International Journal of Evaluation and Research in Education (IJERE)
Vol. 14, No. 3, June 2025, pp. 1904~1915
ISSN: 2252-8822, DOI: 10.11591/ijere.v14i3.29863

The influence of mobile communication technologies in long-term e-learning

Elena Susimenko[1], Alena Gura[2], Alsu Rakhmanova[3], Olga Butylchenko[4]
[1]Department of Foreign Languages, Platov South-Russian State Polytechnic University (NPI), Novocherkassk, Russian Federation
[2]Department of History, Philosophy and Psychology, Kuban State Technological University, Krasnodar, Russian Federation
[3]Department of Pedagogy, Yelabuga Institute of Kazan Federal University, Yelabuga, Russian Federation
[4]Department of Phthisiopulmonology and Thoracic Surgery, I.M. Sechenov Fist Moscow State Medical University, Moscow, Russian Federation

Article Info

Article history:

Received Jan 4, 2024
Revised Nov 28, 2024
Accepted Nov 31, 2024

Keywords:

Communication competencies
Coping adaptation
Distance learning
Mobile-based learning
Technology adaptation

ABSTRACT

Communicative abilities constitute a crucial element of successful learning and interaction. The psychological impact of the prolonged lack of face-to-face contact with the peer audience and teachers typically remains an unresolved problem, despite the availability of appropriate online learning methodologies and technical tools. This study aims to ascertain a quantitative assessment of social maladjustment and a reduction in the level of communicative competence resulting from prolonged distance learning and the use of mobile devices in communication. The research employs a quantitative approach and is based on a survey of students who participated in eight socio-psychological training sessions (A-trainings). The training sessions are oriented towards refining the personal qualities of individuals and facilitating their adaptation to the fluctuating conditions of learning environments. The analysis of pre-and post-training results was compared with the results of the control group. The research findings indicate a positive impact of socio-psychological training on the enhancement of communicative skills and emotional well-being of students.

Corresponding Author:

Elena Susimenko
Department of Foreign Languages, Platov South-Russian State Polytechnic University (NPI)
132 Prosveshcheniya Street, Novocherkassk, 346428, Russian Federation
Email: e.susimenko@npi-tu.ru

1. INTRODUCTION

In recent years, due to the information technology revolution, many educational institutions have switched to online learning. The use of mobile applications has allowed teachers and students to communicate with each other in video or text format [1], [2]. This type of learning requires teachers to use various digital resources to solve problems and implement online learning [3]. The question that needs to be resolved is whether online classes have become effective among schoolchildren and students compared to traditional classes or not. There is a need to study the effectiveness of teaching, skills, and responsiveness of the teacher during online classes, which contributes to the perception of students of the effectiveness of online classes [4].

Distance learning is a concept that is closely related to the development of information and communication technologies and is referred to as remote learning, online learning, and learning from home [5]. This concept is defined as learning from home while the common element of distance learning is not the home, but the use of computers and remote communication technologies that change the form and scope of work [6]. The most important difference between online and classroom learning has become the

greater independence of students. It provokes the formation of an individual learning trajectory or can provoke weaker involvement, lack of motivation, anxiety, and poor academic results [7], [8]. The negative outcomes of online learning are strongly associated with reduced teacher control without the in-person presence and motivation of classmates [9]. These problems can be addressed with existing and constantly improving learning tools and dedicated learning platforms and courses [10].

Based on previous studies, various impacts of the application of mobile devices and online learning, in particular, were considered. These are learning ability, analytical ability, creativity, and critical thinking [11]. Some studies indicate that online students tend to actively seek information, programs, and learning tools on their own [1], [12]. In addition, the evaluation of the implementation of training was noted as an advantage of the media use. It was found that critical thinking skills and independence in completing tasks were improved. It was also concluded that the level of critical thinking among the respondents increased due to the use of advanced information technologies in the learning process. A student questionnaire revealed an improvement in creativity when doing homework in the context of a high degree of mobile media exploitation. Self-directed learning helps students improve their problem-solving skills and take responsibility for managing time and workload [13].

