European Journal of Contemporary Education

ELECTRONIC JOURNAL

Blended Learning in the Context of Digitalization: New Opportunities and Possible Limitations

Elena V. Frolova [a], [*], Olga V. Rogach [a], [b], Rinat V. Faizullin [b]

[a] Financial University under the Government of the Russian Federation, Moscow, Russian Federation
[b] MIREA – Russian Technological University, Moscow, Russian Federation

Abstract

In modern conditions, Russian universities are focused on the active introduction of digital technologies in the educational process, the use of various combinations of online and offline learning. The rapid change in the landscape of higher education determines the scientific significance of research on the effectiveness of mixed forms of student learning, including assessments of synchronous and asynchronous modes of online classes. In the course of working on the article, the authors used the results of a questionnaire survey of students (N = 1,107) conducted in June 2021, as well as focus group interviews (N = 23) conducted in May 2023. The purpose of the article is to analyze the perception of the problems and benefits of blended learning. The results of the study showed that students rate synchronous forms of online learning (video conferencing) in real time more highly (compared to watching pre-recorded video content). The advantages of synchronous forms of learning are associated with maintaining stable communications with the teacher and the group during the lesson. The formation of communication links, the ability to maintain a discussion "here and now" combines the advantages of traditional interaction in the classroom and the advantages of remote learning. The results obtained indicate the limits of the total digitalization of education, the need to create conditions for contact work. The students were asked about the effectiveness of transferring traditional forms of conducting classes (a lecture by a teacher/making presentations at a seminar) to an online environment. The students with a low level of self-organization (often distracted, combine work and study) are most critical of traditional pedagogical practices implemented online. Such students tend to blame the low level of their motivation on the ineffectiveness of blended learning. Students with a high level of self-organization highly appreciated the effectiveness of traditional forms of conducting classes online.

[*] Corresponding author
E-mail addresses: efrolova06@mail.ru (E.V. Frolova)

Keywords: digitalization of education, blended learning, synchronous mode of learning, asynchronous mode of learning, online learning.

1. Introduction

The migration of higher education from the physical space to the digital format provides both the opening of a new window of opportunity for the introduction of innovations and creates new risks and consequences. The administration of higher education institutions is faced with the task of integrating digital experience and practices of personal interaction in the course of education, using digital technologies to improve the efficiency of the implementation of the main functions of universities (Chang, Gomes, 2022). Digital tools and pedagogical practices are shaping the design of the learning environment (Sarkio et al., 2023), which contributes not only to the development of new student competencies, but also to the preservation of educational culture.

In the new conditions, an additional difficulty lies in the need to overcome the digital divide. Although the results of research indicate that today's youth have the necessary digital competencies, formed at school and in everyday life under the influence of the constant use of gadgets. However, according to G. Janschitz and M. Penker, students are not always able to transfer their digital skills to the learning situation (Janschitz, Penker, 2022). The research results illustrate the problems caused by the lack of competence and experience in the daily use of digital technologies (Dong, 2020). Teachers in the new reality of the active introduction of digital technologies in the educational process also faced difficult decisions. On the one hand, there is an understanding in the teaching corps that digital technologies provide a wider coverage of students, the effectiveness of monitoring their progress. On the other hand, digitalization has negative aspects such as distraction, increased workload (Willermark, Gellerstedt, 2022). In the scientific literature, special attention is paid to the test system for assessing knowledge as an integral element of the digital educational environment of modern universities (Chernova i dr, 2023; Kulgemeyer et al, 2023). With the undoubted merits of test forms of control (Szeibert et al., 2023), scientists express doubts about the objectivity of these tools, justify their limitations in the course of testing students' communication skills (Simeonova, 2021).

The key problems of digitalization of education lie in a simplified approach to the content of this process, narrowing the practices of using digital technologies in the educational process. The saturation of the electronic environment with educational content cannot be considered as sufficient conditions for the digitalization of education, the transition to a new qualitative level of education in accordance with the needs of a new generation of students. The digital competencies of a teacher should include a wide range of forms of work in an electronic environment, the active use of interactive technologies. Authentic and relevant course materials that relate to practice are a key predictor of learning success in an e-learning environment (Kumar et al., 2019).

Interactivity, dialogue interaction, sustainability of communication practices are considered as factors that increase learning satisfaction (Armas-Rodriguez, Barroso-Osuna, 2020). The analysis of e-learning success factors is the subject of interdisciplinary research. The systematization of scientific works on this topic allows us to conclude that the following elements are important: social networks, gamification (Lara et al., 2020), digital technologies for assessing knowledge, and the quality of electronic educational content.

In the context of a pandemic and the need to maintain distance between subjects in the educational process, universities were able to evaluate the benefits of introducing digital technologies. Educational administrations have observed an increase in the cost-effectiveness of digital technologies due to the scalability of digital solutions (Sprenger et al., 2021). The works of Russian authors also conclude that it is necessary to actively introduce digital technologies into the educational process, use various combinations of online and offline learning components (Nagaeva, Kuznetsov, 2022). In this regard, researchers are faced with the question of how the perception of the quality of conducting classes in a digital format is changing?

