International Journal of Evaluation and Research in Education (IJERE)
Vol. 13, No. 6, December 2024, pp. 4321~4329
ISSN: 2252-8822, DOI: 10.11591/ijere.v13i6.29726

The effects of mobile technologies on the level of student involvement

Ludmila Abazova, Zhansurat Gutaeva, Madina Kochesokova
Department of Russian Language and General Education Disciplines for Foreign Students, Kabardino-Balkarian State University, Nalchik, Russia

Article Info

Article history:

Received Dec 21, 2023
Revised Apr 11, 2024
Accepted May 7, 2024

Keywords:

Academic performance
Educational process
Involvement m-learning
Mobile learning
Mobile technologies

ABSTRACT

In the modern world, there is a conscious interest in improving education quality with the help of modern information technologies. Innovative m-learning technology expands the possibilities and increases the effectiveness of training. Experiments conducted in European countries showed that the use of mobile devices positively affected academic performance, discipline, and interpersonal relationships among participants in the educational process. However, currently, practical research only generally concerns the issue of increasing foreign student involvement in the educational process. The purpose of the study is to experiment and obtain new data confirming the effectiveness of mobile technologies in increasing foreign student involvement in the educational process. The developed mobile technology-based course was introduced into the educational system of the university. The program included traditional and practical classes. The study confirms the effectiveness of mobile learning technology. A statistical data analysis showed positive dynamics in the indicators of the experimental group. The final data of the experimental group differed significantly from the initial ones: the average indicator of 2.9 (average involvement level) increased to 4 (+1.1). Based on the developed course using mobile learning, it is possible to create and practically implement new educational programs for universities.

Corresponding Author:

Ludmila Abazova
Department of Russian Language and General Education Disciplines for Foreign Students,
Kabardino-Balkarian State University
Nalchik, Russia
Email: lidabazova@gmx.com

1. INTRODUCTION

Today, the world is experiencing continuous changes and the evolution of wireless technologies. These changes concern all spheres of life, including education [1]. An integral part of this evolution is mobile technology, which significantly impacts education [2]. Information and communication technologies (ICT) are becoming an integral part of the educational process, being used for education, administrative tasks, and many auxiliary functions [3]. Mobile learning, or m-learning is one of the advanced technological initiatives that has radically altered the paradigm of education [4].

Mobile learning, or m-learning, is the process of studying and obtaining educational information via mobile technologies, such as smartphones and tablets. It allows learners to access knowledge anytime and anywhere [5]. This technology implies using the internet to find and download educational materials, communicate on forums, and perform tests and assignments, regardless of location [6]. Effective mobile learning can transform the learning process. It makes education more accessible and convenient for students who usually use modern technical devices in everyday life [7].

Mobile learning technology rapidly develops and focuses on individualizing and optimizing the educational process for the needs of students who easily cope with modern technical means. This trend portends a real revolution in the field of education [8]. Mobile learning will bridge traditional boundaries and make education more flexible, personalized, and accessible to everyone [9], [10]. This study aims to evaluate the effect of mobile technologies in education and their impact on foreign student involvement in the educational process.

In the modern world, there is a constant development of wireless technologies. This process undoubtedly changes society and economy [11]. Education experiences the most significant impact of this evolution [2]. In the context of the information age, information and communication technologies are becoming an integral part of education. ICTs perform important roles in the educational process, administrative functions, and additional educational services [3]. Of these technologies, particular emphasis should be placed on mobile learning, often abbreviated as m-learning [4]. Mobile learning (m-learning) is defined as the process of learning and obtaining educational information via portable mobile devices, such as smartphones and tablets. In this case, learners can access information anytime and anywhere. This technology allows students to find and download educational materials from the internet, participate in online discussions, and remotely perform tests and assignments from anywhere [12].

It is important to highlight some of the advantages of using mobile technologies in the educational process. Mobile learning is recognized for its ability to personalize learning content to meet the diverse needs and interests of individual students. This approach offers benefits such as supporting students with disabilities by providing them access to learning materials and educational opportunities. In addition, the convenience of mobile technologies provides quick access to educational resources and materials, facilitating seamless communication and interaction between students, teachers, and educational establishments. Furthermore, the interactive nature of mobile learning increases engagement and motivation among foreign students, promoting deeper interaction with educational materials [2].

