaction and a collective perspective on challenges and potential solutions. Qualitative data (from interviews and focus groups) were analyzed using thematic analysis methods.

The interviews with faculty members and students were designed to deeply explore their experiences with online interaction in the educational environment. The questions addressed five key thematic areas: 1) overall experience with online interaction, 2) challenges and difficulties, 3) the effectiveness of digital tools, 4) the culture of online communication, and 5) their vision of an ideal digital communication model. Participants were invited to describe their experiences using various digital platforms, discuss specific challenges they encountered, assess the effectiveness of current tools, characterize the existing culture of online communication, and suggest ways to improve it. Special attention was given to strategies for overcoming communication barriers, enhancing digital literacy and etiquette, and envisioning the ideal model of interaction between faculty and students in the digital space. The interviews also included questions regarding the impact of online communication on the quality of the educational process and suggestions for improving existing digital platforms.

Focus groups were conducted to further investigate the collective experiences and opinions of participants regarding the culture of online interaction in the educational context. The discussions encompassed five core themes: 1) current trends in online communication between faculty and students, 2) advantages and disadvantages of various digital platforms, 3) ethical aspects of online communication in an academic setting, 4) strategies for overcoming communication barriers in the digital space, and 5) the development of recommendations for improving the culture of online interaction in higher education institutions. Participants were encouraged to discuss how communication culture has evolved with the shift to online formats, which digital tools they found most effective for educational communication, how to encourage more active student participation in online discussions, what ethical issues arise in digital communication, and how they can be addressed. Special focus was placed on sharing experiences of successful online interaction practices and collaboratively developing suggestions for enhancing the digital educational environment at universities.

Based on the analysis of all collected data, a smart university model with a digital environment was developed. This model included recommendations for the implementation of additional digital tools, such as Google Classroom, Zoom for Education, and Quizlet, aimed at improving the interaction between faculty and students. The model was created using Microsoft Excel with the SmartArt feature and visualized in the form of a diagram (see Figure 1). Following the development of the model, a two-week pilot implementation of the proposed digital tools was carried out. After this period, a discussion was organized among students and faculty to evaluate the experience of using the new approach, allowing for direct feedback and necessary adjustments to the model.

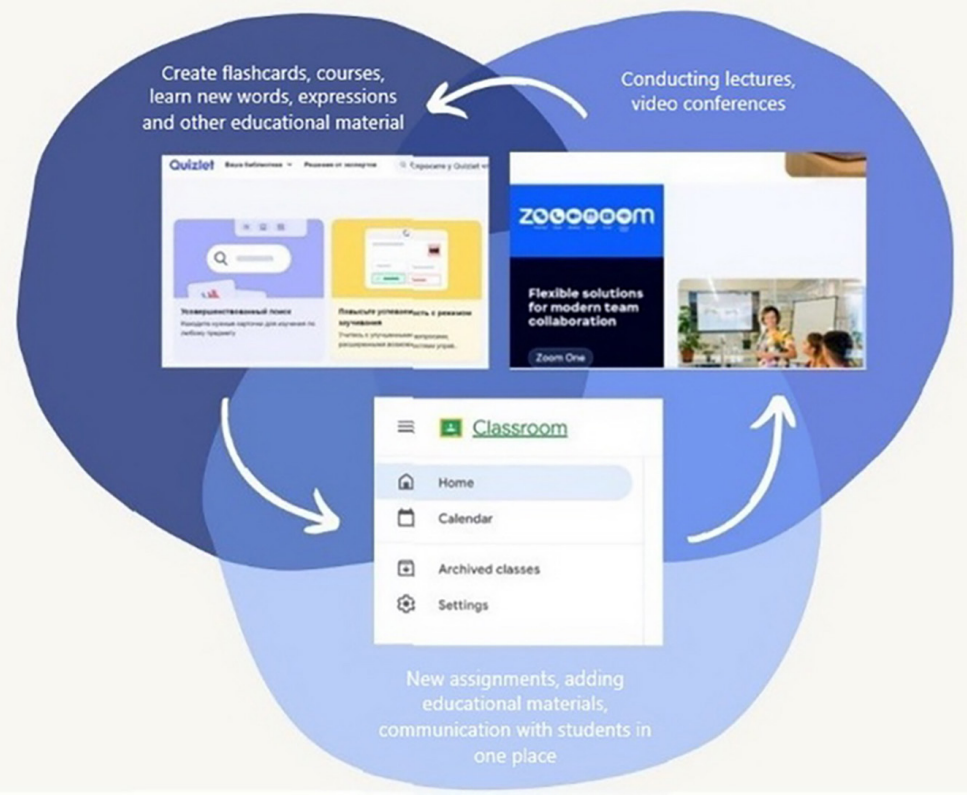

Fig. 1. Scheme of additional digital application tools for enhancing teacher-student interaction in the learning process

Source: Author's own content.

