Online Learning As a Tool for the Education System in the Context of Digitalisation

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Abstract

Online learning has tended to increase its use in the education system since the beginning of the pandemic. The article aims to empirically investigate the effectiveness of online learning as a tool for the education system in the context of digitalization. The study is based on the use of a structured interview technique and an analysis of the results of a survey of Ukrainian university students. To ensure organization and self-discipline, comprehension, learning, and assimilation of learning material, it is important to ensure a sufficient level of interactivity and teacher-student interaction, feedback, and guidance to students in an adequate time frame. A well-functioning feedback system is a supportive and essential element for student learning. Classical deadlines set by the teacher for assignments are also a valid method in online learning. Students noted the importance of creativity in the teacher's presentation of the task and the importance of the limitations of the methods by which the task can be solved. Timely revision, and evaluation by the teacher of the work, the task also encourage students to put a higher level of effort into their online learning. Online synchronous seminars in ZOOM are more impactful and motivating than recorded video lectures, and presentations which are available to students in asynchronous mode. An essential method of online learning was noted by the students to complete individual written assignments on the studied topic immediately after its presentation. The teacher's explanations and live synchronous conversation were also effective in online learning. Continuous, systematic educator monitoring of the progress and attendance at the online classes encouraged students to attend lectures but was not a major method for ensuring synchronous attendance.

Keywords: online learning, distance learning, digitalization of the educational process, online learning methods, the effectiveness of online learning

1. Introduction

The effectiveness of students' online learning depends on various factors, among them personality type, personality traits, methods of learning activities, level of self-discipline, and organization. Since the beginning of the pandemic, online learning has been increasingly exploited. Its effectiveness depends on the context of the educational environment. Different factors determine the success of students' online learning, which can vary and need additional ways of encouraging, motivating, stimulating, and monitoring performance. In an online learning environment, life goals, values, and learning objectives are redefined and this has an impact on academic performance. The online higher education environment affects communication, feedback, levels of motivation, encouragement, and incentives for students to learn the material, and complete tasks. The aforementioned calls for a detailed study of the effectiveness of online learning in higher education institutions (HEIs) in the context of digitalization. Therefore the

article aims to empirically investigate the effectiveness of online learning as an educational system tool in the context of digitalization.

2. Literature Review

For over two decades, online learning has remained a central topic of educational research (Singh & Thurman, 2019). The term "online learning" was first coined in 1995 with the development of WebCT, the first learning management system (LMS) that eventually became Blackboard. Since then, various terms such as e-learning, blended learning, online education, and online courses have been used interchangeably with online learning, leading to ongoing debates among scholars regarding its interpretation and potential ambiguity(Twigg, 2003).

There are different perspectives in the academic literature, depending on the perception of the learning environment and approaches to understanding online learning, sometimes identified with distance learning, and e-learning (Moore, Dickson-Deane & Galyen, 2011). Most scholars characterize online learning as access to the learning process using technology, one way of organizing distance learning. Since the category "online" is computer-mediated communication (communication, interaction) in synchronous mode, online learning is the organization of personal (face-to-face) learning through various technologies in synchronous mode (Zoom, Google Classroom, Skype, etc.).

One of the first definitions suggested by Curtain (2002) interprets online learning broadly as a particular way of using the Internet to enhance teacher-student interaction. Curtain (2002) argues that the online mode of learning encompasses both asynchronous forms of interaction such as assessment tools, and online transmission of course materials and synchronous interaction via email, newsgroups, and conferencing tools such as chat groups. The scholar refers to online learning as both classroom-based and distance education, arguing that the terms synonymous with online learning are 'web-based education' and 'e-learning' (Singh & Thurman, 2019).

Online learning refers to the process of learning via the internet, where learners and students use computers to participate in synchronous sessions with educators and peers, without being restricted by their physical location. It can also refer to asynchronous learning environments where learners and students interact with teachers and fellow students at their convenience, without needing to share a physical space or have a general online presence. The term online education is also commonly used to describe education provided through the internet, where learning content is delivered online, and educators develop learning modules that enhance interactivity and engagement in synchronous or asynchronous settings (O'Doherty et al., 2018).

According to Miller, Topper, and Richardson (2016), the emergence of new technologies has led to the development of new concepts to distinguish different types of distance learning. Some of these concepts include online learning, e-learning, and hybrid/blended learning. Online education and e-learning are often used interchangeably and refer to the use of web-based technologies to combine teacher-student space. Lee (2017), Moore et al. (2011), and Ryan et al. (2016) have also defined online education/e-learning in this manner.