The scientific literature substantiates approaches to understanding the terms "blended learning" and "hybrid learning". In this paper, the authors use the term "blended learning", as they focus on the analysis of the practice of combining traditional "student-teacher" communications and online learning. The supporters of the hybrid approach focus on transferring most of the educational process online (using online resources), while the role of the teacher is narrowed down to an advisory/supporting function (Rudinsky, Davydov, 2022).

Technological progress is transforming the practices of teacher-student interactions in the educational environment, initiating new ethical issues (Kroner et al., 2021). In addition, the generation of "digital natives", who are well versed in the flow of information (D'yakova, Sechkareva, 2019), also makes new demands on teachers. An analysis of the empirical results of research in Sweden made it possible to construct an image of an ideal teacher who is flexible, adapts his approaches to the needs of students, "teaches, not lectures" (Ideland, 2021). Thus, the analysis of scientific publications of education illustrates the relevance of studying the forms of conducting classes, pedagogical approaches and their evaluation in the student environment. Modern scientific works examine the effectiveness of traditional classes, substantiating conclusions about the limitations of "lecture learning" (Mundt, Hänze, 2023). In the changing landscape of higher education, thinking about digitalization provides an evidence-based approach to the development of new approaches to improve the quality of blended learning (Santos et al., 2020).

2. Methods

The purpose of the article is to analyze the perception of the problems and advantages of blended learning in the context of digitalization. The authors solve the following research tasks:

- Analysis of students' perception of the problems and advantages of conducting an online lecture in real time, including an assessment of the importance of traditional communications "student-teacher";

- Analysis of students' perception of problems and advantages of lecture video recording (asynchronous mode);

- Determination of the level of students' involvement in the educational process during online classes.

Research hypotheses:

1. Students of Russian universities are more focused on synchronous forms of online learning in real time.

2. Students who prefer the remote (online) form of conducting classes, in comparison with classroom classes, are less concerned about the lack of live communication, the lack of interactivity during online learning.

The authors used methods of comparative analysis, document analysis and analysis of arbitrary contingency tables. The key methods of collecting information were questionnaires and focus group research. A questionnaire survey of students was conducted in June 2021 (N = 1.107). When constructing the sample, the authors used both the snowball method and spontaneous sampling. Students of Russian universities took part in the questionnaire survey. The structure of the questionnaire made it possible to assess the level of digital competence of students, the pros and cons of digitalization, and students' preferences in terms of conducting classes online and offline. The article also addresses issues that are related to evaluating the effectiveness of transferring traditional pedagogical forms of work to online mode. To clarify a number of provisions, in May 2023, two focus groups were held with students ($N_1 = 11$ and $N_2 = 12$).

3. Results

As part of a questionnaire survey, students were asked about the perception of traditional forms of conducting classes. According to the data received, only every tenth respondent considers it ineffective to transfer traditional practices of conducting classes online. Nevertheless, almost half of the respondents (45.1 %) express doubts, believing that the lack of live communication reduces their interest and motivation.

The materials of the focus group illustrated the students' request for a mixed approach to the organization of classes. Most often, it was about conducting lectures in an online format.

Ivan B, 3rd year: "I think that the best thing is a video recording of a lecture, and seminars in the classroom. Anyway, the lecture is about listening, it doesn't matter where you sit. It's much more comfortable at home."

Tatyana V., 4th year student: "During the pandemic, I really missed the classroom, but now I think it would be good to combine online and offline."

Ekaterina D., 1st year student: "I would not want to study only online. It would be sad without live communication … "

Answering the question about the priority forms of conducting lectures online, the majority of respondents (57.3 %) spoke in favor of listening to lectures in "real time mode". Watching a

video recording of a lecture is preferred by a quarter of respondents (24.8 %). 16.9 % do not see the difference between these forms. The resulting distributions of responses allowed the authors to draw a number of conclusions. In 2021, "pandemic fatigue" generated a request among students to return to the classroom to traditional classes. This circumstance explains the high proportion of respondents who note the relationship between the lack of live communication and a decrease in interest/motivation to study. In addition, a small percentage of students' choice of the answer option "video recording of a lecture" is due to the insufficient level of development of digital forms of education in a pandemic. During the pandemic, universities did not have time to prepare the necessary digital content of the appropriate volume and quality.

The time that has passed since the emergency transition to online mode has not fundamentally changed the digital landscape of modern universities. The quality of digitized educational content is not highly appreciated by the modern student.

Valeria K., 4th year student: "Our teachers do not know how to make videos, it is not interesting to watch and listen. It would be possible to take the experience of bloggers who are interesting to watch."

Anna D., 3rd year student: "At our university, on the portal, there are video recordings of lectures on many subjects. But to be honest, it's hard to listen to. It doesn't work for more than half an hour … It's hard not to be distracted and force yourself to delve into it … "