The study also involved the development of a smart university model with a digital environment. This was a crucial stage of the process, as an ideal model was formulated according to their needs, which would meet the requirements of the modern educational environment [1]. Surveys, discussions, and focus groups provided valuable feedback from participants in the educational process. Students and teachers expressed their preferences regarding the functionality, quality, and usability of digital tools for educational purposes. Special attention was paid to online resources, such as mobile applications and platforms, which can support effective interaction and contribute to the development of the learning process. Based on the data obtained, a model was developed that takes into account all aspects of the educational process, from organizing class schedules to communicating with teachers and students. This model is designed to stimulate a highly effective learning environment, where each participant has the opportunity to receive quality education and develop as a professional. This model was developed using Microsoft Excel with the SmartArt feature.

3.3 Ethical issues

During the research process, participants were guaranteed the protection of their personal data and anonymity. The main goal and objectives of the study were communicated to all research participants. Additionally, all participants provided informed consent to participate in the study.

4 RESULTS

One aspect of the study aims to analyze the usage and perception of digital communication tools in the educational environment. Table 1 provides the result of the survey of the students.

Table 1. Survey results for students

Usage of the Internet for Educational Purposes	%	Digital Communication Tools	%	Satisfaction with the Level of Communication with Instructors Through Digital Applications	%	Feeling of Support	%
Every day	70%	Email	27%	Yes	82%	Yes	92%
Several times a week	30%	Online chats	73%	No	18%	No	8%

Source: Author's own.

Usage of the Internet for educational purposes: Daily (70%): The majority of participants regularly utilize the Internet for learning new material, searching for information, and completing assignments. Several times a week (30%): This group also actively uses the Internet for academic activities, indicating the significant influence of digital technologies on the learning process.

Digital communication tools: Email (27%): A small percentage of participants use email for communication during the educational process. This may be associated with communication practices in different institutions or simply reflect a preference for using other means. Online chat (73%): The majority of participants actively

utilize online chat for communication with classmates, instructors, and other members of the educational environment.

Satisfaction with the level of communication with instructors through digital applications: Yes (82%): High satisfaction indicates the effectiveness of using digital applications for communication with instructors. This fosters open and productive information exchange, leading to enhanced student learning. No (18%): Although this group is small, it is important to identify the reasons for dissatisfaction to improve communication and understanding.

Support: Yes (92%): The high level of support from instructors for digital programs suggests that technologies are well integrated into the educational process, creating an appropriate environment for learning and communication. No (8%): Although this group is small, it is important to address issues that may lead to a lack of support to ensure the full development of students' potential.

The next stage involved conducting a survey among instructors (refer to Table 2).

Table 2. Survey results for instructors

Assessment of Communication Skills in the Digital Environment	%	Frequency of Using Digital Communication Tools	%	Frequency of Using Social Media for Communication	%	Dependence of the Effectiveness of Using Digital Tools on University Preparation and Support	%
Low	10%	Every day	78%	Every day	62%	Yes	76%
Medium	25%	Several times a week	18%	Several times a week	12%	Not	10%
High	65%	Rarely	4%	Rarely	26%	Not Sure	14%

Source: Author's own.

Assessment of communicative skills in the digital environment: The results indicate that 10% of teachers consider their communicative skills to be low. This suggests that the use of digital tools requires additional training and support. 25% of teachers reported an average level, indicating optimal use of digital tools. A large number of participants (65%) rated their communicative skills as above average, indicating that they possess a high level of proficiency in using digital skills for effective utilization of digital tools in their work.

Frequency of using digital resources: A large proportion of teachers (78%) stated that they use digital resources every day. This reflects the widespread use of digital tools in education. Another 18% use these resources several times a week, indicating frequent usage, while only 4% use them rarely. This may suggest that they need additional support or training in using digital tools.

Frequency of using social networks for communication: The majority of teachers (62%) use social networks for communication every day. This indicates that these platforms are frequently utilized for communication and information exchange. The remaining 12% used them several times a week, while 26% used them rarely. Such distribution may reflect teachers' personal preferences regarding the use of social networks. Most teachers (76%) stated that their ability to effectively use digital tools largely depends on the training and support they receive at their university. The results demonstrate the importance of support and training for the successful utilization of digital technologies in the educational process.