Factors contributing to a high level of student engagement include a willingness to make additional efforts beyond formal instructions, a sense of self-worth based on professional achievements, an interest in achieving meaningful results, and a willingness to take responsibility for the quality and results of personal activities. Together, these indicators contribute to the creation of a conducive learning environment that encourages active participation and engagement of students. Indeed, mobile learning is becoming an important tool that changes education and affects the processes of learning and cognition. However, there are also conflicting opinions, such as concern about the possible deterioration of interpersonal relationships and increased stress associated with constant access to mobile devices [13]–[17]. Despite these concerns, many researchers conclude that with competent and professional implementation, mobile technologies can positively impact education [18]–[23].

Portable devices are widespread tools used to increase student involvement in the educational environment. Therefore, this issue is currently relevant, especially in the context of foreign students. Previous research rather narrowly covered the practical use of mobile technologies as a tool to increase student involvement in the modern educational environment. For a modern university, crucial tasks are the meaningful learning of educational material by foreign students and the motivation of students in education. These factors determine the educational process and the quality of professional training. Accordingly, it becomes mandatory to address the problem of foreign student involvement in the educational process of the university.

The practical significance of this research lies in experimentally validating the efficacy of mobile technologies in enhancing student engagement and motivation within the educational process. This conclusion emphasizes the need for further targeted training of teaching personnel to work with mobile technology. The theoretical significance lies in the disclosure of such concepts as mobile learning, mobile technologies, and student involvement. The paper describes the principles and functional effectiveness of m-learning technology. The purpose of the study is to find whether the integration of mobile technologies increases student involvement in the modern educational environment. According to this goal, the research tasks are the following: i) Identify the criteria and levels of foreign student involvement in the modern educational environment; and ii) Conduct a pedagogical experiment to evaluate the effect of mobile technologies on the level of student involvement

2. METHOD

The study considers the experience of using mobile technologies in the educational environment to increase student involvement. An example is the practical implementation of m-learning in the course of the academic discipline named Russian as a Foreign Language (RFL). Participants were randomly divided into control and experimental groups.

2.1. Sample

The study involved 110 students from Kabardino-Balkarian State University named after Kh. M. Berbekov. The sample size was determined using power analysis to provide adequate statistical power to detect significant differences in student engagement between control and experimental groups. Power analysis was performed using statistical software such as G*Power. This involved defining parameters such as the desired level of statistical power and significance and estimating the effect size based on previous research or peer review, which ultimately increased the reliability and validity of the study.

The participants were foreign students of the preparatory department, foreign students receiving a bachelor's degree in the 1st and 2nd year of study, and postgraduate foreign students. There were 57 students in the control group, of which 27 were male and 30 were female. The age of first-year students ranged from 19-20 years. In the experimental group, there were 53 students: 27 men and 26 women. The experimental group included students aged 20-21. The study used random selection to divide participants into control and experimental groups. Thus, it was possible to compare and analyze the impact of mobile technologies on students of different ages and genders. This approach aimed to make the study as representative as possible.

2.2. Tools

A survey conducted before and after the study evaluated the involvement level of foreign students in the educational process. The criteria for assessing the motivation level were three components of involvement: cognitive, emotional, and behavioral. The cognitive component characterizes the desire and motivation to master the didactic cycle of discipline; the ability to self-regulate. The emotional component evaluates the feeling of comfort and psycho-emotional security. The behavioral component encompasses student activity, participation in the classroom, and extracurricular activities. The questionnaire items are grouped into modules that meet the criteria for assessing involvement. The cognitive component encompassed various aspects such as satisfaction with the teaching of academic disciplines, the organization of the educational process, the prospect of employment, as well as material and technical support, along access to information resources. The emotional component focused on gauging relationship satisfaction, particularly in terms of social connections. Meanwhile, the behavioral component revolved around evaluating students' active participation in both classroom and extracurricular activities within the university setting. This comprehensive approach allowed for a holistic assessment of student engagement and involvement throughout the study.