Special attention in the course of the survey was paid to the analysis of respondents' assessments of the benefits of conducting a lecture in real time (video conference/video communication with a teacher) in comparison with watching a video recording of lecture material (broadcasting a video). Most of the students surveyed are of the opinion that direct online communication (video) with the teacher during a lesson creates an accessible communication space due to the possibility of organizing a discussion, communicating online, solving questions and receiving answers from the teacher and colleagues (Figure 1).
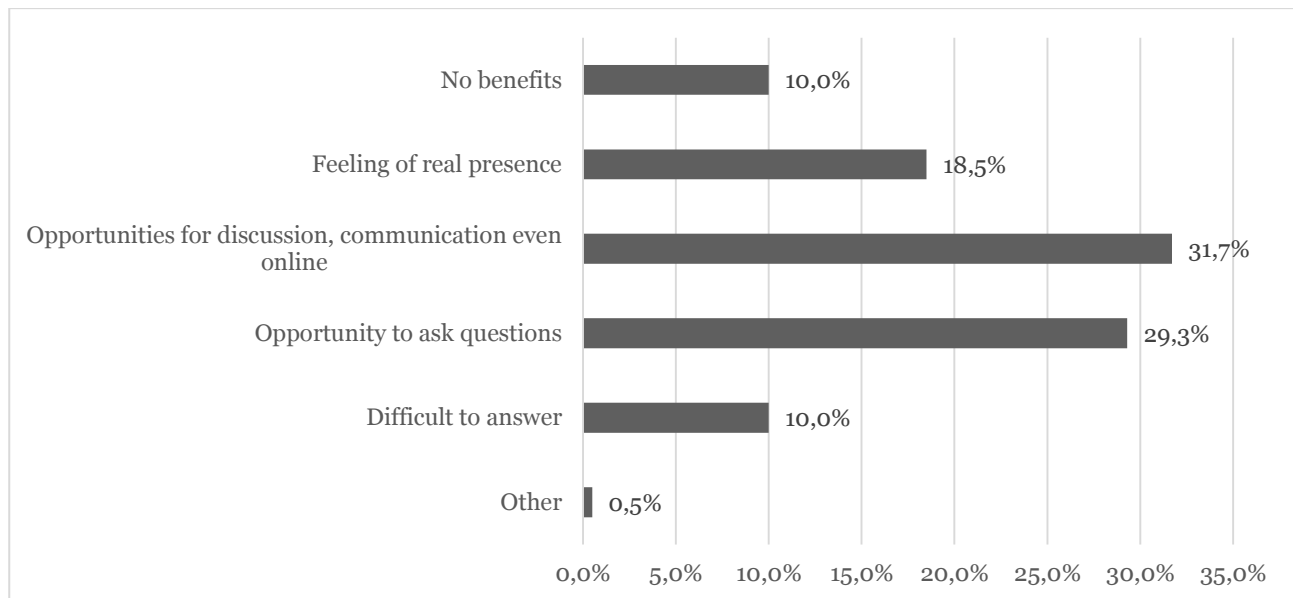

Fig. 1. Distribution of answers to the question: "What are the advantages *of holding a teacher's lecture in real time* compared to video recording?", %

On average, 29.3 % of respondents in the sample believe that the advantage of a teacher's lecture in real time compared to video recording is the ability to ask a question. 31.7 % of respondents talk about the possibility of discussion, communication even online. Only every 10 respondents could not name the benefits. In the open versions, students expressed the opinion that the real-time mode requires them to be more involved: *"there is little that distracts"*, *"all of the above advantages: the opportunity to ask questions, discuss, etc."*.

Conducting a teacher's lecture in real time, unlike video recording, allows you to recreate the space of direct interaction. This circumstance is undoubtedly an advantage of the synchronous online learning format. 18.5 % of students say this.

The results of the focus groups confirmed the findings. The following opinions were voiced in the students' assessments:

Valeria K., 4th year student: "Of course, when watching the video, you can then ask a question in the chat. But it's not that ... Then you already forget. It's better to talk about it right now."

In turn, watching a video recording of lectures, according to students, has its own advantages. The following statements were made in open responses: "*there is usually a more clearly expressed thought in the recording, without distraction and pauses*", "*you can stop the recording, google something (a term that I don't know)*", "*you can watch it at any convenient time*", "*can be delivered at a faster pace, allowing for less distraction and more understanding.*"

The distribution of respondents' answers indicates that the benefits of watching a video recording of a teacher's lecture are associated with better preparation of the content and the elimination of technical problems (Figure 2). In particular, recording a video lecture allows the teacher to work out the visuals more carefully using modern software, to eliminate unnecessary noise and pauses. Thus, 33.5 % of students believe that recording a lecture will provide a high quality of the technical aspect of the lesson (without interference and/or extraneous sounds); 30.2 % – "higher quality in terms of content (higher level of preparation, more thorough study of all issues)".
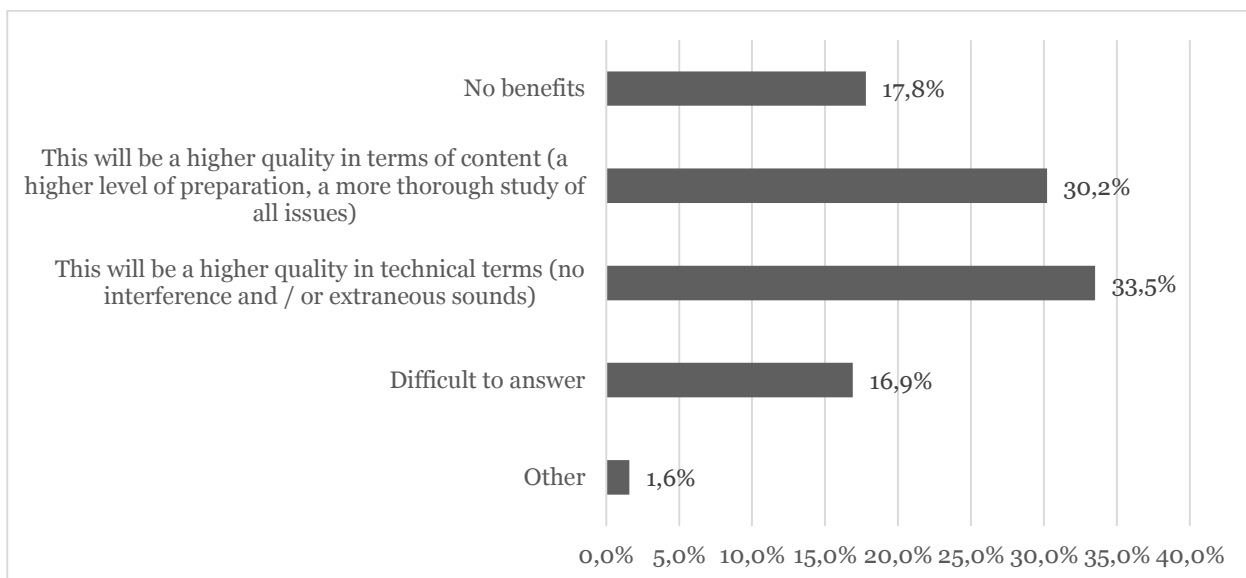