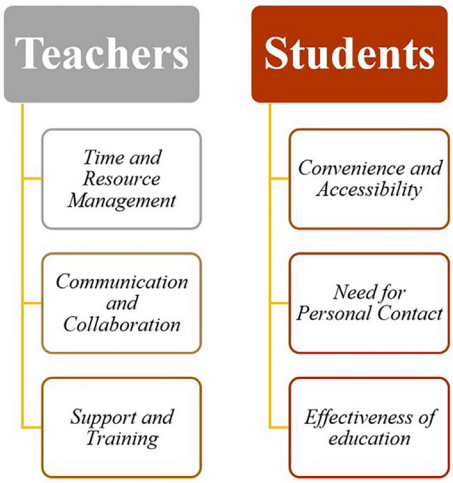

Fig. 2. Results of interviews with teachers and students

Source: Author's own content.

The results of interviews with representatives of both groups–teachers and students–reflect the diversity of opinions and experiences regarding interaction in the digital space of universities. Detailed results are provided below (see Figure 2). Teachers highlighted the importance of effective time and resource management through digital tools, noting that electronic calendars and online resources streamline scheduling and material preparation, enhancing productivity. They appreciated the role of digital platforms in facilitating quick communication and collaboration on projects, even across distances. However, they stressed the need for university-supported training and resources to improve their digital skills, particularly for those less experienced with digital tools, and expressed a desire for ongoing feedback and support to optimize their use of technology.

The study on students' attitudes towards the use of digital tools in education revealed various aspects of their impressions. The survey indicated that students generally have a positive view of the opportunities provided by digital technologies; however, they also expressed certain concerns about the replacement of personal interactions with faculty. Several key statements have been presented to illustrate their perspectives:

Student A: *I find digital tools incredibly convenient for accessing study materials and communicating with my teachers. Being able to watch video lectures, complete assignments, and take tests online makes my study process much smoother, especially since I juggle many responsibilities and have limited time. However, I do miss personal interactions. When it comes to explaining complex topics or understanding intricate rules, discussing them directly with my teacher seems more effective than relying solely on digital communication. Building personal connections and getting real-time advice is still important to me.*

Student B: *Digital tools have greatly enhanced my learning experience by making educational materials readily available at any time and on any device. This flexibility allows me to organize my studies around my other commitments, which is a huge advantage. I also appreciate being able to quickly get answers and feedback from my teachers through online channels. Yet, I sometimes feel that replacing face-to-face interaction with digital communication can be a drawback, particularly for nuanced discussions or when I need more personalized guidance.*

Student C: *Overall, I am satisfied with how digital tools support my learning. They allow me to access information, participate in online lectures, and submit assignments*

efficiently, which is essential given my busy schedule. The ability to communicate with teachers through digital platforms has been very helpful, as I can get prompt responses to my questions. However, I believe that some aspects of learning, like building relationships with teachers and receiving in-depth explanations, are best achieved through personal interaction rather than digital means.

Fig. 3. Results of interviews with teachers and students

Source: Author's own content.

During the conduct of focus groups with representatives from both groups–both teachers and students–several key findings and observations were identified (see Figure 3). The focus group participants expressed a variety of viewpoints and experiences regarding the interaction and collaboration between teachers and students. They emphasized that active interaction and collaboration stimulate the learning process and enrich knowledge through the exchange of ideas, perspectives, and experiences. Additionally, participants highlighted that the exchange of ideas and opinions between teachers and students is a crucial aspect of the learning process. It provides students with additional explanations and answers to questions, enabling teachers to better understand the needs and interests of their students. Focus group participants noted that discussing different viewpoints and analyzing arguments helped them develop critical thinking and information analysis skills. They also stated that discussing various perspectives and approaches helped them see the topic from different angles and provided them with a deeper understanding.

Focus group participants expressed various opinions and perspectives on optimizing the learning process through digital tools. They emphasized the importance of accessibility and convenience of online resources, electronic learning materials, and communication platforms in facilitating learning and providing a more flexible approach to study materials. Some participants stated that the use of digital tools can, in particular, facilitate access to resources, stimulate active interaction, and contribute to effective assimilation of the material. During an in-depth discussion, focus group participants expressed various needs and expectations regarding the university environment's use of digital tools and communication. Many participants emphasized the necessity of active support from the university in utilizing digital tools. They expressed a desire to access resources, courses, and consultations aimed at improving skills in using and integrating digital technologies into the educational process. Some focus group participants pointed out the importance of creating a comfortable and friendly environment for learning and communication.

After participating in the focus group, participants continued their education using additional digital tools. The results of the discussion following the training can be seen below (see Figure 4).

