

DOI: <https://doi.org/10.57125/FED.2023.06.25.15>

How to cite: Biliuk, O., Stepanenko, O., & Kyrychenko, V. (2023). Modern tools for distance education: Information and analytical prospectus. *Futurity Education*, 3(2), 251–265.
<https://doi.org/10.57125/FED.2023.06.25.15>

Modern Tools for Distance Education: Information and Analytical Prospectus

Olena Biliuk

PhD, Lecturer of the Department of Special Education, Faculty of Philology, V. O. Sukhomlynskyi National University of Mykolaiv, Mykolayiv, Ukraine, <https://orcid.org/0000-0002-4098-1064>

Olena Stepanenko*

PhD in Philology, Associate Professor, Professor at the Department of Social and Humanitarian Education, Communal Institution of Higher Education, «Dnipro Academy of Continuing Education», of Dnipropetrovsk Regional Council, Dnipro, Ukraine, <https://orcid.org/0000-0003-0887-5808>

Vita Kyrychenko

PhD in Pedagogy, Associate Professor, Department of Ukrainian Studies and Relevant Teaching Methodologies, Faculty of Philology and Journalism, Pavlo Tychyna Uman State Pedagogical University, Uman, Ukraine, <https://orcid.org/0000-0002-1420-2303>

***Correspondence email:** olena.step@ukr.net.

Received: May 12, 2023 | **Accepted:** June 19 2023 | **Published:** June 25, 2023

Abstract: The article explores modern tools used in distance education, with the goal of reviewing their benefits and limitations. Relevant definitions of distance education are first discussed in the paper and after, the key provisions of the social constructivism theory in the context of education are presented. Various types of distance education tools, including communication, learning management, content creation, assessment, and artificial intelligence tools are identified in the article, and appropriate provisions of the social constructivism theory that allow for the implementation of these tools are explained. Using the theory of social constructivism as a basis, the article analyses modern distance education tools based on various parameters, including interactivity with peers, interactivity with teachers, engagement, problem-solving, and decision-making. In the article the advantages and disadvantages of using these tools are also examined, their potential to enhance communication, collaboration, and personalised learning, while also acknowledging challenges such as a lack of social interaction, technical difficulties, and pedagogical issues are highlighted. Overall, the article emphasises the need for careful design and regulation to reduce risks and overcome limitations, making distance education a valuable option for both learners and institutions. Teachers and students should work together in order to manage these challenges and take advantage of the benefits provided by these modern tools.

Keywords: distance education, distance education tools, social constructivism, interaction, engagement, decision-making, problem-solving.

Introduction

During the Covid-19 pandemic, educational institutions around the world were forced to switch from face-to-face to distance learning (Grynyuk et al., 2022). Obviously, many teachers and students were not ready for such a radical and unexpected change. There were many technical, technological and methodological challenges. However, experience has shown that the education system as a whole has managed to cope with the problem. Teachers quickly reoriented themselves to the new realities of teaching, mastered new technologies and strategies. Students have become accustomed to teamwork through computer communication, and many of them have been given the opportunity to discover their own creative abilities. Zoom, Google classroom, Microsoft Teams, Moodle, Memrise and many other tools were used on a massive scale. The experience of mass distance learning has become very valuable and is still awaiting comprehensive analysis and research. Part of this process has already begun. Russia's full-scale invasion in Ukraine has emerged as the biggest challenge for the country in its modern history. Students and teachers were once again forced to change their habits and ways of doing things, many of them relocating and changing their study environment. The technical difficulties caused by power outages and internet connection disruptions also took their toll. In this crisis situation, the practice of distance learning during the pandemic was useful. Teachers' methodological skills, multiplied by their experience and desire not to lose contact with their students, were key factors in the effective work. Today, distance education becomes more relevant and it raises the issue of revising the necessary arsenal of technical and methodological tools. It is important considering the modern tools used for distance education in order to understand their advantages and opportunities.

Research Problem

There is also the question of the distance education effectiveness, its ability to ensure students' progress and the development of critical thinking, problem-solving and decision-making skills. A series of studies have been performed on the perception of teachers and students of the situation of distance

learning in universities around the world during the Covid-19 pandemic (Barfi et al., 2023; Hurajova et al., 2022; Poláková & Klímová, 2021; Sayaf, 2023; Shih et al., 2021).