The students assessed each of the proposed questions from 1 to 5, where 1 indicated the passive involvement of the respondent, and 5 indicated the maximum involvement. The remaining values (2, 3, 4) reflected the degree of approximation to one or another extreme point. In the study, the average indicators within 4-5 were considered to be a high level of student involvement. Such results as 2.0 and below were considered low. Initially, the survey showed that the average student involvement in the control group was 3.1. The result of the experimental group was 2.9. The validity calculations for Cronbach’s alpha revealed a coefficient of 0.85, indicating a high level of internal consistency between the items. The expert validity test was an independent evaluation of the questionnaire by experts in the field of education and psychology. The experts reviewed the questionnaire items to assess their relevance, clarity, and appropriateness for measuring student engagement. Through their experience and knowledge, they confirmed that the questionnaire items accurately reflect various dimensions of student engagement in the educational context. The experts confirmed that the questionnaire items effectively measured the involvement of foreign students in the educational process.

2.3. Procedure

The following stage of the study was practical. This stage implied the integration of mobile technologies into the education system. To achieve this goal, the study employed a blended learning model, which is a combination of traditional teaching methods and mobile technologies. The mobile learning process lasted one academic semester. Mobile technologies supplemented the curriculum of the discipline named “Russian as a foreign language” for the international students of the experimental group. The developed mobile learning course covered a variety of areas. The content of the course included the directions and means are presented in Table 1. This course provided international students of the experimental group with access to a variety of resources and learning methods via mobile devices. It covered different aspects of the discipline and allowed students to choose the most appropriate learning methods and resources for their needs. The integration of mobile technologies into the educational process opened up new opportunities for students. It enriched the learning process and facilitated access to information and resources at a convenient time and place. This stage of the study was aimed at evaluating the effectiveness of mobile technologies in increasing student involvement.

Table 1. The tools of m-learning

No.	Directions and means of mobile learning
1	A calendar planner of the class schedule, checkpoints, and events.
2	SMS-mailing of notifications, Internet-mailing of educational materials, and results of control assessments.
3	Individual and group consultation.
4	Multimedia presentation of classes and video sessions.
5	Electronic resources of the course, reference books, dictionaries, textbooks, wiki resources, multimedia educational web resources.
6	Educational podcasts and channels with educational materials.
7	Virtual maps and tours.
8	Links to open e-education platforms.
9	Platforms for creating interactive courses, video lectures, and simulators.
10	Virtual laboratories and simulators.
11	Cloud services for organizing teamwork, performing case tasks, and creating group projects.
12	Mobile applications.
13	Microblogs.
14	Messengers and forums on social networks for the exchange of information and discussions within the group, as well as with representatives of educational institutions and organizations.

The practical part of the study was the development and implementation of an educational program based on mobile learning technology. The content of this program included a variety of teaching methods, covering both traditional types of classes (lectures, seminars, practical classes, research, independent training, course design, and tests) and non-traditional teaching methods. Mobile technologies supported a full didactic cycle for studying Russian as a Foreign Language. The target audience of the course was foreign students of the preparatory department and foreign students in the 1st and 2nd years of study. The objectives were to master the following: i) Russian language system for communication in the Russian-speaking environment; and ii) the language of the discipline necessary for obtaining professional education at a university.

The design of the program implied that mobile technologies were an integral part of the learning process. Within the course, mobile technologies allowed the students to access educational resources, complete assignments, and participate in discussions and exams online. This approach contributed to more flexible and accessible learning, as well as increased student engagement in the learning process. This program and the developed teaching methodology became key elements of the practical part of the study. Their impact on student involvement was evaluated. The RFL course objectives were:

i) Teach the Russian language system.
ii) Teach speech activity and speech communication in Russian.
iii) Form certain abilities that comprise the four skills of speech activity: reading, writing, listening, and speaking. In reading, the development of reading skills and abilities, introductory and study reading of texts related to the discipline, as well as socio-economic and socio-cultural texts. In writing, mastering the basic types of writing in scientific and official business styles for writing official documents, university assignments, and term papers. In listening, the formation of linguistic, communicative, and socio-cultural competencies in colloquial, journalistic, and scientific styles of speech contributing to the adequate perception of information, close to the perception of native speakers. In speaking, the formation of sociolinguistic, communicative, and discursive competencies that determine the optimal use of linguistic means in various spheres of communication.
iv) Familiarize students with the material and spiritual culture of the country.