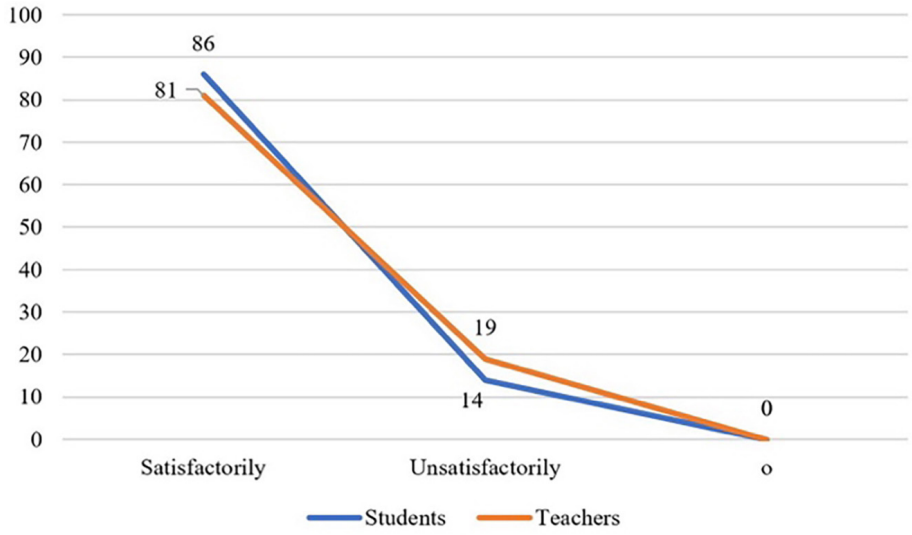

Fig. 4. Results of the discussion after training with additional digital tools

Source: Author's own content.

Totally, 86% of students reported being satisfied after being trained with additional digital tools such as Google Classroom, Zoom for Education, and Quizlet. Students noted that using these resources made it more comfortable and convenient to communicate with their instructors. They also remarked that learning became more engaging and enriched. This indicates a positive outcome of implementing such applications and online platforms for education in higher educational institutions. Such an approach allows students and instructors to interact in a comfortable and relaxed environment.

However, 14% of students expressed dissatisfaction with the teaching methodology offered. Some students reported difficulties in fully understanding the interfaces of online platforms, and a negative aspect was that they could not always ask questions directly to the instructor during classes. Some complained about technical issues that may arise when using digital tools, such as internet connectivity problems or difficulties in accessing materials.

Also, 81% of instructors deemed this teaching method effective and were satisfied with the results of using additional digital tools. According to their feedback, such online platforms help better organize the educational process, facilitate communication with students, and provide new opportunities for conducting interactive lessons and assessments. Teachers also highlighted the advantages of using digital tools such as webinars and online quizzes and the ability to tailor instruction to each student individually. They noted that with the help of these tools, educational materials can be better adapted to the needs and learning paces of individual students, thereby improving the overall learning process. These positive reviews from instructors underscore the importance of integrating digital tools into the educational process and their role in modern pedagogy. They also emphasize the importance of preparing teachers to use and adapt new technologies to ensure quality education. However, 19% of instructors expressed dissatisfaction with the proposed teaching methods and the use of additional digital tools. Some of them were disappointed by the loss of personal contact with students and the ineffectiveness of online formats for presenting complex content. Additionally, some instructors noted

the difficulty of organizing and conducting online classes, particularly in terms of resolving technical issues and ensuring the active participation of all students. For some instructors, the transition to online teaching required additional preparation and adaptation to new technologies, which posed particular challenges and disappointments.

Furthermore, the authors have developed a model of a smart university with a digital environment for greater efficiency of the educational process, taking into account the suggestions and preferences of students and instructors (see Figure 5).