After analyzing various definitions of online learning, Singh & Thurman (2019) have identified three fundamental elements that are present in all definitions. The first element is the utilization of technology for learning. The second element is the time element, which can be either synchronous or asynchronous. Lastly, the third element is the use of synonyms for online learning, which can lead to confusion and inconsistency in the definition of this concept.

Most definitions of online learning share common themes, such as the use of technology, recognition of confusion around related terms, and the consideration of physical distance and comparison with traditional classroom learning (Singh & Thurman, 2019). Meanwhile, Dhawan (2020) conducted a study on online learning and identified its strengths, weaknesses, opportunities, and challenges, which are summarized in Figure 1.

Distance learning uses various digital tools, such as audio podcasts, videos, exercises, and tests, to carefully track a student's progress and build an individual learning trajectory. It differs from traditional learning in its approach to interaction, structure, and educational paradigm. Online learning, on the other hand, is organized through a set timetable of classes and takes place at the location of the participants. It requires stamina and routine task skills and uses traditional lecture materials and teaching methods. The main differences between online and distance learning are in their organization, required skills, and educational approaches. Distance learning, unlike online learning, allows for more flexibility in terms of location and schedule. Students can access course materials and complete assignments at their own pace and from any location with an internet connection. This approach to learning has become increasingly popular in recent years due to its accessibility and convenience. Additionally, distance learning often utilizes more interactive and collaborative learning tools, such as online discussion forums and group projects, which promote engagement and knowledge sharing among students.

Strengths: flexibility of time, flexibility in participant location, accessibility to a wide audience, wide availability of courses and content, and quick feedback.	Weaknesses: technical differences, learner capacity, and confidence levels, time management, frustration, burnout, puzzlement, distraction, lack of personal, and physical presence
Opportunities: a set of innovations and digital development; design of flexible learning programs; strengthening skills: problem-solving, critical thinking, adaptation; users can be of different ages; innovative pedagogical approaches (radical transformation of all educational aspects)	Challenges: unequal distribution of ICT infrastructure; quality of education; digital literacy; digital gap; cost of technology

Figure 1. The SWOC Analysis of Online Learning During Such Crises

Note. SWOC = Strengths, Weaknesses, Opportunities, & Challenges.

Source: Dhawan (2020).

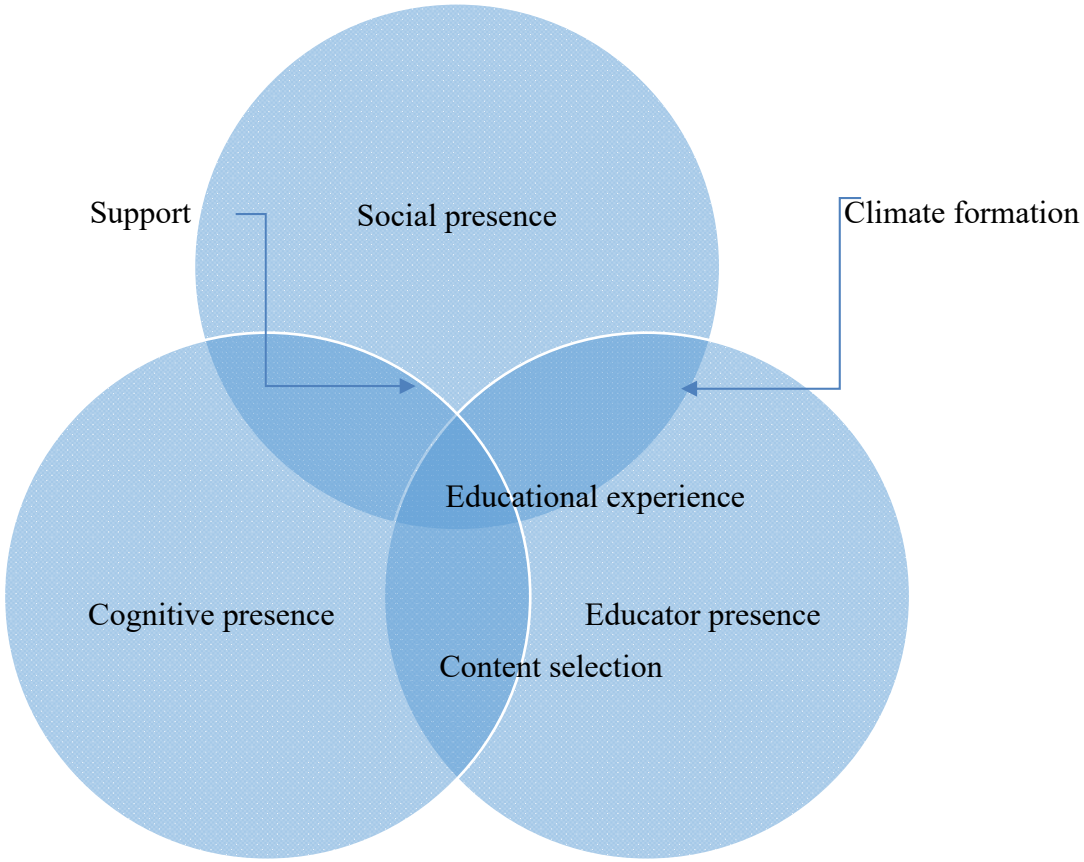

Figure 2. Community of Inquiry

Source: Anderson (2004).