The students of the experimental group used various functions and features of mobile technologies: mental maps, video materials, and interactive presentations for structuring information, social networks, comments on tasks in project management systems, SMS mailing, webinars, demonstration of the desktop PC screen (for communication within the group and with the teacher), mobile applications, calendar for planning; programs for creating digital educational materials.

2.4. Data analysis

The experimental period lasted one semester, which involved the practical of testing mobile learning within an educational discipline. A control measurement of student involvement indicators took place at the end of the experiment. STATA was used to calculate means, standard deviations, frequencies, and other descriptive measures from the survey data. STATA was used to perform statistical analysis and generate summary statistics. The dynamic progression of involvement indicators gave some insights into the effectiveness of mobile technologies in the modern educational environment. Descriptive statistics allowed for analyzing the data. Mean scores, standard deviations, and frequencies were used as specific descriptive measures to analyze data from pre- and post-intervention surveys, providing insights into student involvement levels. The reasons for using descriptive statistics include the following. Descriptive statistics

reveals a general idea of the data, including means, spread, variance, and other characteristics, without the need to conduct complex statistical analyses. It clearly and accessibly provides information, facilitating the interpretation of the results and their presentation in the text and graphs. Thus, this method helped visually demonstrate changes in indicators before and after the introduction of mobile technologies. Descriptive statistics also determined the initial dynamics of changes and assessed the overall trend. Inferential statistics were not included because the study aimed to assess changes in involvement over time and between groups, rather than making broader population inferences or establishing causal relationships. This decision ensured a focused analysis aligned with the objectives. The comparison of statistical parameters between the control and experimental groups showed differences in student involvement.

2.5. Ethical issues

The participants of the experiment were informed about the research goals and processes. The study did not specify the personal data of students; the data collection and storage procedures followed privacy standards. Participants had the right to withdraw at any time without negative consequences for themselves, and participation in the study was voluntary. The study introduced all necessary measures to reduce the risk of any negative effects on the participants.

3. RESULTS AND DISCUSSION

The survey developed for the study allowed for analyzing the involvement level of the participants. According to the quantitative and qualitative processing of the obtained data, the majority of the university students had moderate and low levels of involvement. Specific results revealed that 75.5% of students in the control group had a moderate or low level of involvement. Comparatively, in the experimental group, this indicator was 81.2%, which was 5.7% higher. Table 2 presents the results of statistical data processing. There is detailed information about the levels of involvement in each of the groups. These data served as the starting point for further analysis and discussion of the results.

Table 2. Average student involvement indicators

Level	The experimental group (%)	The control group (%)
High	24.5	18.8
Moderate	49	47
Low	26.5	37

The second stage of the study aimed to evaluate the impact of the developed mobile technology-based program on student involvement in the educational environment. This stage covered the period of introducing the course program into the educational system of the university. To assess the effectiveness of this program, it was necessary to conduct a control measurement of student involvement. The second survey revealed changes and progress in the level of student involvement in the first and second years of study. The results of this practical part of the study demonstrated significant changes in involvement among the students of the experimental group compared with the control group.

A detailed analysis of the survey modules showed the following: the average indicator of the control group before the experiment and after one academic semester remained almost unchanged, with slight variations within tenths (+0.3). In turn, for the students of the experimental group, the final data highly differed from the initial ones. The average indicator, which was 2.9 (the moderate level of involvement), increased to 4 (+1.1), which was a sufficiently high level of student involvement. The cognitive and behavioral indicators of involvement increased from moderate to high. The average indicators of the emotional component remained almost the same (+0.2). Table 3 presents the detailed results of this mathematical data processing. These results indicate a positive impact of mobile technologies on student involvement in the educational process.

Table 3. A comparative table of average student involvement indicators by components before and after the experimental program

Component	The experimental group			The control group		
	Before	After	Dynamics	Before	After	Dynamics
Cognitive	2.5	4.1	+1.5	2.6	3	+0.4
Emotional	3.7	3.9	+0.2	3.8	4	+0.2
Behavioral	2.6	4	+1.4	3.1	3.3	+0.2
Average	2.9	4	+1.1	3.1	3.4	+0.3

At the final stage of the study, the experimental group demonstrated a significant improvement in student involvement. The high level of involvement increased by 7.6%, the moderate level increased by 7.5%, and the low level decreased by 15.1%. In the control group, the improvements were less significant: the high level of involvement increased by only 2%, the moderate level increased by 3.6%, and the low level decreased by 5.6%. Table 4 shows details of the statistical processing of these data.