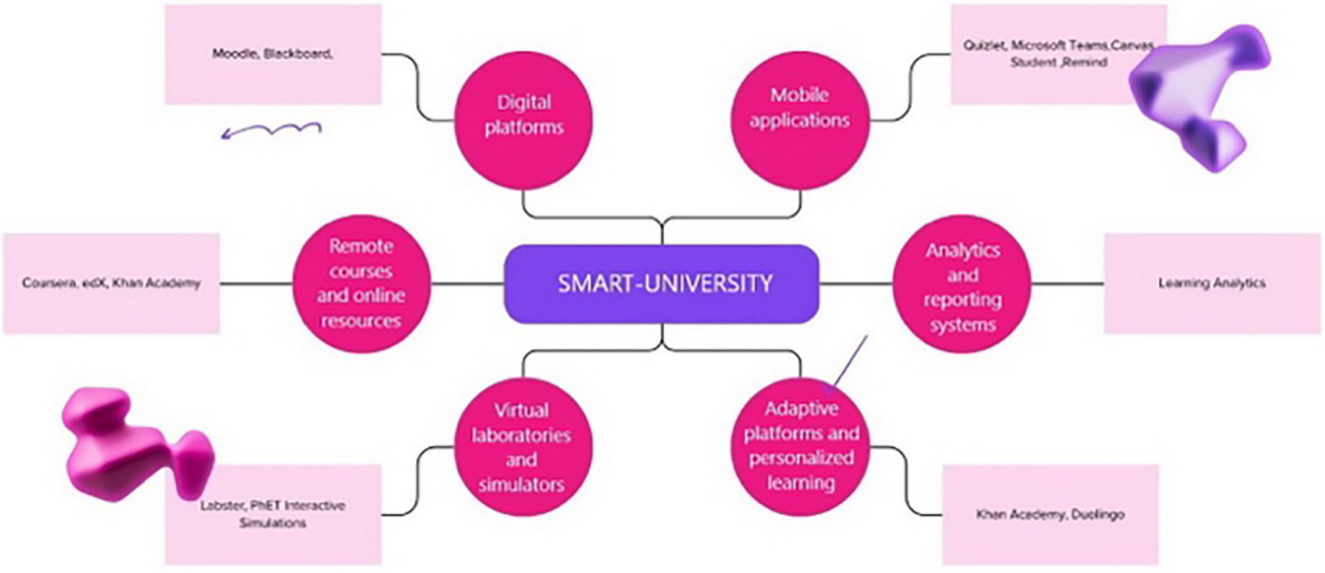

Fig. 5. Model of a Smart University with a digital environment

Source: Author's own content.

Figure 5 illustrates the conceptual model of the "Smart University" (SMART UNIVERSITY), centered in the diagram, around which various integrated components are positioned to emphasize a comprehensive approach to the modern educational environment (see Figure 5). The central concept of "SMART UNIVERSITY" is surrounded by key elements, including digital infrastructure, which provides the technical foundation through high-speed internet and cloud technologies; interactive learning platforms, such as Google Classroom and Zoom for Education, aimed at enhancing the educational process; knowledge management, encompassing the organization and storage of educational resources; an adaptive learning environment, which personalizes learning through artificial intelligence; virtual laboratories, offering access to practical experiments online; learning analytics, which assesses the effectiveness of the educational process; artificial intelligence in education, for automating and supporting learning; and cybersecurity, which protects the university's information systems. The diagram employs vibrant colors, predominantly shades of pink and purple, and includes decorative elements such as speakers, which enhance visual appeal and underscore the importance of communication and information dissemination in creating an effective and integrated educational environment.

Table 3. Categorization of digital educational tools and their functional capabilities

Digital Educational Tools	Examples	Functions and Capabilities
Educational Platforms	Moodle, Blackboard, Canvas	Communication between students and instructors Material and assignment exchange Participation in discussions Assessment of learning outcomes Feedback and progress analysis
Remote Courses and Online Resources	Coursera, edX, Khan Academy	Access to a wide range of courses Learning from experts in various fields Possibility of obtaining certificates and online diplomas Free and paid learning options
Virtual Laboratories and Simulators	Labster, PhET Interactive Simulations	Practical experience in a virtual environment Expansion of learning opportunities in remote conditions Requires appropriate equipment and software
Adaptive Platforms and Personalized Learning	Khan Academy, Duolingo	Individualized learning approach Analysis of student responses Selection of materials according to needs and knowledge level
Analytical Systems and Reporting Systems	Learning Analytics	Tracking academic progress of students Identification of difficulties Providing recommendations for improving the learning process Data analysis and identification of trends

Table 3 provides a comprehensive overview of various categories of digital educational tools, highlighting their functional capabilities. It includes digital learning platforms, such as Moodle and Canvas, which support communication, material exchange, assessment, and feedback. Remote courses and online resources, such as Coursera and Khan Academy, offer access to a wide range of courses and certificates. Virtual laboratories, such as Labster, provide opportunities for practical experience in an online environment. Adaptive platforms, such as Duolingo, offer personalized learning by tailoring materials to the student's needs. Analytical systems, such as learning analytics, assist in tracking academic progress, identifying difficulties, and providing recommendations to enhance the learning process. This table illustrates how different tools can be integrated to improve the educational process through various functional capabilities. Such a broad range of tools underscores the importance of integrating technology into modern education to ensure an effective, adaptive, and personalized learning environment.

4.1 Mobile applications

Mobile applications, such as Quizlet, Microsoft Students, Canvas Students, and Remind, which encompass various functions from scheduling organization to communication with teachers and students, also enable students to stay connected to their education at any time and from any place (see Figure 6).