The unified theory of acceptance and use of technology (UTAUT) is effectively used in several studies to assess the intention and behavior of users during technological changes [10]. It effectively connects the concept of user groups by the rate of technology adoption with the pedagogical concept of different types of learning. Research shows that coping with the challenges of online learning is closely related to the willingness to accept, master, and intentionally use new technologies for learning and development, which makes this theory valuable within this approach [7], [8], [14]. In the case of online learning, student satisfaction is seen as an indicator of the quality of the education system [15]. The UTAUT model enables the assessment of various factors, such as performance expectancy, effort expectancy, social influence, and facilitating conditions, in order to understand how these factors, affect students' acceptance of technology. This study integrates these theoretical foundations to analyze how students adopt and use new technologies in online education. Specifically, the UTAUT model is utilized to assess the factors that influence the success of integrating VR technologies into dance education. The paper evaluates how students perceive the impact of using mobile devices on their learning ability and social adaptation. The study also examines how pressures from peers, teachers, and parents affect students' use of technology. This research also involves the theory of active learning, which is implemented through socio-psychological training sessions designed to improve the personal qualities of individuals and adapt them to changing learning conditions. This approach actively engages participants in the learning process and promotes their personal development.

The COVID-19 pandemic has led to a rapid transition to online learning, making the community of inquiry (CoI) relevant for establishing meaningful and effective online learning [16]. The CoI structure suggests that social, cognitive, and teaching presence are essential elements that allow for a successful educational experience in computer-based distance learning environments [17]. Social presence is defined as the ability of online learning participants to communicate in person, express their opinions effectively, and perceive others as real people. This component plays a key role in overcoming social maladjustment and improving communication competence. In one of the studies, the task was to understand how the use of CoI affects students' actual learning outcomes by including student empowerment as an essential aspect. The results have shown that student empowerment has a direct and positive impact on students' actual learning outcomes and partially mediates the relationship between CoI availability and learning outcomes [16]. Another study examined the impact of the CoI learning model and learning styles on students' social skills [18]. The experimental group used the CoI learning model, while the control group used the cooperative learning model (comparison). The results of the experiment revealed significant differences in social skills between the two groups of students. The researchers focused on visual, auditory, and kinesthetic learning styles and found that an interaction between the CoI learning model and learning styles impacts students' social skills. The results of another article revealed no association between students' perceptions of their participation in CoI and any of the three indicators of academic achievement evaluated by the teacher. This indicates that the efficiency of the CoI structure as a model of the educational process remains in doubt [17].

Research shows that teacher presence and social presence are critical to successful online learning. In particular, social presence contributes to a sense of community, emotional support, and developing interpersonal skills [18]. The presence of a teacher provides structure, guidance, and individual support, positively affecting the social adaptation and communication skills of students [17]. Thus, the incorporation of social and teacher presence within online learning can effectively reduce social maladjustment and enhance students' communication skills, thereby contributing to their successful transition to distance learning.

Tomé-Fernández *et al*. [9] conducted a study to assess the factors influencing e-learning. They examined students' perceptions of e-learning across various universities utilizing electronic learning platforms. It was found that instructor perspective, service quality, and system quality are among the key components influencing e-learning. Factors considered within the study of online learning must include

student and teacher interaction, student and student interaction, and student and curriculum interaction. The engagement of students in online lessons has increased due to the quick response of the instructor to student requests for accessibility and a user-friendly interface of online training programs [8]. Another higher education study conducted by Milic and Simeunovic [19] assessed student acceptance and use of virtual learning environments and provided recommendations for the design and implementation of e-learning in higher educational institutions and schools focusing on the impact of pedagogical methods on student efficiency by creating an efficient virtual world.

Thus, the primary objective of this study was to assess the fundamental parameters of communicative competence among a cohort of first - and second-year university students forced to transition to online learning early in their academic program. The research hypothesis posits that the conduct of socio-psychological training and the implementation of adaptive strategies may mitigate the negative impact of the transition to distance learning, fostering the improvement of communicative skills and facilitating the psychological adaptation of students to the new learning conditions. The primary inquiries that this study aims to investigate are as:

i) How does the transition to distance learning impact the level of communicative competence among first and second-year students?
ii) What correlations exist between social maladjustment and changes in communicative competence during the transition to online learning?
iii) What strategies and approaches can be employed to enhance the communicative skills of students in new learning conditions?

The chosen research is motivated by the necessity to comprehend how virtual learning and the use of mobile devices impact the social maladjustment and communicative skills of students. The surveys and training conducted in the research provide an opportunity to quantitatively assess these changes and identify potential avenues for improving social adaptation and communicative competence in the conditions of modern education.