Table 4. A comparative table of average student involvement indicators by modules

Level	The experimental group			The control group		
	Before	After	Dynamics	Before	After	Dynamics
High	18.8%	26.4%	+7.6%	24.5%	26.5%	+2%
Moderate	47.2%	54.7%	+7.5%	49%	52.6%	+3.6%
Low	34%	18.9%	–15.1%	2.5%	33%	–5.6%

These results indicate a significant positive impact of mobile technologies on student involvement in the modern educational environment. These findings highlight the effectiveness of integrating mobile technologies into the educational process and their capability to stimulate students to more active and engaged learning. The use of portable devices provides numerous advantages in the organization of the educational process: i) Mobility and availability of the course at any time. Participants in the educational process are not tied to a specific forced location. The opportunity to choose an individual pace of learning the educational material is also important; ii) The vast information component. At any time of study, students can use the Internet, access any world sources, and combine forms of presenting and learning material; iii) The flexible educational process and an opportunity to creatively approach the performance of tasks; iv) The formation of independence and a sense of responsibility among students. Thus, this research has confirmed the effect of mobile technologies in the modern educational environment on increasing the involvement of foreign students.

Previous research has already addressed the effectiveness of online learning based on mobile technologies [24]. To obtain the necessary data, the authors also conducted surveys and observations among students. A descriptive analysis revealed that foreign students had a negative attitude toward the online learning process. Not only media but also the entire learning process negatively affected student involvement. The paper suggests further research to find effective and feasible solutions to eliminate the negative perception. The success rate of the online learning process with wireless devices was 61.9%. These results are consistent with the conclusions of this study. The latter found that mobile technologies efficiently increase the involvement of foreign students in the educational environment.

The study of Bransford *et al*. [25] suggests that the negative attitude of students to online learning may be due to numerous obstacles. The author showed that online learning is ineffective since students must have various auxiliary tools, with mobile technologies being indispensable. The results also showed that the majority of students prefer mobile learning to online learning. The study by Amin *et al.* [26] confirms the previous conclusion. The authors noted that almost 65% of the surveyed students believed that learning using mobile technologies was better and more effective.

One of the most important features of m-learning is an individual approach to education. This innovative technology focuses on the personal qualities and personality of a student. Mobile technologies have proven effective in the modern educational process of both full-time and distance education. These tools help effectively organize the independent work of students and increase student motivation through new forms and methods of teaching [27].

Earlier studies investigated the specifics of the educational process in three different universities using the concept of student involvement and the methodology of its measurement [28]. The paper describes the main types of involvement and tools for influencing its indicators. In the article, the author emphasizes the factors that affect student involvement in the educational environment. The study reveals that male students are more likely to demonstrate a passive type of involvement in the learning process than their female counterparts. When processing the new experimental data obtained in this study, there was no such trend. The degree of student involvement depends on a student's conscious desire and choice of subjects to study. This factor has a direct impact on student involvement. Nevertheless, the experimental part of this study also showed the importance of the processional introduction of innovative technologies into the university educational system. As a result, motivation can have positive and progressive dynamics even with a negative attitude of a student. The psychological atmosphere and emotional component are individual in a team and interpersonal relationships. Often, due to their temperament, it is difficult for a student to fully realize their potential. In this case, the effectiveness of using mobile technologies is as indicative as possible.

Another project confirmed that the use of portable devices has become an effective communication tool in the youth culture environment. It increased the involvement of students in the educational process, ensured the timely implementation of the curriculum, and ultimately had a positive impact on academic performance [29]. Conclusions about the effectiveness of m-learning in increasing student involvement are consistent with the data presented in this paper.

The experiments have demonstrated that m-learning positively influences the motivation and learning outcomes of students [7]. The authors confirm the effectiveness of mobile learning technology in increasing student involvement. Their findings prove the readiness of modern students and teachers to introduce portable devices. Almost all students demonstrate a strong and obvious interest in mobile technologies, in contrast to university teaching personnel. Similarly, this paper aimed to experimentally substantiate the effectiveness of mobile technologies for student involvement, as well as the prospects and importance of m-learning.