Anderson (2004) notes that online learning has three central components: cognitive presence, social presence, and educator presence (Figure 2). Cognitive presence means creating a learning environment that can support the development of critical thinking skills. Social presence means creating a supportive environment where students feel comfortable expressing their thoughts, and ideas, can communicate, and represent themselves.

After reviewing the existing literature on barriers and how to address them in designing and implementing online learning programs, O'Doherty et al. (2018) identified several common challenges. These include time constraints, insufficient technical skills, inadequate infrastructure, lack of institutional strategies and support, and negative attitudes among participants. To overcome these barriers, the authors suggest implementing solutions such as providing training to improve teacher skills, offering incentives and rewards for time spent developing and delivering online content, improving institutional support and strategies, and fostering positive attitudes among all participants involved in online content development and delivery.

Mukhtar et al (2020) identify the following advantages of distance learning: comfort, and accessibility. Among the limitations, the authors highlighted the inefficiency and difficulty of supporting academic virtue. Recommendations to address the limitations included training educators in the use of online modalities and developing a lesson plan with a reduced cognitive load and more interactive activities.

Kauffman (2015) explores students' perceptions of online learning compared to traditional courses, claiming possible negative effects such as decreased motivation, persistence, and curiosity. Kauffman (2015) notes that a wide range of factors influences success and satisfaction in online learning environments, including learning outcomes, instructional design, and learner characteristics. Accordingly, online learning requires the selection of adequate instructional methods, support, course structure, and design that should contribute to student success and satisfaction. Nguyen (2015) provides evidence for the effectiveness of online learning: based on an analysis of studies, the author proves that about 92% of all studies of distance and online education found that distance and online learning is at least as effective, if not better, than traditional education.

In their study, Dumford & Miller (2018) aimed to investigate how learning through online courses affects student engagement levels. They found that there were significant relationships between online course attendance and student engagement across all ages, with students who attended more courses being more likely to participate in discussions and workshops. However, these students were less likely to engage in collaborative learning, student-faculty interactions, and discussions with other participants compared to their peers in traditional courses. Coomey & Stephenson (2018) argue that online learning designers should prioritize student control, learner control, dialogue, learner support, student support, and opportunities for direct participation by those involved in the learning process. Meanwhile, Adnan & Anwar (2020) found that online learning may not produce desired results in underdeveloped countries such as Pakistan, where most students lack internet access due to technical and financial problems. Lack of face-to-face interaction with the instructor, response time, and absence of traditional socialization in the classroom were identified as the main problems of online learning for tertiary students.

Studies have examined the impact of digital technology on learning effectiveness, highlighting specific communication tools for students and educators (Wargadinata et al., 2020). Hybrid distance learning models using platforms have been found to have positive effects (Masalimova et al., 2021; Muthuprasad et al., 2021), as has a full transition to an online environment (Radha et al., 2020). The primary advantage of online teaching platforms is their flexibility, while distraction caused by family and poor internet connection are among the disadvantages (Dost et al., 2020; Fatonia et al., 2020). Studies have shown mixed effects of online learning on students' academic performance, with anxiety over distance conditions, security risks, and the need for effective online learning and control being factors (Simamora, 2020). Negative perceptions of online learning can lead to psychological distress and fear of losing the academic year (Hasan & Bao, 2020). The effects of online education depend on the level of development of the country and the availability of resources to ensure its effectiveness in higher education during times of crisis (Gismalla et al., 2021).

Thus the rise of digital technologies has led to an increased demand for digital literacy skills, which are essential for success in the modern workplace. Online learning provides an opportunity for learners to develop these skills while also pursuing their education. Overall, the use of online learning as a tool for the education system in the context of digitalization is highly relevant and necessary. It provides learners with greater flexibility, personalized learning opportunities, and the chance to develop digital literacy skills. As digital technologies continue to advance, it will be increasingly important for educational institutions to embrace online learning as an essential tool for education.