A gap in scholarly research has emerged due to the limited number of studies dedicated to the issue of declining indicators reflecting the communicative competence of students during shifts in the educational paradigm. According to the classification by Wang and Han [20], there are active learners (learning by doing), sensing learners (learning by discussing possibilities and relationships), visual learners (learning by seeing things), and sequential learners (acquiring knowledge in linear incremental steps). Different types of learners show diverse characteristics in online learning. They require different tools and approaches to learning, and receive academic achievements in different ways [21]. With long-term online learning, these differences are especially noticeable. The research makes a significant contribution to the fields of social psychology and education: it focuses on a crucial aspect of modern education - the utilization of technology and distance learning. Additionally, the research employs a quantitative approach to assess the effectiveness of training sessions and compares results with a control group, thereby ensuring the scientific validity and reliability of the findings. Thus, this study enhances the understanding of the impact of distance learning and the development of socio-psychological strategies to improve the educational process and student well-being.

2. RESEARCH METHOD

2.1. Research design

This study aims to ascertain a quantitative assessment of social maladjustment and a reduction in the level of communicative competence resulting from prolonged distance learning and the use of mobile devices in communication. To achieve the research objective, a survey and experiment were conducted. After the survey and evaluation of indicators of social stability, socio-psychological training aimed at improving the personal qualities of individuals and their adaptation to changing learning conditions was carried out. Subsequently, the progress in improving the adaptive socialization of the focus group participants was compared to the control group's indicators.

This study implied the involvement of the theory of active learning. In this study, this theory was implemented through socio-psychological training aimed at improving the personal qualities of individuals and their adaptation to changing learning conditions. It is widely discussed in the field of education, especially about the introduction and integration of mobile technologies [22]. According to the theory of active learning, dynamic and interactive learning environments allow students to develop personal qualities and adapt to changing learning conditions. Such environments provide for active participation of students in the educational process, stimulating them to independent thinking, discussions and interaction. The use of mobile technologies in this context makes the learning process more effective and motivating for students. In this study, the theory of active learning was employed in socio-psychological training in order to achieve the following outcomes: i) a high level of confidence, communication skills, and self-regulation; ii) the improved

ability to efficiently utilize mobile technologies for learning and communication; and iii) increased motivation to learn through engagement in an active and interactive learning experience.

The methodology employed in this study was chosen because it facilitates a systematic examination of the impact of socio-psychological training on students' development, providing objective data regarding their effective utilization in the context of prolonged distance learning and the use of mobile devices in communication. This design combines both qualitative and quantitative methods. Surveys enable a quantitative assessment of the influence of training on students' levels of social maladjustment and communicative competence. Active learning methods allow for the active engagement of participants in the learning process and contribute to their personal development. The use of a control group permits a comparative analysis of results between groups, thereby identifying the specific impact of the training on the investigated indicators.

2.2. Sample

This study was conducted at I.M. Sechenov First Moscow State Medical University and Platov South-Russian State Polytechnic University (NPI). Advertising regarding the research study was posted around the university campus. Participation was voluntary. Out of 175 students, 96 responses to the research questionnaire were obtained within the established deadline, of which only 92 were correctly filled out. Thus, a sample of 92 students from this university was used for the study. The sample consisted of 40 males and 52 females. The sample size of 92 participants is sufficient to ensure the statistical reliability, representativeness, and generalizability of the study's findings. The sample provided objective data on the efficacy of socio-psychological interventions within the context of online learning and mobile technology usage [23], [24].

The selection criteria for participants in this study were carefully examined to ensure the representativeness of the sample and its conformity to the characteristics of the target population:

- The age range of 17-19 years: age restrictions were imposed to maintain homogeneity in the age composition of the sample, thereby minimizing significant variations in results due to potential age-related characteristics and differences in life experiences.
- Minimum duration of one year of online learning: this criterion allowed for the inclusion of participants with sufficient experience and knowledge of online learning peculiarities, ensuring parity in the initial knowledge levels among participants.
- Consent to participate in the survey and agreement to participate in the educational course: ensuring ethical standards and voluntary participation in the study.

After randomization (random allocation), baseline student demographics were assessed to ensure that the two groups were similar, as shown in Table 1. To include the representatives of different faculties or specializations in the sample, the study applied a stratified selection.