The statistical data obtained through research indicate that 76% of the surveyed university teachers systematically used mobile learning technologies for teaching [30]. More than half (61%) of the respondents considered it appropriate to introduce mobile technologies into classroom and extracurricular work [31]. The results of the study are identical to the presented conclusions. Thus, this study also demonstrated the effectiveness of using wireless devices in increasing the involvement of students in the modern educational environment. This research confirms the validity of m-learning as a modern form of organizing classes in the ICT format. The paper presents an experimental study on the effectiveness of mobile technologies in increasing student involvement in the modern educational environment.

The results of the study revealed the trend of student involvement: it depends on the year of study. Most of the senior students showed a low level of motivation in the modern educational environment and preferred computer technology. The positive dynamics of student involvement in the experimental group indicated the effectiveness of mobile technologies in the modern educational environment. Thus, it is necessary to introduce mobile technologies in the field of education. The article reveals the prospects, confirms the effectiveness, and demonstrates the relevance of mobile learning. This technology is recommended for inclusion in other universities and educational organizations.

4. CONCLUSION

The paper presented the theoretical generalization and practical solution to the actual problem of mobile technologies in the modern educational environment. The study showed whether mobile technologies increase the involvement of foreign students. It described the concept of “mobile technologies” and “mobile learning” based on the scientific and methodological literature. In addition, the paper considered the features of m-learning in the process of university education.

The analysis of the research results demonstrated a positive trend in the indicators of the experimental group. As the final survey revealed, in the control group, the average of the three involvement components (cognitive, emotional, and behavioral) remained almost unchanged (+0.3) to the end of the experiment. At the same time, the dynamics of the indicators in the experimental group showed a positive progression. The cognitive and behavioral components of engagement increased from moderate to high levels. The average indicator of the emotional component remained almost unchanged (+0.2). The high involvement level in the experimental group increased by 7.6%, the average - by 7.5%, and the low level decreased by 15.1%. In turn, in the control group, the high level increased by only 2%, the average level increased by 3.6%, and the low level decreased to 5.6%. Thus, the results confirmed the feasibility of introducing mobile technologies and their effectiveness in the vocational education of foreign students.

According to the new experimental data obtained, the analysis of scientific literature, and the experience of modern research, mobile technology effectively increases student involvement in the modern educational environment. M-learning is a process often initiated by students themselves. Although this approach typically results in an additional amount of independent work, it forms self-organization, responsibility, and the ability to set personal goals and objectives.

The use of mobile technology in the modern educational environment provides great opportunities for the modernization of the learning system. However, to date, there are no effective examples of its introduction and application in the modern educational process. Possible reasons are the insufficient awareness of mobile technology and its capabilities and the lack of methodological materials for using educational applications on mobile platforms. The integration of mobile learning with traditional education is a promising direction for higher educational institutions. The paper proves that the introduction of mobile technologies can improve the efficiency of education and individualize the learning process. It increases the involvement of foreign students in the modern educational environment and enhances the competitiveness of educational institutions.

REFERENCES

[1] M. Holovatyi, "Unity of science and education as a paradigmatic way of development of economy and social sphere: the conceptual aspect," *Economic Annals-XXI*, vol. 159, no. 5–6, pp. 6–9, Jul. 2016, doi: 10.21003/ea.V159-01.

[2] A. Shaqour, S. Salha, and Z. Khlaif, "Students' characteristics influence readiness to use mobile technology in higher education," *Education in the Knowledge Society (EKS)*, vol. 22, pp. e23915-e23915, 2021, doi: 10.14201/eks.23915.

[3] N. Gagulina, A. Samoylov, A. Novikov, and E. Yanova, "Innovation-driven development and quality of living under conditions of digital economy," *E3S Web of Conferences*, vol. 157, p. 04037, Mar. 2020, doi: 10.1051/e3sconf/202015704037.

[4] P. Taman, S. S. Nasution, T. Hastomo, N. N. Sukmawati, and L. A. Kusumoriny, "The young learners' perception towards English instructional practices using virtual platforms," *Journal of Applied Linguistics and Literature (JOALL)*, vol. 6, no. 2, pp. 181–193, Aug. 2021, doi: 10.33369/joall.v6i2.15369.