3. Methodology

The research employs a structured interview methodology and analyzes survey data collected from university students in Ukraine. The research tool was a questionnaire (Table 1) developed by the authors and sent via electronic means of communication (e-mail). Students were asked to answer questions regarding 1) the level of discipline and organization in conducting online classes; 2) students' use of learning materials; 3) methods, and tools of online learning. Based on the survey results, it was found that online learning is effective in terms of digitalization.

Table 1. Student Survey Questionnaire on the Effectiveness of Online Learning in a Digital Environment

Questionnaire. Pandemic wave 2. 2020-2021. I.N. Diachenko.	Response options
1. Has it helped you to improve your level of discipline and organization while studying an unknown subject?	01) deadlines set by the teacher for the completion of the work/assignment; 02) timely review and evaluation of work/assignment by the teacher; 03) provision with manuals, methodological materials; 04) your own method _____ (write down in words); 05) nothing helped.
2. Has it helped you to comprehend unfamiliar material in a short amount of time?	06) structure-logical schemes, tables (structure of information); 07) video lectures with presentations as an outline of material (visualization of material); 08) use of color, highlighting, and underlining of material; 09) seminars in ZOOM followed by written assignments on the studied topic; 10) _____ your option (write down in words); 11) explanation by the teacher and lively conversation with him/her about the material; 12) nothing helped.
3. The learning material has become easier to remember in a short span of time as a result of this	13) an individual has written answers of the teacher to control written tasks and the possibility to compare with his/her answers; 14) structural-logical schemes, tables (structured information); 15) use of color, highlighting, and underlining of material; 16) live dialogue with the teacher at seminars in ZOOM followed by individual written assignments on the studied topic; 17) _____ your option (write down in words); 18) systematization of the material and constant repetition in class; 19) nothing helped.
4. Has it helped you to remember the study material in a brief period?	20) Use of Proficonf, ZOOM, etc. ; 21) structured teaching material; 22) systematization of material and constant repetition in the classroom; 23) live dialogue with the teacher during seminars in ZOOM followed by individual written assignments on the studied topic; 24) your option _____ (write down in words). 25) independent work; 26) constant, systematic monitoring of my progress and attendance by the teacher; 27) nothing has helped me to learn the study material.

Source: developed by the authors

Statistical estimates (mean, variance, standard deviation) were used to process the results.

A total of 120 university students participated in the study, of whom 90% were female and 10% male (Table 2); 10.9% of students were studying and employed in the profession, 89.1% were studying; 31.6% were 18 years old, 44.6% 19 years old, 16.3% 20 years old, 2.2% 21 years old, 1.1% 22 years old.

Table 2. Distribution of Respondents by Curriculum Course and Gender

	Frequency, individuals	Specific weight, %	Cumulatively, %
		Course	
First-year	19	15,8	15,8
Second year	42	35,0	50,8
Fourth-year	49	40,8	91,7
Fifth year	10	8,3	100,0
Total	120	100,0	
		Gender	
Male	12	10,0	10,0
Female	108	90,0	100,0
Total	120	100,0	

Source: calculated by the authors.

4. Results

The level of discipline and orderliness in the process of studying the material and the subject was provided for students by manuals, and methodological materials (60% of the respondents pointed out their effectiveness as a tool of self-discipline). In second place in terms of efficiency, the teacher set deadlines for tests and tasks (42% of the respondents pointed out their effectiveness). The timely check and evaluation by the teacher of the work and tasks were also a stimulating method for online learning (19% pointed out their effectiveness) (Figure 3). Thus, in the online learning environment, students' discipline and orderliness depended on the same methods used in traditional face-to-face learning environments.