Table 1. Demographic information about participants

Criteria	Description	
	Experimental group	Control group
Number of participants	54	38
Gender	33 male, 21 female	7 male, 31 female
Previous experience of participating in courses/training	Participants	Not participants
Year of study	1st-2nd	
Age	17-19 years	
Minimum duration of online training	1 year	

2.3. Limitations of the sample

The limitation of the sample relates to the specificity of the region of the study as the results are unified specifically for the Russian Federation. At the same time, the number of respondents is relatively small, which indicates the subjectivity of the research findings. The most challenging task was to create an assessment scale that would most comprehensively reflect the psycho-emotional state, which is not a measurable unit. Therefore, the results that we obtained are exclusively subjective and could have been influenced by both the mood of the person at the time of the survey and deliberately overestimated or underestimated judgments. The researchers' explicit/optimistic assumptions regarding the influence of remote learning on social adaptation and communicative proficiencies may have introduced an additional limitation. These assumptions guided the data collection process, which could have resulted in biased data and potentially impacted the study's outcomes. As a result, this potentially biased data collection process might have had an impact on the outcomes of the study.

2.4. Data acquisition

The survey was based on a structured questionnaire (own development) as a research tool. The development and validation of the questionnaire was conducted through a rigorous process that involved literature review, item generation and testing, feedback-driven refinement, and assessment of the tool's reliability. During the literature analysis, the main topics and concepts of the questionnaire were identified. This stage was followed by the formation of initial ideas for the questionnaire items based on theoretical and empirical research. Then specific questions were created that were supposed to explore the key aspects identified in the previous stage. The questions were clear and consistent with the research goals. An initial version of the questionnaire included a set of questions covering various aspects of distance learning and socio-psychological training. The subsequent stage was preliminary testing of the questionnaire on a small group of students (25 people). Their feedback made it possible to improve the wording of questions, their sequence, and format of answers. The tool's reliability was evaluated using Cronbach's alpha, yielding a value of 0.864, which indicates acceptable levels of reliability for the questionnaire.

The structured questionnaire was distributed in the form of a Telegram bot to minimize personal contact between people. All participants received research instructions and signed informed consent to participate in the simulation group. All respondents answered the same online survey questions related to their perception of the effectiveness of distance learning and the aspects of their social life that have changed after switching to the new format of learning. The students responded to the questionnaire items using a Likert scale, ranging from 1, indicating strong disagreement, to 5, indicating strong agreement. After students answered all the questionnaire questions, they could complete the survey. The bot confirmed their completion and saved the collected data. The questionnaire for the survey of 1- and 2-year students of I.M. Sechenov First Moscow State Medical University and Platov South-Russian State Polytechnic University (NPI):

- I find it easy to adapt to the format of distance learning.
- I am satisfied with the level of effectiveness of remote classes.
- My social life has noticeably changed since transitioning to distance learning.
- I feel a deterioration in interaction with classmates during distance learning.
- My communicative skills have worsened due to distance learning.
- I sense a reduction in opportunities for interaction with instructors during online sessions.
- My social relationships during distance learning have become less active.
- I feel less integrated into the student community due to distance learning.
- Distance learning has significantly affected my emotional state.
- I feel stressed due to the loss of personal contact with participants in the learning process.
- I perceive a loss of social support after transitioning to distance learning.
- My ability to interact with others has decreased due to the online format.
- Overall, I am satisfied with distance learning and its impact on my social life.

2.5. Experiment

Prior to the experiment, an online mini-survey was conducted for students to determine if any of them had taken courses or training sessions related to digitization and psychology. Based on their responses, two groups of students were formed: the experimental group and the control group. The experimental group consisted of students who had previously participated in courses/training sessions on psychology or digitization. These students participated in the social-psychological training of this study (A-training). This training addressed two aspects: digital and communicative. Firstly, participants underwent a 5-week course titled "Digital Communications in the Global Space," aimed at enhancing their digital skills and understanding the use of information technologies for personal and professional purposes. Secondly, upon completion of this course, students were offered psychological counseling focused on overcoming communicative barriers associated with distance learning. The control group, in turn, consisted of students who did not participate in any training and continued their regular learning process without additional interventions.

The socio-psychological training program (A-training) was designed to enhance students' adaptation to the new conditions of distance learning and develop their digital and communicative skills. The training consisted of two main components: digital integration and communicative development.