[5] N. Hockly, "Mobile learning," *ELT Journal*, vol. 67, no. 1, pp. 80–84, Jan. 2013, doi: 10.1093/elt/ccs064.

[6] S. Criollo-C, A. Guerrero-Arias, Á. Jaramillo-Alcázar, and S. Luján-Mora, "Mobile Learning Technologies for Education: Benefits and Pending Issues," *Applied Sciences*, vol. 11, no. 9, p. 4111, Apr. 2021, doi: 10.3390/app11094111.

[7] R. Salhab and W. Daher, "University students' engagement in mobile learning," *European Journal of Investigation in Health, Psychology and Education*, vol. 13, no. 1, pp. 202–216, 2023, doi: 10.3390/ejihpe13010016.

[8] S. I. Senaratne and S. M. Samarasinghe, "Factors Affecting the Intention to Adopt M-Learning," *International Business Research*, vol. 12, no. 2, p. 150, 2019, doi: 10.5539/ibr.v12n2p150.

[9] C. Lai, "Trends of mobile learning: A review of the top 100 highly cited papers," *British Journal of Educational Technology*, vol. 51, no. 3, pp. 721–742, May 2020, doi: 10.1111/bjet.12884.

[10] A. Naciri, M. A. Baba, A. Achbani, and A. Kharbach, "Mobile Learning in Higher Education: Unavoidable Alternative during COVID-19," *Aquademia*, vol. 4, no. 1, p. ep20016, Apr. 2020, doi: 10.29333/aquademia/8227.

[11] M. H. Fagan, "Factors Influencing Student Acceptance of Mobile Learning in Higher Education," *Computers in the Schools*, vol. 36, no. 2, pp. 105–121, Apr. 2019, doi: 10.1080/07380569.2019.1603051.

[12] A. Ison, A. Hayes, S. Robinson, and J. Jamieson, "Txt Me: supporting disengaged youth using mobile technologies," *Australian Flexible Learning Framework. Retrieved August 15*, 2004.

[13] M. Benali and M. Ally, "Towards a Conceptual Framework Highlighting Mobile Learning Challenges," *International Journal of Mobile and Blended Learning*, vol. 12, no. 1, pp. 51–63, Jan. 2020, doi: 10.4018/IJMBL.2020010104.

[14] M. Kumari and V. Singh, "Mobile learning: An emerging learning trend," *Tata consultancy services*, 2011, [Online]. Available: http://www.tcs.com/resources/white_papers/Pages/Mobile_Learning_An_Emerging_Learning_Trend.aspx (accessed: Feb. 12, 2024).

[15] S. Marshall, "Reporting & Analysis of Mobile Learning: Is It Worth It?" *Learning Solutions Magazine*. 2011. [Online]. Available: https://www.learningguild.com/articles/780/reporting--analysis-of-mobile-learning-is-it-worth-it/. (accessed: Feb. 12, 2024).

[16] E. M. Onyema, E. C. Deborah, and U. O. Anthonia, "Potentials of Mobile Technologies in Enhancing the Effectiveness of Inquiry-based Learning Approach," *International Journal of Education (IJE)*, vol. 2, no. 1, pp. 1–25, 2019.

[17] F. S. Salim, Z. A. Bakar, N. M. M. Noor, and R. Mohemad, "A literature study of mobile-based learning interfaces design," in *AIP Conference Proceedings*, 2023, p. 040006, doi: 10.1063/5.0152314.

[18] N. Ballantyne, "Are Smartphones Useful for Vocabulary Learning? An Appraisal," *Learning Solutions Magazine*. 2011. [Online]. Available: https://www.learningguild.com/articles/693/are-smartphones-useful-for-vocabulary-learning-an-appraisal/. (accessed: Feb. 12, 2024).

[19] M. L. Bernacki, J. A. Greene, and H. Crompton, "Mobile technology, learning, and achievement: Advances in understanding and measuring the role of mobile technology in education," *Contemporary Educational Psychology*, vol. 60, p. 101827, Jan. 2020, doi: 10.1016/j.cedpsych.2019.101827.