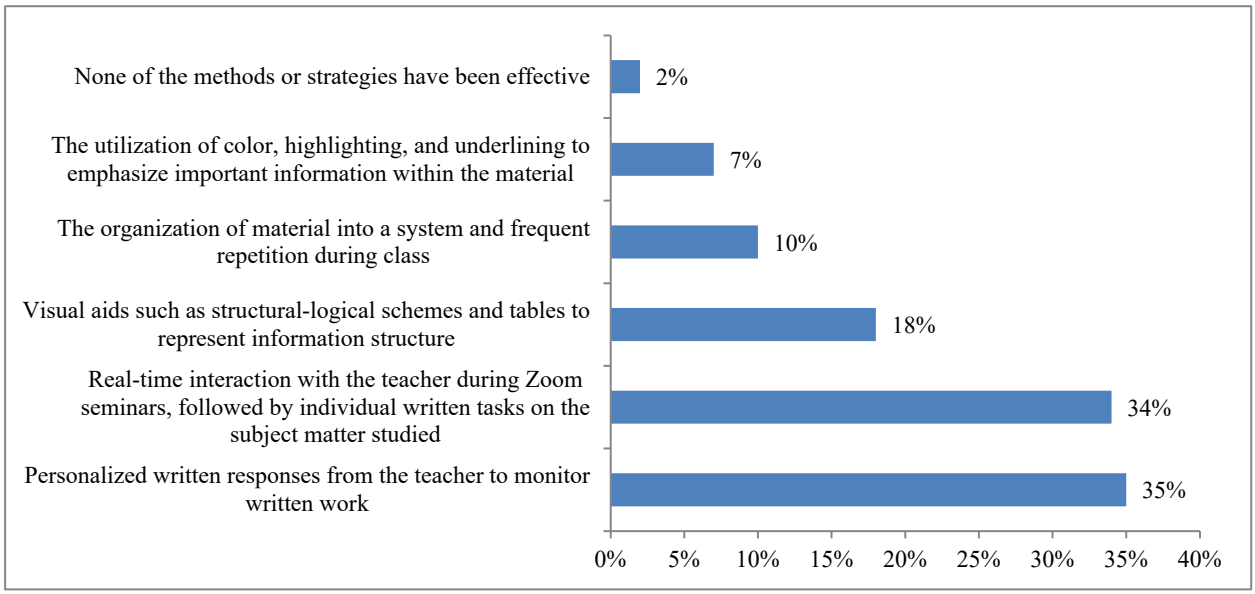

Figure 3. The Distribution of Responses Provided by Participants in regards to the Question:"Has it helped you to improve your level of discipline and organization while studying an unknown subject?"

Source: calculated by the authors

According to the survey results, the most effective tools for quickly mastering new material were structural-logical schemes and tables for 32% of the respondents. 24% of the students found seminars in ZOOM followed by written assignments to be effective, while 18 % preferred video lectures with presentations to visualize the material. For 18.50% of students, teacher explanation and live conversation were the most effective, and for 8% of students, the use of color, highlighting, and underlining were helpful. All these methods were found to be effective by 10% of students (Figure 4). The study shows that live communication remains a crucial aspect of learning for students, and

technology has provided support for such communication. Seminars and video lectures with presentations, which combine live communication with communication technology, are just as important as digital tools for learning.