- Digital integration: i) Digital communications in the global space: participants underwent a 5-week course covering the fundamentals of digital communications, the use of information technologies for communication and collaboration, as well as digital literacy (for example, Telegram-completion of surveys, YouTube-viewing video lectures); ii) Interactive exercises and assignments: students engaged in interaction by completing practical tasks and collaborative projects aimed at utilizing digital tools in learning and work (for example, Google Forms).

- Communicative development: i) Psychological counseling: upon completion of the course, students were offered individual and group consultations with psychologists. These consultations were focused on addressing communicative challenges and the psycho-emotional well-being of students in the context of distance learning; ii) Group discussions and mutual support: participants took part in group sessions where they discussed their experiences, shared strategies for overcoming challenges, and provided mutual support.

These two components of the training complemented each other, facilitating the integration of students' digital and communicative skills and enhancing their adaptation to the new learning conditions. Participants engaged in the training for 2-3 hours each week. The course comprised video lectures and interactive exercises that students completed independently or in groups, allowing them to develop practical skills in using digital tools and applying them in virtual projects. The methods employed to verify whether students in the experimental group viewed the assigned videos included monitoring viewing duration, assessing comprehension of the material through tests and discussion questions following viewing, as well as conducting surveys regarding impressions of the video content. Additional methods, such as monitoring activity on online platforms or engaging students in discussions about the video material, also aided in assessing the effectiveness of video viewing.

After completing the course, students were offered individual consultations with psychologists, typically lasting 30-60 minutes. Group sessions could be extended longer depending on the number of participants and group needs. Lectures were delivered by qualified speakers and experts in the field of digital communications, who shared their knowledge and practical experience with participants. Psychological counseling sessions were conducted by psychologists who took responsibility for an individualized approach to students and group dynamics. The course and consultations were conducted through the online platform Zoom. This approach allowed students to flexibly organize their study time and provided access to experts and psychologists for individual development and support. During sessions with psychologists, the students participated in role-playing games. The opportunity to reproduce various social scenarios allowed them to enhance their communication skills and improve social interaction. The introduction of group discussions on topics related to changes in social life through distance learning contributed to the exchange of views and experiences between the participants. Within the sessions, the psychologists used special techniques to facilitate adaptation to new learning conditions and social environment. These techniques were aimed at developing active listening skills, effective communication, and the ability to resolve conflicts in the online environment. Training interventions were supposed to improve the students' ability to adapt to new social situations and changes that occur during distance learning. In general, the learning process integrated the following psychological support services: i) Students were provided with the opportunity to book online sessions with licensed psychologists through the platform; ii) The A-training included a section with meditations, relaxation, and other techniques of complacency; iii) Students received round-the-clock text support, which provided them with immediate help in crisis situations; iv) A library of articles, videos, podcasts, and other materials was available to students at any time; v) Regular surveys and self-monitoring tests helped students assess their levels of stress, anxiety, and other aspects of mental health; and vi) Support groups have been set up to allow students to connect with their peers, discuss issues, and share experiences. These strategies contribute to a more conducive and supportive environment for students that promotes their successful learning and personal development.

2.6. Statistical processing

Quantitative data were collected and calculated using the computational tool of the statistical package for the social sciences (SPSS) version 25 program. To compare the average test results before and after the experiment in each group, the Wald test was carried out. The use of the Wald test to compare average test results before and after an experiment has its advantages, especially when the study is binary. The latter implies that participants can be divided into two categories (for example, "before" and "after" the experiment). The Wald test is a statistical test for evaluating changes in binary or dependent data. This tool is ideal for determining a statistically significant difference between two points in time. The variables of "communicative maladjustment" and "social adaptability" were analyzed among students who participated in the socio-psychological training.

3. RESULTS AND DISCUSSION

Table 2 provides a subjective assessment of variables related to students' communicative competence in their first and second years before and after participating in the social-psychological training (A-training). For each of these variables, indicators are presented before A-training, as well as indicators for two groups of students: those who did not undergo A-training–control group, and those who did–experimental group. Each indicator is represented by a numerical value indicating the level of subjective

assessment by students of a specific variable before and after participating in the training. For example, the indicator "I find it convenient to use mobile devices for learning" has a value of 4.5 before the training for all students, but 4.7 for those who underwent the training, indicating a potentially positive impact of the training on this aspect of communicative competence. At the same time, before the introduction of the training course, the respondents felt tired and unsatisfied (Table 2).