Fig. 2. Distribution of answers to the question: "What are the advantages *of watching a video recording of a teacher's lecture* compared to a lecture in real time?", %

The analysis of the data obtained indicates the actualization of the lack of live communication for those students who prefer the education in the classroom (Table 1). Such students note "lack of interactivity" less often than those students who prefer online (11.5 % and 19.9 %, respectively). Among students who prefer online learning, there is a higher proportion of those who indicate "heavy workload" as a barrier (9.3 percentage points higher than among students who prefer the traditional form of classroom learning).

Table 1. The relationship between the preferred form of education and the assessment of factors that reduce online learning, pers.

Which form of education do you prefer: traditional (in the classroom) or remote (online)	What, in your opinion, reduces the effectiveness of online learning?						
	lack of live communication	lack of interactivity	large loads	routine	difficult to answer	other	Total
online	125	106	116	100	54	31	532
traditional, in the	161	42	46	84	11	22	366

classroom						
difficult to answer	56	21	38	30	46	18	209
Total	342	169	200	214	111	71	1107

Table 2. The relationship between the preferred form of learning and the advantages of an asynchronous online format over synchronous learning, pers.

Which form of education do you prefer: traditional (in the classroom) or remote (online)	What are the advantages of watching a video recording of a lecture by a teacher compared to a lecture in real time?					
	This will be a higher quality in technical terms (no interference and / or extraneous sounds)	This will be a higher quality in terms of content (a higher level of preparation, a more thorough study of all issues)	No benefits	difficult to answer	other	Total
online	184	183	87	72	6	532
traditional, in the classroom	125	101	81	51	8	366
difficult to answer	62	50	29	64	4	209
Total	371	334	197	187	18	1107

An analysis of arbitrary contingency tables using the χ2 criterion showed that when the number of degrees of freedom is 8, the value of the χ2 criterion is 44.497. The critical value of χ2 at the significance level p = 0.01 is 20.09. The relationship between factor and resultant signs is statistically significant at a significance level of $p < 0.01$ (Table 2).

As the results of the student survey show, there is a relationship between the involvement of students in the educational process during online classes and the assessment of the effectiveness of transferring traditional pedagogical practices to new conditions. The results obtained showed that students who are more involved rate the effectiveness of transferring traditional forms of conducting classes to online mode higher than the average for the sample (higher than the average values for the sample by 24.2 p.p.). Among those students who are not involved in studies due to high workload at home or at work, the proportion of those respondents who consider traditional forms of conducting classes ineffective online is higher than the average for the sample (by 29 p.p.). At the same time, the inefficiency is explained by them by the lack of the possibility of interaction with both the teacher and the students.

Among those students who always listen carefully and ask questions/make comments, the following opinion was heard in open answers: "*not always <effective>, because sometimes, due to technical reasons, the connection may disappear and become unstable*", "*ineffective, most teachers monotonously tell not the most interesting and useful material, remotely people can simply walk away during such monologues and go about their business.*" For those students who listen carefully but ask questions, the opinion that "*teachers need to adapt*" is rarely characteristic. The most critical in open statements were students who are not involved in the educational process due to being busy at work/at home. Including a lecture or a seminar as a background for their everyday affairs, students at the same time say: "*this is all outdated, it is necessary to change the teaching policy: both lectures and seminars, because what we have now does not provide any useful skills for further work by profession*".

An analysis of arbitrary contingency tables using the χ2 criterion showed that when the number of degrees of freedom is 15, the value of the χ2 criterion is 201.746. The critical value of χ2 at the significance level p = 0.01 is 30.578. The relationship between factor and resultant signs is statistically significant at a significance level of $p < 0.01$ (Table 3)

Thus, the results of the study showed a relationship between the assessment of the effectiveness of the practice of transferring traditional forms of conducting classes to an online format and the level of students' self-organization. Students who are sufficiently self-organized and involved in the educational process tend to be less critical of the practice of transferring traditional forms of conducting a lesson (teacher's lecture/presentation at a seminar) to an online format. Their interest and motivation are supported not by external pedagogical influence, but by internal

enthusiasm. Data visualization in Figure 3 illustrates a sharp decrease in the assessments of the effectiveness of traditional forms of online classes with a decrease in the level of student involvement in the educational process (Figure 3).