Sayaf (2023) examines the factors that influence student engagement and satisfaction in a distance learning system. Based on the statistical analysis, the author concludes that technical distance learning tools have a positive impact on user satisfaction and engagement in collaborative work. Hurajova et al. (2022) studies the effectiveness of online learning through systems such as Zoom and Google Meet, and individual consultations via email, chat and social media, arguing that modern online technologies contribute to the sustainability of the educational process during an emergency situation. Researchers focus on the positive impact of distance education tools that support communication, collaboration and knowledge building and also maintain students' commitment, motivation, and encourage their sense of responsibility (Berge, 2018). Some studies, however, show that the motivation of teachers and students for asynchronous distance learning is insufficient (Radovan & Makovec, 2022; Taner et al., 2021). Researchers also draw attention to psychological, methodological and technical problems (Grynyuk et al., 2022).

A series of studies have focused on the challenges faced by the educational community in the context of online education (Bhise et al., 2022; Hussein et al., 2020; Jameel et al., 2020; Thompson, 2018). These are primarily challenges related to academic integrity. Researchers note that it can be difficult to monitor and prevent dishonest practices, such as plagiarism or cheating, among students. To avoid worries about the authenticity and reliability of academic work and grades, additional measures are needed. It's important to ensure that students adhere to high standards of academic integrity. Technical difficulties that students may encounter are also noted: limited battery life/charges, connectivity problems, limited storage capacities, small screens or slow text input (Berge, 2018; Sarsar et al., 2020). These factors affect usability and, ultimately, the quality of information acquisition and learning effectiveness. Some researchers suggest combining distance and face-to-face learning (Cleveland-Innes & Garrison, 2020). This approach should ensure the most flexible and efficient education system in modern context.

Research Focus

Based on the results of the literature review, it is noted that the use of distance education tools is a problem that is in the focus of research attention. Some aspects of this complex problem can be clarified through the application of the theory of social constructivism, where modern educational process functions. Interaction, collaboration, and co-construction of knowledge are the fundamental principles of social constructivism that can be implemented through the use of distance education tools. In this context, it is important finding out the mechanisms for realising the principles of social constructivism by distance education. This will benefit to the role of distance education tools in the modern educational paradigm specificity. It will also help to see their place in the arsenal of educational resources of the teacher. It will also help to understand the degree of effectiveness of distance education tools for students' educational outcomes.

Research Aim and Research Questions

The aim of this study is to review modern distance education tools and identify their benefits and limitations. For this purpose, the following research questions are highlighted:

1. What types of modern distance education tools are used by Ukrainian teachers?

2.What principles of social constructivism are realised by distance education tools?

3.What are the benefits of using modern distance education tools for participants in the educational process?

4.What are the limitations for students and teachers of their use?

Research Methodology

General Background

The methods of observation, analysis and synthesis are used in the paper. Based on the key research, the most relevant definitions of distance education are presented. Using social constructivism and guided by it, several important online tools that facilitate interaction at the student-teacher and student-student levels are identified. It was accomplished by analysing communication tools, learning management systems, content creation tools, assessment tools and Artificial Intelligence for their potential to facilitate meaningful dialogue between students and teachers. The advantages for students and teachers arising from the use of distance education tools are discussed. The limitations of using distance education tools that participants in the educational process may face are specified.

Research Results

Considering several definitions of distance education, Moore (2018) defines distance education as “teaching and planned learning where the teaching normally occurs in a different place from learning, requiring communication through technologies, as well as special institutional organisation” (Moore, 2018). Another definition of distance education is as follow: a mode of educational provision, characterised by the physical separation between the student and the teacher. It can be synchronous where both coexist at the same time in the educational process, or asynchronous when the student defines his own time, space and rhythm of study independently of the teacher (Bandeira & Cardoso, 2021). Similar to the above is the definition of distance education as a type of education where technical communication tools bring instructors and learners together, who are physically separated from each other during teaching. In other words, it provides an open, distance and flexible education where learners are free from the constraints of the time and place (Goksel & Karadeniz, 2022). It is visible that the given definitions emphasise three key factors that outline distance education, namely: the distance between the teacher and the student in space, the distance in time and the availability of technical learning tools.

The use of technical learning tools in the context of social constructivism theory opens up new opportunities for both teachers and students. Social constructivism is a theoretical concept that focuses on the role of social and cultural factors in shaping the process of learning and knowledge acquisition. According to this concept, learning is not only an individual activity, but rather a cultural participation process where learners are engaged with the practical activities of their community in order to acquire relevant knowledge, with the support of their cultural environment. Knowledge is not only generated through the interaction of individuals with the physical environment but also through the interactions that take place in a social and cultural context. This means that the creation of knowledge is influenced by the social and cultural dynamics that occur within a given community. In a classroom setting, students primarily learn through their interactions with their peers and teachers. Teachers facilitate this learning process by stimulating and encouraging conversations in the classroom. These processes enable students constructing new knowledge and understanding through the exchange of ideas and

perspectives. Social constructivism recognises the role that social and cultural factors play in shaping the learning process, and highlights the importance of cultural participation in the acquisition of knowledge.