After the completion of the experiment, the group that took a course of socio-psychological training reported an increased level of social adaptation and a comfortable atmosphere in the team compared to the group that did not participate in the sessions. The parameter of communication with peers underwent the greatest changes (4.6 vs. 4.2 in the group that did not participate in the training sessions). In both groups, the students had a relatively neutral attitude towards the level of workability, which remained unchanged (4.5), and attentiveness during the lesson (4.3). A-method improved the emotional state of the control group students. Both groups reported that they would recommend the appropriate training method to their classmates.

Table 2. Subjective assessment of the variables of communicative competence by 1st and 2nd-year students

Variables of communicative competence	Indicators before A-training (N=92)	Control group (N=38)	Experimental group (N=54)
I am comfortable using mobile devices for learning purposes	4.5	4.5	4.7
My emotional state	4.3	4.3	4.5
Feeling of tiredness	4.3	4.2	4.4
Ability to work	4.5	4.5	4.5
Communication with peers outside of school	4.2	4.2	4.6
Attentiveness at the lesson	4.3	4.3	4.3

At the same time, none of the parameters acquired the maximum value even after the introduction of the training course. The variable "communication with peers outside of school" underwent the greatest changes; it increased by 0.3 points. In the context of almost all parameters, there was a significant improvement in the social sentiment of students. The only indicator that did not change was the criterion "level of ability to work". It should be noted that the criterion "attentiveness at the lesson" remained unchanged in all the groups. Given the target segment of A-training, the trend towards maintaining the initial level of attentiveness in all respondent groups was expected as this factor is more personal than social.

Table 3 presents a statistical analysis of the assessment of various aspects of communicative competence for two groups of students: those who underwent training A and those who did not. For each aspect of communicative competence, the table displays the minimum (MIN) and maximum (MAX) values, as well as the standard deviation (SD) for each of these groups. From Table 3, it can be concluded that training A has a positive impact on the comfort of using mobile devices for learning, emotional state, fatigue, and communication with peers outside of school. However, this training did not significantly influence students' ability to work and attention.

Table 3. Statistical analysis of indicators

Variables of communicative competence	Control group (N=38)			Experimental group (N=54)		
	MIN	MAX	SD	MIN	MAX	SD
I am comfortable using mobile devices for learning purposes	4.0	4.7	0.4	4.3	4.9	0.2
My emotional state	4.2	4.6	0.6	4.4	4.7	0.3
Feeling of tiredness	4.1	4.5	0.5	4.4	4.7	0.3
Ability to work	4.4	4.7	0.4	4.5	4.8	03
Communication with peers outside of school	4.1	4.5	0.6	4.5	4.8	0.4
Attentiveness at the lesson	4.2	4.5	0.5	4.4	4.7	0.3

At the same time, the respondents demonstrated predominantly positive reactions to the training course. Thus, about 68% of the participants noted that the materials received during the digital interactive session were useful. Among the main innovations, the students noted the study of operating systems, types of web resources, and the specifics of their creation and use. Also, about 15% of the respondents noted their interest in information on cloud technologies, tools for working with social networks, and digital etiquette. Almost a third of all participants in the experiment confirmed the use of a much larger number of learning tools in the process of doing online homework compared to the classroom format. At the same time, they are going to apply the acquired skills in the course of further training. On the other hand, the vast majority of A-training participants took the initiative to receive psychological help from a specialist (about 86%).

According to psychologists, the most common issues were the lack of communication in distance learning and an increase in the overall level of depression among students. The respondents noted a decline in their interest in the educational process (57%) and reported negative moods of classmates. Among the recommendations proposed by the psychologists, the following ones should be highlighted:

- To conduct a sociometric study in an academic group to identify outsider students;
- To create additional communication channels for students (group projects and collective tasks);
- To introduce a number of educational and recreational activities that promote informal communication among respondents;
- Provide psychological support to students.