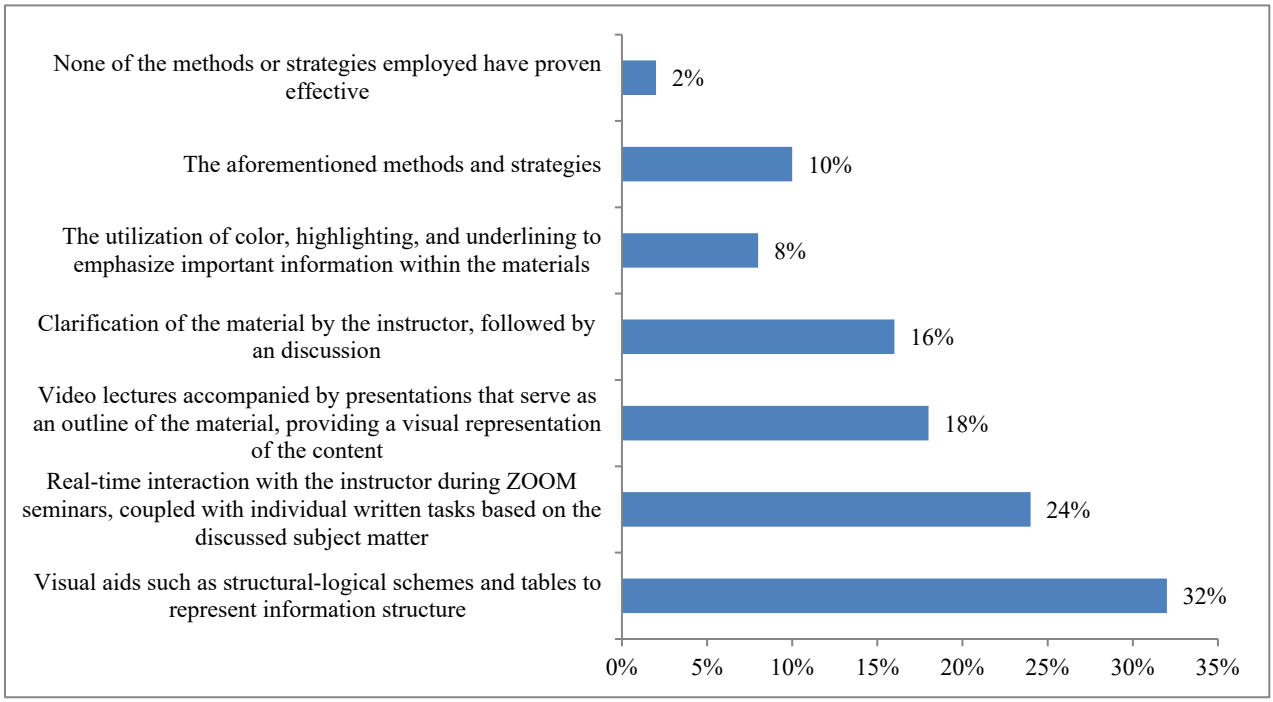

Figure 4. The Distribution of Responses Provided by Participants in regards to the Question: "Has it helped you to comprehend unfamiliar material in a short amount of time?"

Source: calculated by the authors

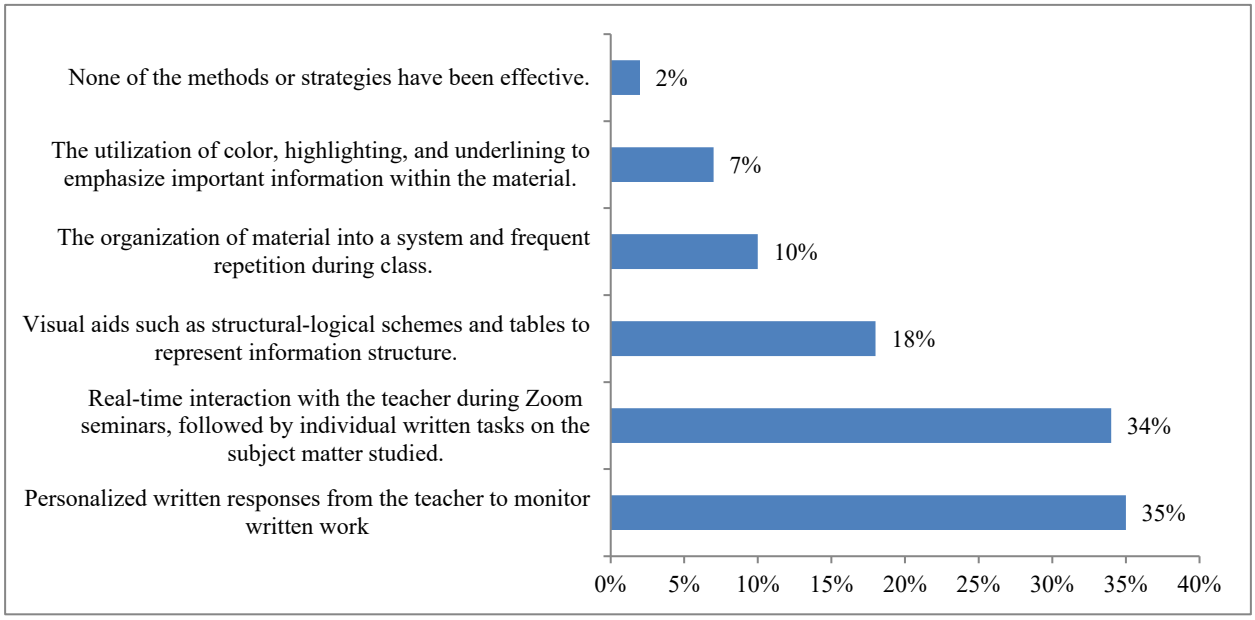

Figure 5. The Distribution of Responses Provided by Participants in regards to the Question: "The learning material has become easier to remember in a short span of time as a result of this".

Source: calculated by the authors

In order to help students memorize learning material in a short amount of time, various teaching methods were assessed (as shown in Figure 5). The most effective method was found to be individual written feedback from the teacher to control written assignments, with the opportunity for students to compare their answers (35%). Live dialogue with the teacher at seminars in ZOOM, followed by individual written assignments on the studied topic, was also a highly effective method (34%). Structural-logical schemes and tables (structure of information) were found to be effective for 18% of students. Systematization of material and constant repetition in class were effective for 10% of students, while the use of colors, highlighting, and underlining of material was also beneficial. These results suggest that traditional teaching methods can still be effective in pandemic and distance learning environments.

According to Figure 6, the most effective teaching method for mastering the study material was live dialogue with the teacher at the seminars in ZOOM followed by individual written assignments on the studied topic, which was reported by 45% of the respondents. Systematization of the material and constant repetition in class were also found to be effective by 19% of the respondents, followed by constant and systematic progress control by the teacher (13%). The use of structured study material was effective for 10% of the respondents, while 8% reported the effectiveness of using tools such as Proficonf, ZOOM, etc. On the other hand, 7% of respondents did not find anything that helped them learn the study material. These findings highlight the importance of live communication with teachers and the significance of individual written assignments in the learning process.