Table 3. The relationship between the student's involvement in the learning process and the assessment of traditional forms of conducting a lesson (teacher's lecture/presentation at a seminar) online, pers.

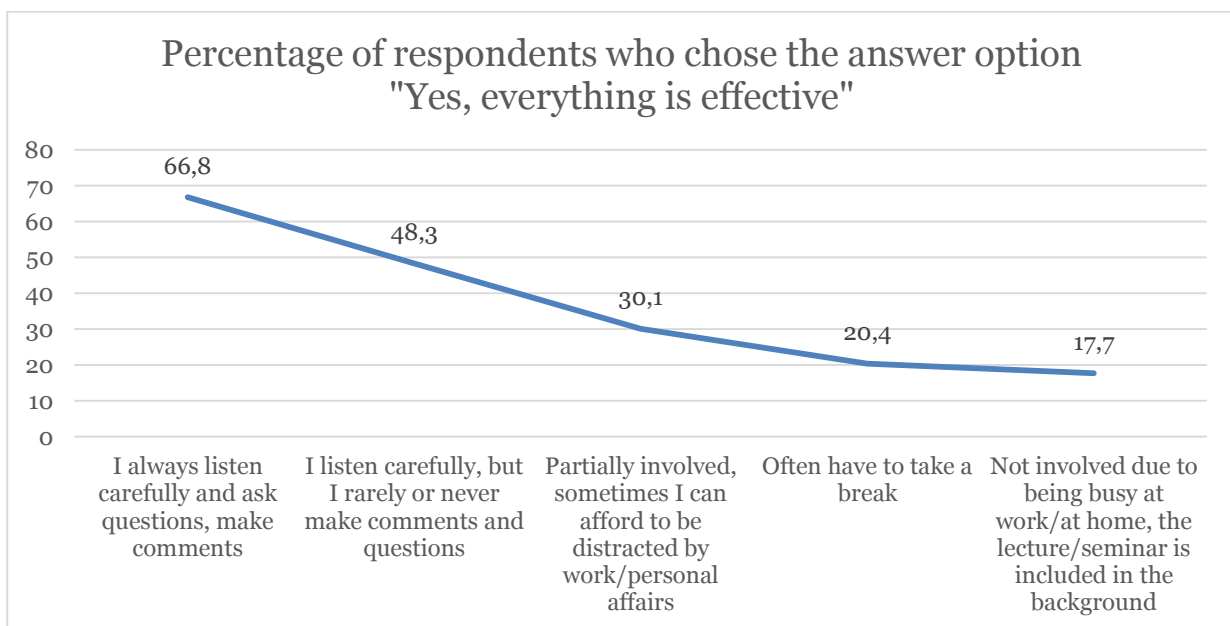| How involved are you in the learning process during online classes?	Do you think that the traditional forms of conducting a lesson (a lecture by a teacher / making presentations at a seminar) are effective online?				Total
	Yes, everything is efficient.	Partly, since the lack of live communication reduces interest and motivation	It is completely ineffective, since there is no possibility of interaction with both the teacher and students online	other	
I always listen carefully and ask questions, make comments	169	69	12	3	253
I listen carefully, but I rarely or never make comments and questions	175	165	20	2	362
Not involved due to being busy at work/at home, the lecture/seminar is included in the background	14	31	32	2	79
Partially involved, sometimes I can afford to be distracted by work/personal affairs	95	179	41	1	316
Often have to take a break	19	52	22	0	93
Difficult to answer	0	3	1	0	4
Total	472	499	128	8	1107

Fig. 3. Evaluation of the effectiveness of traditional forms of conducting classes online among students with varying degrees of involvement in the educational process, %

The effectiveness of blended learning is determined not only, as previously thought, by the resource capabilities of the university and the digital maturity of the teacher, but also by the student's consciousness and orientation towards active learning. A low level of involvement forces students to shift responsibility for developing interest in learning to teachers and the university as a whole, without making demands on themselves and their cognitive characteristics.

4. Discussion

The polarization of students' opinions regarding the assessment of digital forms of conducting classes. Fatigue from the pandemic has made traditional forms of lectures and seminars (in the classroom) more in demand. This circumstance led to a decrease in students' interest in impersonal forms of interaction during training (for example, lectures in video recording mode). At the same time, students were able to see the advantage of saving time on the road to the university, the opportunity to combine their everyday activities with their studies. Reflecting on the experience of the pandemic during the focus group, the respondents expressed a strong request for blended learning.

The transition to completely remote learning is not considered by students as a priority format for obtaining education. The wide representation of video content and the content of the electronic educational environment do not reduce the severity of the problems of remote learning (Frolova, Rogach, 2021).

This conclusion finds partial confirmation in the studies of Russian authors (Ustinova i dr., 2021). Scientists conclude that online learning is characterized by difficulties in self-organization of students, health problems, dysfunctions of knowledge testing, narrowing of dialogue communications. Post-pandemic studies also focus on the risks of "continuous e-education": deterioration in psychological health, information overload (Bermus, 2023).