Active learning is an approach to education that emphasizes engaging students in their learning process and deepening their understanding of the material through active participation, interaction, and collaboration [25]. Active learning is, because, during the lesson, students are not only passive listeners; they also actively take notes and have an opportunity to interrupt the teacher to ask a question not at the end of the lesson, but during it. This keeps students from losing track of information and enables a high level of learning and knowledge retention in contrast to traditional classroom lessons. In this paper, unlike the classroom format, in distance learning, active students use more opportunities (mainly digital ones) to make decisions related to the learning process. At the same time, it has been found that they go beyond the process of typical acquisition of information and relate to more complex data processing methods: analysis, synthesis, and evaluation of mental tasks. Instead of memorizing and repeating the information, the respondents were involved in developing their communication skills, discussing what they learned in the context of a particular subject using various role-playing forms during discussions.

Traditional education has been replaced by online platforms that offer a wide range of programs and applications for distance communication. As a rule, with a massive transition to online learning, teachers do not fully use new tools to compensate for the lack of in-person interaction in the classroom [15]. This may result in students' poor or underdeveloped public speaking skills and some reduction in their vocabulary due to the specific limitations inherent in online communication [19]. Thus, the students who lack an opportunity to improve their reading and public speaking skills may experience a decrease in vocabulary [21], [26]. According to the results of Kang *et al.* [27], children's online learning progress has been reduced by more than half compared to their entry-level. The current study proved that training A has a positive impact on the comfort of using mobile devices for learning, emotional state, fatigue, and communication with peers outside of school. However, this training did not significantly influence students' ability to work and attention. Damopolii *et al*. [3] conducted a study on the effectiveness of online education. Their findings indicate that its effectiveness depends on the quality of the course content and qualifications of teachers, as well as interaction between teachers and their students [28]. In current study, the respondents demonstrated predominantly positive reactions to the training course. Thus, about 68% of the participants noted that the materials received during the digital interactive session were useful. This proves the effective impact of the course on student learning.

Based on the results, it can be concluded that due to the considerable impact of pedagogy, teaching style, and its effectiveness on the students' perception of online classes, it becomes imperative for educational institutions to ensure the availability of well-trained teaching staff. In addition, as there is no significant effect of institution type, gender, and age groups on teacher skills, responsiveness, and teaching effectiveness, students in these demographics had a similar learning experience in a virtual learning environment [29]. In this study, the authors corroborate the conclusions of previous research. Indeed, students who underwent A-training and utilized digital technologies in their learning demonstrated better outcomes in the measured indicators. For instance, the indicator of respondents' emotional state significantly improved (from 4.2 to 4.4) in the group that underwent A-training.

The foundation of the research by Czech scientists was a survey of respondents dedicated to the study of foreign languages using a personalized smartphone application [22]. The results indicate that learning a foreign language, particularly studying and reviewing English vocabulary and phrases through smartphones, is effective in improving university students' performance. Most participants were satisfied with its usage, while some students did not share this sentiment. The findings of our study demonstrate that respondents predominantly exhibited a positive reaction to the educational course. Specifically, approximately 68% of participants noted that the materials obtained during the digital interactive session were beneficial.

The current research highlights that the applications used for online classes should make learning more convenient as most people who use them face problems. It would be helpful if they also provided mobile solutions as problems arise. From the point of view of students, teachers should give more hands-on assignments to keep their interest. Students feel shy or uncomfortable when asking questions in the online environment so teachers should develop a way to encourage their participation. For example, institutions should control the screen time of online lessons as longer classes negatively impact vision.

On the other hand, the transformation of the educational process should be carried out based on compliance with global changes in world trends. Consequently, the trend towards mass digitalization of many processes requires rising specialists in any industry to freely use internet technologies [30], [31]. Therefore, according to the 2021 digital transformation report, about 73% of respondents are looking for flexible working hours with the opportunity to use advanced information technologies. At the same time, the gross volume of investments in the digital transformation of enterprises and their personnel in 2021 exceeds 659 billion US dollars worldwide. Analysts predict rapid growth in the capacity of the IT services market.

4. CONCLUSION

The survey conducted before and after the A-training course devoted to the communicative and digital interactions of students demonstrates a significant difference in the identification of distance learning among students of I.M. Sechenov First Moscow State Medical University and Platov South-Russian State Polytechnic University (NPI). Thus, for example, the indicator of the emotional state of respondents significantly improved (from 4.2 to 4.4) in the group that took A-training. At the same time, the criterion of communication with peers underwent the greatest changes (4.6 vs. 4.2 in the group without training), which indicates an improvement in the communicative component among the respondents. Incorporating a discussion of the limitations of this study is imperative. The researchers' explicit/optimistic assumptions regarding the influence of remote learning on social adaptation and communicative proficiencies may have introduced an additional limitation. These assumptions guided the data collection process, which could have resulted in biased data and potentially impacted the study's outcomes. As a result, this potentially biased data collection process might have had an impact on the outcomes of the study.