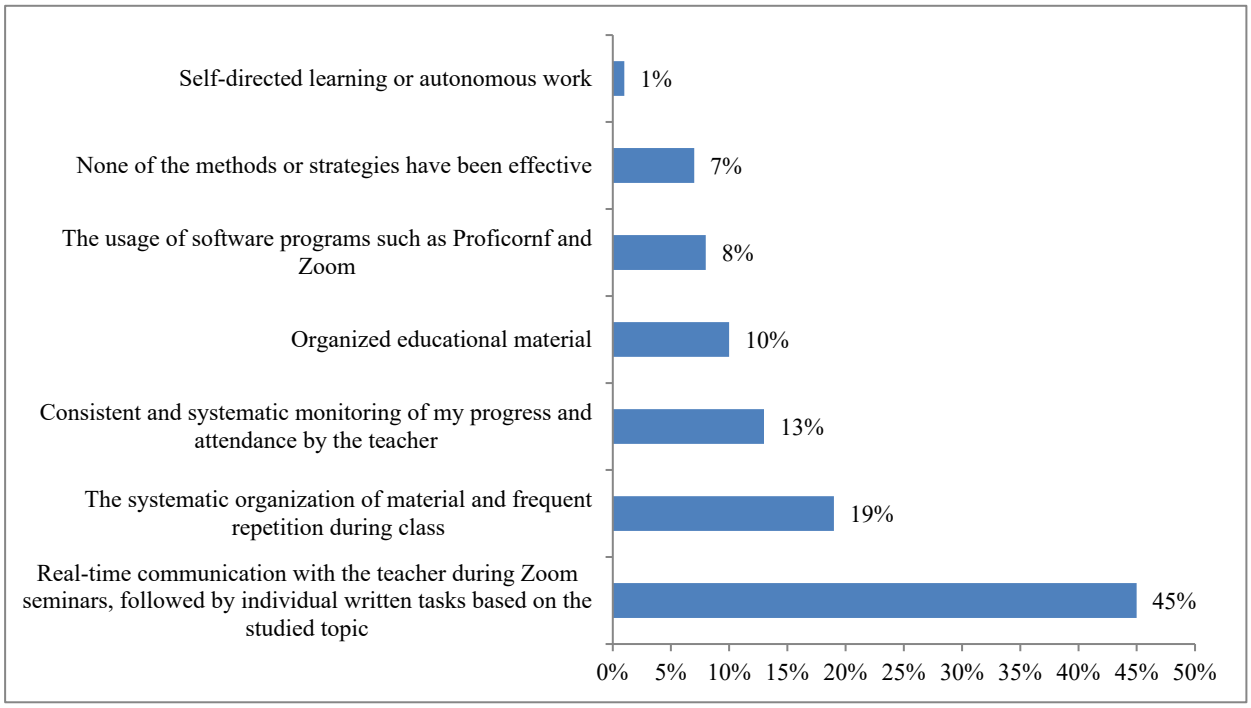

Figure 6. The Distribution of Responses Provided by Participants in regards to the Question: "Has it helped you to remember the study material in a brief period?"

Source: calculated by the authors

The above survey results confirm that for understanding unknown material, memorization, and learning the most effective methods in the pandemic remain the classic teacher-student communication using technology, the structuring of information, and teacher control. Information and communication tools are auxiliary tools for distance learning.

5. Discussion

The study reveals the effectiveness of online learning (different tools) in ensuring student achievement and motivation. Students perceive the transition to an online learning environment as a necessity in the context of digitalization. After the pandemic, online learning is perceived more positively, despite several difficulties.

Several studies on the effectiveness of learning in HEIs have found an improvement in student performance through a combination of different online learning methods that complemented traditional or online pedagogical practices. Muthuprasad et al (2021) based on an evaluation of 307 students' perceptions of online learning revealed the effectiveness of a combination of different online teaching methods in helping to create an effective distance learning environment. 70% of students commented on the effectiveness of synchronous online sessions as a way to manage learning during a pandemic. Students noted the importance of interactive activities, such as quizzes at the end of the session, for greater engagement in learning material. As in the present study, Muthuprasad et al. (2021) found that synchronous modes of interaction have been more effective than simply recorded lecture sessions. However, the flexibility and convenience of asynchronous interaction were noted as key advantages. It was the flexibility of the sessions that provided a more positive perception of distance education. As in other studies, problems with access and broadband connectivity in rural areas were key barriers to online learning. Muthuprasad et al (2021) emphasize the importance of a hybrid learning model to provide more flexibility and motivation to students.