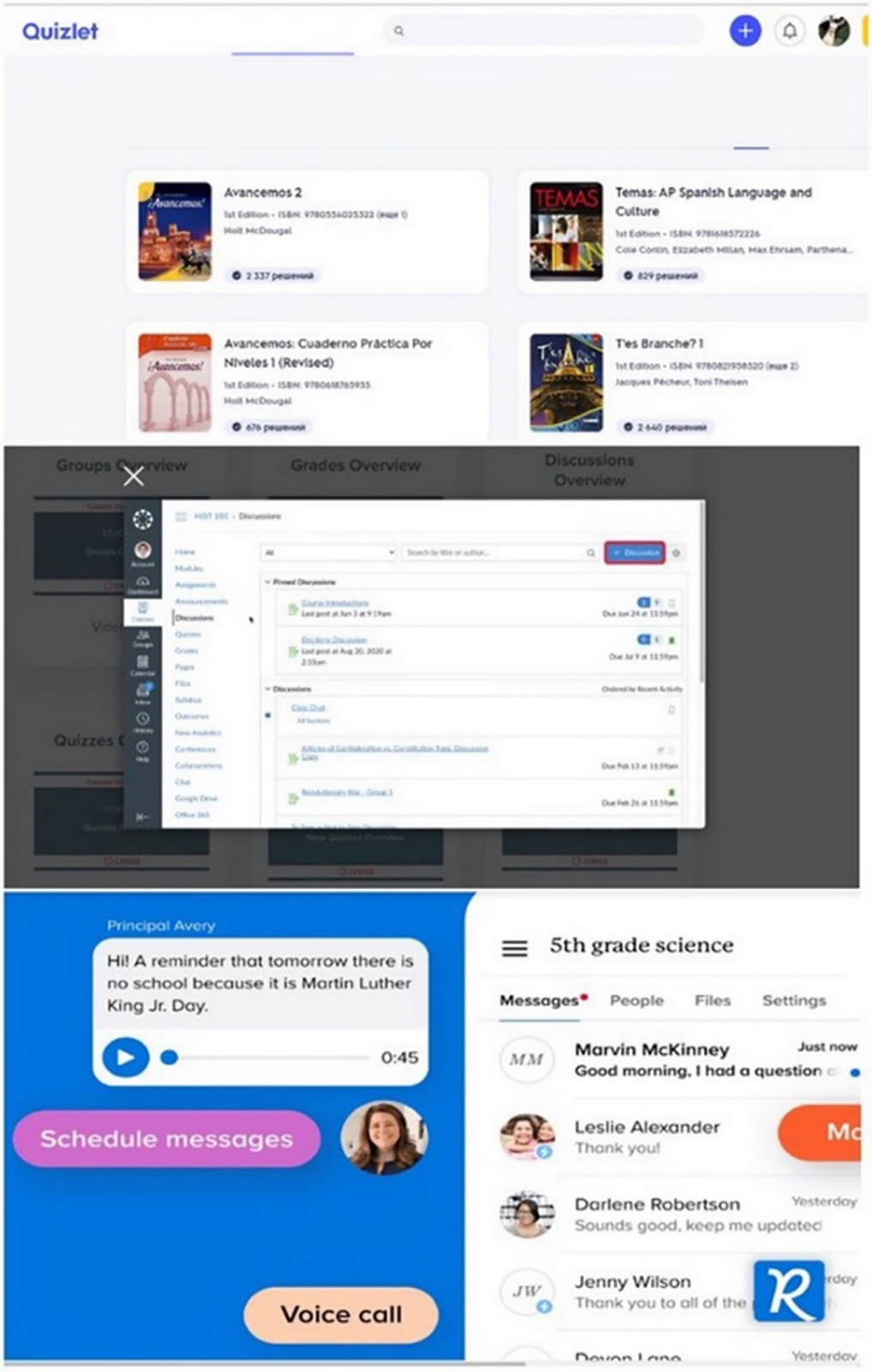

Fig. 6. Screenshots from the mobile applications: Quizlet, Canvas Students, and Remind
Source: Created by the author based on the mobile applications Quizlet, Canvas Students, and Remind.

These applications enable students to easily track their schedules, assignments, and other important events, offering customization options for notifications and reminders. Students can interact with instructors through message exchanges, forums, or chats, facilitating asking questions, discussing materials, or jointly solving problems. The applications allow students to access educational materials such as lectures, textbooks, video tutorials, and more conveniently and readily from their mobile devices. Some applications, such as Quizlet, provide students with the ability to take tests, complete exercises, and track their academic progress, aiding in identifying weaknesses and improving academic performance. Applications can send students important announcements, updates, and other information through notifications on their mobile devices, allowing them to stay connected to their studies at all times and from anywhere.