This study holds significance within the context of the development of distance learning and its impact on student adaptation and communicative skills. Specifically, it underscores the effectiveness of socio-psychological training aimed at improving students' adaptation to new learning conditions. The research results indicate a positive influence of A-training on students' communicative skills and emotional well-being. Improvements in peer communication and increased interest in learning testify to the substantial contribution of the training to the social adaptation of students.

The findings also highlight the importance of digital literacy in enhancing attitudes toward distance learning. For educators and policymakers, the research provides practical implications for the field of e-learning. The study demonstrates the implementation of effective strategies that improve the process of distance learning and enhance the quality of education. The research findings can be utilized to develop more effective and adaptive pedagogical programs for distance learning. Educators can use the data to determine the most effective methods and teaching strategies in the online environment.

Additionally, the research results will assist educators in understanding how to improve communication with students in the online environment-they can implement best practices to create a conducive learning and interaction environment. Policymakers in the field of e-learning may utilize these findings to develop and refine strategies and programs that support the quality and accessibility of distance education. Based on the study, teacher training programs and coach training programs can be developed with the focus on effective use of technology in the educational process. This would allow educators to be more prepared for the challenges associated with distance learning. The research results can serve as a basis for decision-making regarding investments in the development of technologies and infrastructure for distance learning. Policymakers can focus efforts on ensuring access to quality education through the use of modern technologies. Therefore, the findings can become an important tool for practitioners and policymakers in the field of education who seek to improve the effectiveness and quality of distance learning.

ACKNOWLEDGEMENTS

Alsu Rakhmanova has been supported by the Kazan Federal University Strategic Academic Leadership Program.

FUNDING

Authors state no funding involved.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Elena Susimenko	✓		✓		✓	✓		✓	✓					
Alena Gura		✓		✓	✓			✓	✓		✓	✓		
Alsu Rakhmanova		✓		✓			✓			✓		✓	✓	
Olga Butylchenko	✓		✓			✓	✓			✓	✓			

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The research related to human use has been complied with all the relevant national regulations and institutional policies in accordance with the tenets of the Helsinki Declaration and has been approved by the Ethical Committees of I.M. Sechenov First Moscow State Medical University and Platov South-Russian State Polytechnic University.

DATA AVAILABILITY

The authors confirm that the data supporting the findings of this study are available within the article.

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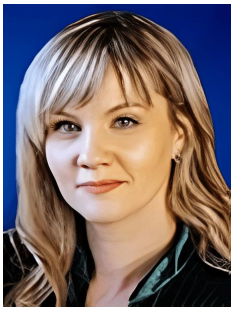
BIOGRAPHIES OF AUTHORS

Elena Susimenko has a candidate of science degree in Sociology, Doctor of Science degree in Philosophy, academic title of professor. She has been working at Platov South-Russian State Polytechnic University (NPI) since 1998, now as the head of the Foreign Languages department. Her area of research interests covers social philosophy, sociology of culture, sociology of education, sociolinguistics, teaching foreign languages. She can be contacted at email: susimenkoele52@rambler.ru.



Alena Gura is a candidate of philosophical sciences, docent of the Department of History, Philosophy and Psychology in Kuban State Technological University, Krasnodar, Russian Federation. Her interests include: mobile-based learning, philosophy. She can be contacted at email: Alena-gura85@yandex.ru.

Alsu Rakhmanova is Ph.D. (Pedagogy), associate professor of the Department of Pedagogy in Yelabuga Institute of Kazan Federal University, Yelabuga, Russian Federation. Her interests include: pedagogy, psychology. She can be contacted at email: rahmanovaar@mail.ru.

Olga Butylchenko is Ph.D., associate professor of Department of Phthisiopulmonology and Thoracic Surgery in I.M. Sechenov Fist Moscow State Medical University, Moscow, Russian Federation. Her interests include: psychology and surgery. She can be contacted at email: olga16.53@list.ru.