Actually, social constructivism in pedagogy is considered to be an educational model based on the concept of cognitive development by J. Piaget, the theory of social development by L. Vygotsky, and the theory of pragmatism by J. Dewey. The studies of Grooms (2000), Long (1983), and Moore (1989), demonstrate that according to the constructivist concept, a student interacts with three main components of learning - content, teacher and peers. The process of intellectually interacting with content "is a defining characteristic of education" because "that results in changes in the learner's understanding, the learner's perspective, or the cognitive structures of the learner's mind" (Moore, 1989). When teachers interact with learners, their impact on learners is stronger and more frequent than when learners interact with content alone. In preparing material for student-content interaction, teachers can create materials that motivate, present information, help learners apply what they have learned, assess their progress, and even provide some emotional support. "The instructor is especially valuable in responding to the learners' application of new knowledge", – argue Moore (1989). Indeed, self-directed students can motivate themselves and engage with the presented content, but they are at risk when it comes to applying what they have learned. They may not have enough knowledge of the subject matter to ensure that they apply it correctly, they may also be unsure of all the possible ways in which they can apply what they have learned. In such cases, the interaction with the teacher is extremely valuable to provide feedback and practice checks. Student-to- student interaction is an extremely valuable resource for learning. The level of self-management that students possess makes this process successful, and helps recognising and encouraging the development of their experience.

Critical in this process is recognising the shifting role of the teacher who becomes the content facilitator and is no longer the content provider. The student's role also has changed from being a passive receiver of information to an active participant in the knowledge-making process. A constructivist approach recognises that students do not learn within the constraints of a local educational institution, but rather in the wider international and global context of their personal lives, enhanced by social media and various technologies. Consequently, the boundaries between the university and the larger community become blurred, creating its own unique set of opportunities and challenges.

The concept of social constructivism highlights the significance of interpersonal interaction and discussion in facilitating effective teaching and learning. The focus is on students' understanding of the discussed ideas, and the knowledge is created through the process of discovery and investigation of problems. Knowledge is not something that is found, but rather something that is constructed or made. Instead of merely receiving information, learners seek meaning from various sources of information and engage in discussions with others. In this regard, teaching practices shift from traditional modes of transmission, such as lectures, to more collaborative, problem-based, and experiential approaches to learning. In an attempt to make sense of the given experience, concepts, models and frameworks were created. These designs based on new experiences, improving the understanding of the world around us were constantly tested and modified. The key points of social constructivism that are important for this study are as follows:

- Learning is a learner-centered process;
- Knowledge is co-constructed during interaction with other people;

- Interaction and collaboration have important role in the learning process;
- Learner must be engaged in the learning process (Brown, 2014; Long, 1983; Moore, 1989).

Social constructivism often refers to a collaborative learning since it is centered around interaction, discussion, and sharing of knowledge among students (Moore, 1989). This teaching approach enables a variety of interactive methods to be used, such as whole-class discussions, small group discussions, or students working in pairs on tasks or projects. The fundamental principle behind this theory is that learners work together in groups, sharing ideas and engaging in brainstorming sessions to discover cause-and-effect relationships, solutions to problems, or new ways to add to existing knowledge. By collaborating in this way, students can learn from one another, build upon each other's ideas, and develop a deeper understanding of the subject matter.

Based on the theory of social constructivism, modern distance education tools according to the following parameters are analysed:

- Interactivity with peers;
- Interactivity with teacher;
- Engagement;
- Problem-solving and decision making.

Modern tools used for distance education are reviewed in the paper. The tools are divided into categories such as communication tools, learning management systems (LMS), content creation tools, assessment tools and artificial intelligence (AI). The use of these tools in distance education are also discussed. The evaluation commences by communication tools such as video conferencing software and instant messaging apps. Video conferencing software allows students and teachers engaging in real-time, face-to-face communication. Some examples of video conferencing software include Zoom, Skype, Webex, and Google Meet. Zoom, Webex, and Google Meet offer features such as screen sharing, breakout rooms for small group discussions, and recording of sessions. Breakout rooms are a useful tool for students to collaborate with each other. This ensures the effectiveness of distance learning “where students engage each other with group projects designed to create and foster the reliance of team members upon each other” (Brown, 2014). These tools are often used for virtual classes and lectures, where teachers can share their screens and present course materials to students. They also provide a virtual whiteboard, useful for collaborative work in the context of social constructivism. Moreover, Zoom, Webex, and Google Meet allow using real-time subtitles. Skype, on the other hand, enables screen sharing and recording of sessions but does not offer breakout rooms or a virtual whiteboard.