The results of a qualitative study showed a low demand for digital educational content. Students compare the presentation of lecture video material and entertainment content that is broadcast on the network. On the one hand, this indicates the high expectations of students, the danger of stereotyping thinking, where the meaning of education is reduced to the ability to entertain (Frolova, Rogach, 2022). On the other hand, the results obtained may indicate the dysfunction of the digitalization of the educational space of the university (low digital skills of teachers, lack of digital infrastructure, etc.). According to E.V. Gnatyshina and A.O. Belousova digitalization of education should not be reduced to the creation of a digital copy of the usual textbooks. The value-semantic basis of the digitalization of education, in their opinion, should be the new digital skills of the participants in the educational process (Gnatyshina, Belousov, 2019). In the context of active digitalization of all spheres of public life, educational institutions should make significant efforts to adapt educational practices to the new challenges of the digital age. High expectations regarding the digitalization of education dictate the need to update hybrid forms of education (Holmgren, 2022).

The data obtained during the study made it possible to conclude that students need synchronous learning. The opportunity to immediately ask a question, express your opinion in the discussion "here and now" combines the advantages of traditional interaction in the classroom and the advantages of remote learning. The results obtained indicate the limits of the total digitalization of education, when even the high quality of educational content does not make up for the lack of contact work. As the research results show, it is the communication between the student and the teacher that is perceived as the highest space of dysfunctions in online learning (Frolova et al., 2023). The problem of the lack of live communication is most acute for the category of students who prefer traditional classroom classes. For all the students surveyed, the advantages of conducting online lectures in real time are associated with the presence of a communication space "here and now".

The assessment of the limitations and advantages of various learning formats (synchronous/asynchronous online learning) is determined by subjective preference, orientation towards the traditional (in the classroom) or remote form of education. The unifying feature of groups of students who express differences in priority forms of education was the understanding of the technical and content aspects of ensuring the quality of digital educational content (video recording of a lecture). Both groups of students see the benefits of delivering live online lectures in direct interaction. There is a high potential for blended forms of learning, which maintain a wide space for interaction and create comfortable conditions for participants in the education system.

The criticism of mixed forms of education is due not so much to objective factors as to subjective reasons. In particular, the low involvement and interest of students, combined with weak self-organization, creates excessive demands on the teacher's ability to diversify the learning process in an online format. It should be noted that in the scientific literature, when studying the processes of digitalization of education, attention is primarily focused on the role of the teacher, his digital competence, the need to change the usual educational practices, methods of involving students in active communication (Doz et al, 2023). However, the results obtained by the authors outlined a new direction of research. The results of the author's research showed that the effectiveness of learning in the context of digitalization is determined not so much by digital competencies, professional skills, and the charisma of the teacher, but by the level of responsibility of the student, his desire to acquire knowledge. A deeper understanding of the dependence of student motivation on subjective causes and conditions is required: employment at home and at work, the desire for quality online education, the ability to self-organize and learn. The research materials showed a direct correlation between the assessments of the effectiveness of transferring traditional pedagogical practices to the online environment and the level of student self-organization. It can be assumed that students with a high level of motivation do not expect additional "digital incentives". Such students believe that traditional pedagogical practices are quite effective and sufficient for obtaining a quality education. The results obtained are confirmed by other studies that substantiate the importance of maintaining subject-oriented learning, maintaining the trends in the humanization of education (Manikovskaya, 2019), and a reasonable combination of traditional and digital pedagogy (Kryukova, 2018).

5. Conclusion

The results of the questionnaire survey confirmed the research hypotheses. An analysis of the respondents' ratings showed that students see more advantages of lecturing via videoconference (synchronous forms of learning) compared to watching pre-recorded video content (asynchronous forms of learning). The perception of the advantages and disadvantages of synchronous/asynchronous forms of learning is determined by the preferences of students, their orientation towards online or classroom classes. Students who prefer traditional forms of conducting classes in the classroom are more focused on synchronous forms of online learning in real time. The second research hypothesis received partial confirmation. Students who prefer a remote (online) form of conducting classes in comparison with classroom classes are less concerned about the lack of live communication, however, they are more sensitive to the lack of interactivity in the course of online learning.

Blended forms of learning show their limitations for students with a low level of self-organization. The narrowing of control over the involvement of students online initiates such destructive practices as distraction to work and personal issues, the perception of lectures as a background for everyday affairs. At the same time, such students tend to blame the low level of their motivation on the inefficiency of mixed forms of education. This trend has become widespread, creating a stereotype about the low quality of online learning with the high availability of this form of education. For students with a high level of self-organization, blended learning opens up new opportunities, while maintaining all the advantages of online (the ability to review class records, save travel time, etc.). Further areas of research may be the following: analysis of the "limits" of digitalization of education, the possibility of a "turn" to the established, traditional roles and values of pedagogical practices, the development of humanization of education in the context of digitalization, the effectiveness of test tools for assessing students' knowledge.

6. Limitations

The limitations of this study include the use of a random sample, which does not fully reflect all categories of students. In order to clarify the results obtained, it seems appropriate to differentiate the opinions of students of humanitarian and technical profiles of education.