Franchi (2020) noted that the loss of face-to-face contact and direct interactions with participants in the educational process were barriers to students' development, particularly the formation of their practical experience and skills (Franchi, 2020). Despite advances in the use of technology in the educational process to enhance the effectiveness of online learning, the acquisition of practical skills and knowledge requires the search for innovative technologies to help shape students' experiences (Ghosh, 2017). The loss of students' access to physics labs, and other hands-on learning methods has negatively affected their academic performance, knowledge, and practical outcomes (Sugand et al., 2010).

The lack of student practice tries to compensate with digital interactive teaching methods to ensure the effectiveness of higher education. As in the present study, Lapitan et al (2021) proved that previously recorded video lectures are less effective compared to synchronous online learning for students. The authors also found a positive impact of synchronous interaction on performance, particularly due to the use of live video conferencing platforms (Zoom or Google Meet), and pre-prepared online meetings on YouTube (Lapitan et al., 2021). Thus, combining different learning methods for synchronous learning and interaction is the most effective and confirms the effectiveness of online learning.

Despite the effectiveness of online learning with a combination of online methods, other studies found that only 26% of students would like to continue online learning 100%, while 49% of students favored learning through a blended model combining online and traditional environments (Almuraqab, 2020). In comparison, Gismalla et al (2021) found that approximately two-thirds (64%) of students indicated the effectiveness of e-learning as a solution during the COVID-19 quarantine. However, among the weaknesses of online classes students mentioned the following: limited bandwidth, internet connectivity, limited technical support, unfamiliarity with e-learning system principles, time flexibility in case of technical problems during online exams, and lack of face-to-face interaction (Gismalla et al., 2021).

According to Gopal, Singh & Aggarwal (2021), the factors that positively influence student satisfaction and performance in online learning include course design, quality of teaching, prompt feedback, and student expectations. This study highlights the importance of live communication, feedback, teacher supervision, and evaluation of learning activities in ensuring effectiveness. On the other hand, Fatonia et al. (2020) noted several disadvantages of online learning, such as the need for students to independently plan their learning activities, discipline and self-organization, unstable network connectivity, lack of synchrony in communication with teachers, and absence of feedback. As a result, student attendance and concentration on learning materials have decreased, reducing the overall effectiveness of online learning.

Simamora (2020) highlights the importance of synchronous and asynchronous communication in online learning. Synchronous communication refers to interactions between course participants in real-time, such as through video conferencing platforms like Google Meet and WebEx. Asynchronous communication, on the other hand, allows for communication to occur at different times, such as through email, streaming videos, publishing lecture notes, or using social media. Simamora suggests that synchronous guidance, guided by the lecturer, is crucial for effective online learning, along with quick feedback.

The importance of live communication, a combination of different learning methods, is indicated by a cross-sectional study by Yekefallah et al (2021). The paper assessed the level of satisfaction with the delivery of online learning and the effectiveness of e-learning. The results showed that the mean score (standard deviation) of satisfaction with online learning among students was 20.75 (2.13), and 59% of the interviewed students claimed a low level of satisfaction. According to the authors, there was a significant correlation between online learning satisfaction and

variables such as students' age and prior experience with online classes. Students who reported higher satisfaction levels also tended to have higher average scores in key areas such as teaching and learning, flexibility and suitability, feedback and assessment, and the level of learning demand. As a result, it appears that those who were more satisfied with their online learning experience were able to achieve greater productivity.

6. Conclusion

To ensure orderliness and self-discipline, understanding, learning, and assimilation of learning material, it is crucial to ensure a sufficient level of interactivity and teacher-student interaction, feedback, and guidance to students in an appropriate time frame. It is a well-functioning feedback system that is a supportive and essential element for student learning. At the same time, the use of classic manuals, methodological materials, and digital flow charts and tables is not enough to motivate students. Classical deadlines set by the teacher are also an effective method in online learning. Students noted the importance of creativity in the presentation of the task by the teacher and the significance of the limitations of the methods by which the task can be solved. Timely revision and evaluation by the teacher of the work or the task also stimulate students to put more effort into online learning. Online synchronous seminars in ZOOM are more effective and motivating compared to recorded video lectures, and presentations which are available to students in asynchronous mode. An essential method of online learning was noted by the students to complete individual written assignments on the studied topic immediately after its presentation. The educator's explanations and live synchronous conversation were also effective in online learning. Continuous, systematic educator monitoring of the progress and attendance at the online classes encouraged attendance but was not a key method for ensuring synchronous attendance.

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