[20] C.-M. Chao, "Factors Determining the Behavioral Intention to Use Mobile Learning: An Application and Extension of the UTAUT Model," *Frontiers in Psychology*, vol. 10, Jul. 2019, doi: 10.3389/fpsyg.2019.01652.

[21] W. Y. B. Lim *et al.*, "Federated Learning in Mobile Edge Networks: A Comprehensive Survey," *IEEE Communications Surveys & Tutorials*, vol. 22, no. 3, pp. 2031–2063, 2020, doi: 10.1109/COMST.2020.2986024.

[22] V. Narayan and J. Herrington, "Towards a theoretical mobile heutagogy framework," in *Proceedings of ASCILITE 2014 - Annual Conference of the Australian Society for Computers in Tertiary Education*, 2014, pp. 150–160.

[23] S. K. Robinson, "Do schools kill creativity?" *TED Talk*, 2019. [Online]. Available: https://moodle2.units.it/pluginfile.php/221618/mod_folder/content/0/Sir Ken Robinson_ Do schools kill creativity_ _ TED Talk.pdf?forcedownload=1. (accessed: Feb. 12, 2024).

[24] T. Hastomo, "Schoology Effects on Students' Writing Ability," *Lentera: Jurnal Ilmiah Kependidikan*, vol. 12, no. 1, pp. 149–154, 2019.

[25] J. D. Bransford, A. L. Brown, and R. R. Cocking, *How People Learn: Brain, Mind, Experience, and School*. Washington, D.C.: National Academies Press, 2000, doi: 10.1016/0885-2014(91)90049-J.

[26] M. Amin, A. M. Sibuea, and B. Mustaqim, "The effectiveness of Moodle among engineering education college students in Indonesia," *International Journal of Evaluation and Research in Education (IJERE)*, vol. 12, no. 1, pp. 1–8, 2023, doi: 10.11591/ijere.v12i1.23325.

[27] C. C. Chen and P. H. Huang, "The effects of STEAM-based mobile learning on learning achievement and cognitive load," *Interactive Learning Environments*, vol. 31, no. 1, pp. 100–116, 2020, doi: 10.1080/10494820.2020.1761838.

[28] P. Ninghardjanti, C. Huda, and A. Dirgatama, "The perception on mobile-based interactive learning media use in archiving course completion," *International Journal of Evaluation and Research in Education (IJERE)*, vol. 11, no. 2, pp. 516–521, 2022, doi: 10.11591/ijere.v11i2.22131.

[29] S. Gaddess, "Mobile learning in the 21st century: benefit to learners," *Knowledge Tree E-J*, vol. 30, no. 3, pp. 214–228, 2004.

[30] M. A. Camilleri and A. C. Camilleri, "Learning from anywhere, anytime: Utilitarian motivations and facilitating conditions for mobile learning," *Technology, Knowledge and Learning*, vol. 28, pp. 1687–1705, 2023, doi: 10.1007/s10758-022-09608-8.

[31] A. Alshehri and T. M. Cumming, "Mobile Technologies and Knowledge Management in Higher Education Institutions: Students' and Educators' Perspectives," *World Journal of Education*, vol. 10, no. 1, pp. 12–22, 2020, doi: 10.5430/wje.v10n1p12.

BIOGRAPHIES OF AUTHORS

Ludmila Abazova is Candidate of Philology, Assistant professor of the Department of Russian Language and General Education Disciplines for Foreign Students, Kabardino-Balkarian State University, Nalchik, Russia. Her research interests are: educational process; involvement; m-learning; mobile learning; mobile technologies. She can be contacted at email: abazova.ludmila@mail.ru.

Zhansurat Gutaeva is Candidate of Philology, Assistant professor of the Department of Russian Language and General Education Disciplines for Foreign Students, Kabardino-Balkarian State University, Nalchik, Russia. Her research interests are: educational process; involvement; m-learning; mobile learning; mobile technologies. She can be contacted at email: gutaevazhansurat@mail.ru.

Madina Kochesokova is Candidate of Philology, Assistant professor of the Department of Russian Language and General Education Disciplines for Foreign Students, Kabardino-Balkarian State University, Nalchik, Russia. Her research interests are: educational process; involvement; m-learning; mobile learning; mobile technologies. She can be contacted at email: madina_kochesokova@mail.ru.