7. Declaration of Competing Interest

The manuscript's authors declare that there is no interest in conflict, and all reference materials were dully acknowledged.

References

Armas-Rodriguez, Barroso-Osuna, 2020 – *Armas-Rodriguez, N., Barroso-Osuna, J.* (2020). Questionnaire to diagnose interactivity in distance education from the students' perception. *LUZ.* 19(2): 3-16.

Bermus, 2023 – *Bermus, A.G.* (2023). Problems and prospects of health saving research in the educational environment of the university: a theoretical review. *Pedagogy. Questions of theory and practice.* 8(1): 1-12.

Chang, Gomes, 2022 – *Chang, S., Gomes, C.* (2022). Why the Digitalization of International Education Matters. *Journal of studies in international education.* 26(2): 119-127. DOI: https://doi.org/10.1177/10283153221095163

Chernova i dr., 2023 – *Chernova, N.I., Ivanova, E.A., Bogush, N.B., Katakhova, N.V.* (2023). Tekhnologiya opredeleniya kognitivno-psikhologicheskikh osobennostei studentov negumanitarnogo vuza [Technology for determining non-humanities university students' cognitive-and-psychological characteristics]. *Russian Technological Journal.* 11(3): 104-116. DOI: https://doi.org/10.32362/2500-316X-2023-11-3-104-116 [in Russian]

Dong, 2020 – *Dong, S.* (2020). Practical exploration of using 'cloud classroom' to organize online learning: A case study of Jianye district, Nanjing during the COVID-19 Pneumonia. *Science insights education frontiers.* 5(2): 553-556. DOI:10.15354/sief.20.rp016

Doz et al., 2023 – *Doz, E., Cuder, A., Caputi, M.* (2023). Distance learning environment: perspective of Italian primary and secondary teachers during COVID-19 pandemic. *Learning environments research.* 26: 5550571. DOI: https://doi.org/10.1007/s10984-022-09451-9

D'yakova, Sechkareva, 2019 – *D'yakova, E.A., Sechkareva, G.G.* (2019). Tsifrovizatsiya obrazovaniya kak osnova podgotovki uchitelya XXI veka: problemy i resheniya [Digitalization of education as the basis for training a 21st-century teacher: problems and solutions]. *Vestnik Armavirskogo gosudarstvennogo pedagogicheskogo universiteta.* 2: 24-36. [Electronic resource]. URL: https://cyberleninka.ru/article/n/tsifrovizatsiya-obrazovaniya-kak-osnova-podgotovki-uchitelya -xxi-veka-problemy-i-resheniya (date of access: 10.09.2023).

Frolova et al., 2023 – *Frolova, E.V., Rogach, O.V., Faizullin, R.F* (2022). Problems of Student Communication in Online Learning. *European Journal of Contemporary Education.* 12(1): 79-91. DOI: 10.13187/ejced.2023.1.79

Frolova, Rogach, 2021 – *Frolova, E.V., Rogach, O.V.* (2021). Digitalization of higher education: advantages and disadvantages in student assessments. *European Journal of Contemporary Education.* 10(3): 616-625. DOI: 10.13187/ejced.2021.3.616

Frolova, Rogach, 2022 – *Frolova, E.V., Rogach, O.V.* (2022). Disfunktsii tsifrovizatsii vysshego obrazovaniya (opyt pandemii COVID-19) [Dysfunctions of the digitalization of higher education (experience of the COVID-19 pandemic)]. *Monitoring obshchestvennogo mneniya: ekonomicheskie i sotsial'nye peremeny.* 6(172): 84-107. DOI https://doi.org/10.14515/ monitoring.2022.6.2265 [in Russian]

Gnatyshina, Belousov, 2019 – *Gnatyshina, E.V., Belousov, A.O.* (2019). Transformatsiya metodicheskoi raboty uchitelya v usloviyakh tsifrovizatsii obrazovaniya [Transformation of the methodological work of the teacher in the context of the digitalization of education]. *Nauchnoe obespechenie sistemy povysheniya kvalifikatsii kadrov.* 2(39): 47-52. [in Russian]

Holmgren, 2022 – *Holmgren, M.* (2022). Enacting special education in a digitalized school: opening for new understandings of a digitalized special educational practice. *Journal of Special Education Technology.* 0(0). DOI: 10.1177/01626434221131776

Ideland, 2021 – *Ideland, M.* (2021). Google and the end of the teacher? How a figuration of the teacher is produced through an ed-tech discourse. *Learning, Media and Technology.* 46(1): 33-46. DOI: 10.1080/17439884.2020.1809452

Janschitz, Penker, 2022 – *Janschitz, G., Penker, M.* (2022). How digital are 'digital natives' actually? Developing an instrument to measure the degree of digitalisation of university students – the DDS-Index. *Bulletin of Sociological Methodology/Bulletin de Méthodologie Sociologique.* 153(1): 127-159. DOI: 10.1177/07591063211061760

Kroner et al., 2021 – *Kroner, S., Christ, A., Penthin, M.* (2021). Digitalization in aesthetics, arts and cultural education-a scoping review. *Zeitschrift fur erziehungswissenschaft.* 24(1): 9-39. DOI: 10.1007/s11618-021-00989-7

Kryukova, 2018 – *Kryukova, O.S.* (2018). Traditsionnaya i «Tsifrovaya» pedagogika v sovremennom obrazovatel'nom prostranstve [Traditional and "digital" pedagogy" in the modern educational space]. *Rossiya: tendentsii i perspektivy razvitiya.* 13(1): 856-857.