5 DISCUSSION

Comparing the results of this study with similar research allows for identifying both similarities and differences in the perception and usage of online communication tools by both instructors and students. Both instructors and students view online communication tools as indispensable for facilitating learning and communication [35, 36]. Such shared understanding of the importance of technology in the educational process reflects the rapid development of modern approaches to teaching and interaction. The use of digital media becomes a key factor in creating a dynamic and convenient learning environment conducive to active communication, exchange of experiences, and effective learning. Thus, the convergence of views on the role of online tools in the educational process attests to their necessity and importance for successful learning in the modern world.

Researchers also point out the diversity in the choice of communication methods. For example, students prefer online chat for communication with instructors and classmates. This preference is explained by the fact that online chat is a faster and more convenient means of communication [37]. At the same time, another study highlights the growing popularity of email, as it is considered a more formal and reliable means of communication among participants in the educational process [38]. This diversity in the choice of communication means indicates that the selection of a particular tool may depend on several factors, namely the type of communication, the type of information, the level of confidentiality, and the personal preferences of users.

These factors should be taken into account when developing communication strategies in educational institutions, as this allows for addressing individual needs and creating optimal conditions for effective communication. Comparing various studies shows how diverse the approaches to supporting the use of digital tools in universities are. Some authors emphasize the need for active support and training from universities and highlight the importance of organizing professional courses, training sessions, and consultations for both teachers and students [39]. This demonstrates that without proper support, the use of digital tools can be limited or ineffective [40]. On the other hand, it enhances the user's independence in this matter. It also underscores the importance of self-directed learning and information seeking, as well as fostering the initiative of students and teachers in using digital resources. Spontaneity and autonomy in learning digital tools are key to their successful use in the educational process [41]. Such a variety of approaches indicates that universities' approaches to the use of digital tools may vary depending on the context,

organizational philosophy, and user needs. The ideal strategy involves combining intensive efforts with personalized support to achieve a balance between standardization and flexibility, which corresponds to the individual needs of each student.

The practices of other countries demonstrate various opportunities for integrating digital environments into education. For instance, China actively utilizes the "Internet Plus Education" program to facilitate the integration of digital technologies into the educational process. The government invests in the development of digital infrastructure and educational platforms that support distance learning and access to online resources [42].

In European countries, there are programs aimed at digitizing education and developing digital skills for students and teachers. The government seeks to ensure access to educational online resources at all levels of education, including schools and universities [43]. In the United States, there is active development of programs aimed at enhancing technological infrastructure in education and integrating digital tools into the learning process. Federal grants and initiatives support the creation of online education, virtual classrooms, and platforms for distance learning [44].

Depending on the context and methodology, differences in the level of communication skills between teachers and students may be reflected in various studies. Some studies have shown that the majority of teachers and students possess a high level of communication skills in the digital environment and express confidence in using various communication tools and social networks for interaction and collaboration [45]. However, other authors point to a more diverse range of skills, covering both high and moderate or low levels of communicative abilities. For example, some teachers and students may experience difficulties in using digital tools for effective communication, possibly due to a lack of experience or confidence in technology usage [46–48].

Such diversity underscores the necessity for differentiated approaches to the development of communication skills in higher education. It is important to differentiate the needs of various user categories and provide individual support to less experienced users. Access to educational resources, training, and consultations can help reduce the gap in communication skills and contribute to the overall improvement of communicative culture in the university.

Despite the diverse fields represented by the selected universities, the research results may not encompass the entire diversity of higher education in Kazakhstan. It should be noted that other universities may have different insights into network communication culture. While structured questionnaires, interviews, and focus group participation are effective methods, they may not provide a comprehensive understanding of the situation. For example, some participants may be less open during interviews or focus group participation, which could limit the results obtained from the data. Focus group participants have shown significant interest in the prospects for further development of interaction in the university environment through the use of new technologies and innovations. Many expressed their opinion on the importance of integrating cutting-edge technologies into the educational process. They expressed a desire to see more innovative tools that would enhance the quality of education and communication among participants in the educational process. Some participants discussed the possibility of developing a virtual platform that would provide access to various educational materials, interactive lessons, and opportunities for collaboration between students and teachers. Participants also expressed a desire to see more opportunities for communication and idea exchange through digital tools. They emphasized that the development of interactive forums, chats, and online conferences could significantly facilitate communication among

participants in the educational process. Also, some wished to see more support from the university in the development and implementation of innovative ideas and projects aimed at improving communication and collaboration in the university environment.

6 CONCLUSION

The research findings demonstrate the widespread adoption of digital technologies among both students and educators. Among students, the high level of Internet usage for educational purposes (70%) and active utilization of online chats (73%) underscores the importance of access to online resources and the variety of communication tools in their learning process. Among educators, there is also significant activity in the use of digital tools; however, there is a certain percentage who report low (10%) or moderate (25%) levels of skills, indicating the need for additional training and support.