Kulgemeyer et al., 2023 – *Kulgemeyer, C., Riese, J., Vogelsang, C., Buschhüter, D., Borowski, A., Weißbach, A., Jordans, M., Reinhold, P., Schecker, H.* (2023). How authenticity impacts validity: developing a model of teacher education assessment and exploring the effects of the digitisation of assessment methods. *Zeitschrift für Erziehungswissenschaft.* DOI: 10.1007/s11618-023-01154-y

Kumar at al., 2019 – *Kumar, S., Martin, F., Budhrani, K., Ritzhaupt, A.* (2019). Award-winning faculty online teaching practices: elements of award-winning courses. *Online learning.* 23(4): 160-180. DOI: 10.24059/olj.v23i4.2077

Lara at al., 2020 – *Lara, J.A., Aljawarneh, S., Pamplona, S.* (2020). Special issue on the current trends in E-learning Assessment. *Journal of computing in higher education*, 32(1): SI. DOI: 10.1007/s12528-019-09235-w

Manikovskaya, 2019 – *Manikovskaya, M.A.* (2019). Tsifrovizatsiya obrazovaniya: vyzovy traditsionnym normam i printsipam morali [Digitalization of education: challenges to traditional norms and principles of morality]. *Vlast' i upravlenie na Vostoke Rossii.* 2(87): 100-106. DOI: 10.22394/1818-4049-2019-87-2-100-106 [in Russian]

Mundt, Hänze, 2023 – *Mundt, E., Hänze, M.* (2023). Course characteristics influencing students' oral participation in higher education. *Learning Environments Research.* 26: 427-444. DOI: 10.1007/s10984-022-09437-7

Nagaeva, Kuznetsov, 2022 – *Nagaeva, I.A., Kuznetsov, I.A.* (2022). Gibridnoe obuchenie kak potentsial sovremennogo obrazovatel'nogo protsessa [Hybrid learning as a potential of the modern educational process]. *Otechestvennaya i zarubezhnaya pedagogika.* 1(3): 126-139. DOI: 10.24412/2224-0772-2022-84-126-139

Rudinskii, Davydov, 2021 – *Rudinskii, I.D., Davydov, A.V.* (2021). Gibridnye obrazovatel'nye tekhnologii: analiz vozmozhnostei i perspektivy primeneniya [Hybrid educational technologies: analysis of opportunities and prospects for application]. *Vestnik nauki i obrazovaniya Severo-Zapada Rossii.* 7(1): 44-52. [in Russian]

Santos et al., 2020 – *Santos, L.A.M., Gomes, S.P.S., Luduvice, J.LS.* (2020). Study about the appreciation of teaching from the continuous training of teachers who work in elementary education in the public and private network of Sergipe. *Revista praxis educacional.* 16(39): 356-378. DOI: 10.22481/praxisedu.v16i39.6382

Sarkio et al., 2023 – *Sarkio, K., Korhonen, T., Hakkarainen, K.* (2023). Tracing teachers' perceptions of entanglement of digitally-mediated educational activities and learning environments: a practice-oriented method. *Learning Environments Research.* 26: 469-489. DOI: 10.1007/s10984-022-09442-w

Simeonova, 2021 – *Simeonova, N.M.* (2021). K voprosu ob integratsii innovatsionnykh i traditsionnykh metodov kontrolya znanii po inostrannomu yazyku v ekonomicheskom vuze [To the issue of integration of innovative and traditional methods of foreign language knowledge control in an economic university]. *Sovremennoe pedagogicheskoe obrazovanie.* (4): 107-113. [in Russian]

Sprenger et al., 2021 – *Sprenger, D.A., Schwaninger, A.* (2021). Technology acceptance of four digital learning technologies (classroom response system, classroom chat, e-lectures, and mobile virtual reality) after three months' usage. *International journal of educational technology in higher education.* 18(1): 8. DOI: 10.1186/s41239-021-00243-4

Szeibert et al., 2023 – *Szeibert, J., Muzsnay, A., Szabó, C., Bereczky-Zámbó, C.* (2023). A case study of using test-enhanced learning as a formative assessment in high school mathematics. *International Journal of Science and Mathematics Education.* 21: 623-643. DOI: 10.1007/s10763-022-10264-8

Ustinova i dr., 2021 – *Ustinova, O.N., Volkova, L.M., Das'ko, M.A., Golubev, A.A., Datsenko, A.A., Vasil'ev, D.A.* (2021). Tsifrovizatsiya obrazovaniya v sovremennykh usloviyakh [Digitalization of education in modern conditions]. *Uchenye zapiski universiteta im. P.F. Lesgafta.* 3(193): 433-436. [in Russian]

Willermark, Gellerstedt, 2022 – *Willermark, S., Gellerstedt, M.* (2022). Facing radical digitalization: capturing teachers' transition to virtual classrooms through ideal type experiences. *Journal of Educational Computing Research.* 60(6): 1351-1372. DOI: 10.1177/07356331211069424