The interview results with representatives from both groups underscore the importance of effective time and resource management for educators, as well as the convenience and accessibility of digital tools for students. However, some student's express doubts regarding the replacement of face-to-face interaction with digital tools, emphasizing the value of interpersonal communication. Overall, the majority of students note the positive impact of using digital tools on their learning. Focus group participants highlighted key aspects, including collaboration, optimization of the learning process, and support from the university. They hope for the creation of a comfortable and diverse atmosphere in the university environment through the use of digital tools and communication. The results of the discussion following the use of the proposed digital teaching methods showed that the majority of students have a positive attitude toward such methods, and most educators noted that the integration of digital platforms is a good option for enhancing teaching effectiveness.

Based on the responses and feedback from participants gathered during the survey, discussions, and focus groups, a model of a smart university with a digital environment has been developed to enhance the quality of the teaching process and the communicative connection between teachers and students.

The research findings obtained can be integrated into the structure of humanity's knowledge in the fields of education, pedagogy, information technology, and sociology. They allow for a better understanding of the impact of digital technologies on the learning process and help identify the needs of students and educators regarding the use of digital tools and communication. The obtained results can also serve as a basis for developing recommendations and strategies to optimize the use of digital technologies in educational institutions.

Acknowledgments. The study was conducted as part of the project MNVO RK IRN BR21882318 "Customization of the system for developing network communicative culture, digital etiquette of teachers and students in the 'online community' of the university."

Funding. The research received no funding.

Conflict of interests. Authors declare that they have no conflict of interest.

Data availability. All data generated or analyzed during this study are included in this published article.

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8 APPENDIX

8.1 Appendix A: Assessment of the Level of Network Communicative Culture Among Students of Higher Educational Institutions

How frequently do you use the Internet for educational purposes?
1 – Almost never
5 – Almost every day

How would you rate your communication skills in a digital environment (e.g., email, social networks, online forums)?
1 – Very poor
5 – Excellent

How often do you use digital communication tools during your studies? (e.g., email, chats, forums, video conferences)
1 – Very rarely
5 – Very frequently

How satisfied are you with the level of communication with your instructors through digital means?
1 – Not satisfied at all
5 – Very satisfied

Have you ever encountered conflict situations in online communication?
1 – Never
5 – Very frequently

How well do you know the basic rules of etiquette in online communication?
1 – Not at all
5 – Very well

Does interaction with instructors and peers in an online environment contribute to your learning?
1 – Does not contribute at all
5 – Contributes greatly

How dependent is your academic success on the level of communication in the digital environment?
1 – Not at all dependent
5 – Completely dependent

How strongly do you feel support and collaboration from your peers in the digital environment?
1 – Not at all
5 – Very strongly

Do you feel that your educational institution supports the development of digital communication and collaboration skills?
1 – Does not support at all
5 – Fully supports

How would you rate the level of technology integration into your learning process?
1 – Very low
5 – Very high

How adequately do the instructors and administration of your institution respond to issues related to digital communication?
1 – Do not respond at all
5 – Always respond appropriately

Does the level of network communication impact your academic learning and overall well-being?
1 – Does not impact at all
5 – Impacts greatly

Open-Ended Questions
Which digital communication tools do you consider most effective for learning?

What challenges do you encounter when communicating with instructors and peers in an online environment?

What improvements would you suggest for the digital communication system at your university?

What measures, in your opinion, could enhance digital communication within the educational environment?

8.2 Appendix B: The Assessment of the Level of Network Communicative Culture Among Teachers of Higher Educational Institutions

Evaluate your level of communicative skills in the digital environment (email, chats, video conferences, etc.):
1 – Very low
5 – Very high

How often do you use digital communication tools to interact with students and colleagues?
1 – Never
5 – Daily

How frequently do you use social media to engage with students or colleagues?
1 – Never
5 – Daily

To what extent do you agree that effective use of digital tools requires special training or support from the university?
1 – Strongly disagree
5 – Strongly agree

Assess the level of support and communication with the administration through digital channels (email, online consultations, etc.):
1 – Very low
5 – Very high

How often do you participate in webinars or online courses for professional development?
1 – Never
5 – Regularly

How effective is collaboration with colleagues through digital tools?
1 – Not effective at all
5 – Very effective

To what extent do you agree that the available digital tools are effective for interacting with students?
1 – Strongly disagree
5 – Strongly agree

How do you assess the level of students' proficiency in using digital tools for learning and communication?
1 – Very low
5 – Very high

To what extent do you agree that your university provides adequate support and training for the use of digital tools?

1 – Strongly disagree

5 – Strongly agree

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