Communication tools also promote student – student and student – teacher interaction. These tools enable students communicating with their teachers and peers, participating in group projects, and receiving feedback from their instructors. Furthermore, communication tools empower teachers to provide personalised feedback to students, thus improving learning outcomes. During this collaborative learning process, they must negotiate, make sense of and find solutions to problems through a shared understanding. In this way, education moves from a single, solitary search for knowledge to a collaborative learning community that shapes and informs responses to the environment.

Instant messaging apps such as Slack and Microsoft Teams are commonly used in distance education in order to facilitate the real-time communication among individuals or groups. These apps

allow students communicating with their teachers and peers, participating in group projects, and receiving feedback from their instructors. Slack and Microsoft Teams have features such as chat rooms, channels, and direct messaging that enable students and teachers to effectively communicate. They also allow for the sharing of documents and files, making collaboration on projects easier. These apps also offer video and audio calling features, which can be useful for virtual meetings and discussions.

One of the key advantages of using instant messaging apps in distance education is that they provide a platform for ongoing communication outside of scheduled class times. This helps students feel more connected to their peers and teachers, and makes for a more engaging and interactive learning experience. Instant messaging apps are valuable tools for building communication, collaboration, and community in distance education.

The use of learning management systems (LMS) has revolutionised the education by providing a range of powerful tools that facilitate the delivery and management of educational content. Several types of LMS are available to educators, including Google Classroom, Moodle, Canvas, and Blackboard. The introduction of LMS has had a significant impact on the way teachers create, share and monitor learning content, leading to increased efficiency and effectiveness of teaching methods.

Google Classroom, Moodle, and Blackboard promote student – student collaboration and student – teacher communication. Google Classroom allows for some interactivity with teachers and peers through features such as class comments and private messaging. However, its collaboration capabilities are somewhat limited. Moodle provides a range of collaboration tools such as forums, wikis, and group activities, which encourage interaction between peers. It also supports virtual classroom tools like BigBlueButton for live instruction. Blackboard also offers a variety of communication tools, such as discussion forums and group projects, that help you collaborate and interact with your teachers and peers. This collaborative learning approach has been shown to improve critical thinking skills and promote the development of soft skills such as communication, teamwork, and problem-solving.

Canvas is an LMS that is widely used by many universities around the world. It has a variety of features such as rubric creation, module creation, calendar development, assessment options, curriculum upload, data analytics, and much more. Additionally, Canvas can be integrated with various other technologies like Google Classroom, Microsoft Teams, Zoom, and others to create a single learning platform. With Canvas, teachers can communicate with their students individually, in groups, or with the entire class using messaging, audio notes, video, and other communication tools. Students can also collaborate with one another through chat groups, video, and other messaging tools.

An LMS has a number of benefits that include the ability to provide a flexible and personalised learning experience for students. LMS help teachers creating and customising online courses that offer different learning styles and levels. With LMS, students can learn at their own pace, and teachers can provide immediate feedback on assignments and tests. This personalised learning approach has been proven to improve student outcomes and increase student engagement. When students collaborate in different types of learning activities using LMS, they bring different perspectives and experiences to each situation, often creating multiple points of view, which is the core constructivist approach to learning.

Another significant benefit of LMS is its ability to centralise and streamline tasks. LMS can automate many administrative tasks, such as grading and tracking student progress, allowing educators to focus on teaching and engaging with students. In addition, LMS give teachers valuable information

about student progress, which can be used to make educational decisions and improve the overall quality of education.

Content creation tools are software applications that enable educators to build and share learning material in a variety of formats, including text, images, audio, and video. In distance education, content creation tools increasingly become important as teachers seek to provide engaging and interactive learning experiences for their students. The most popular tools among teachers and students are Camtasia, Audacity, and Articulate Storyline. It is a video recording and editing software that allows teachers generating and managing a video content for their courses, produce podcast-style lectures and self-study modules. Camtasia, Audacity, and Articulate Storyline are effective tools for creating instructional videos, demonstrations, and lectures. They also support screen capture, audio recording, and adding annotations and animations. Content creation tools are easy to use and demand minimal technical knowledge, which is an advantage. They enable teachers to provide engaging and interactive learning content that can be accessed remotely and on demand. By using content creation tools in social constructivism context, educators can adapt their teaching approach to the unique learning preferences and styles of each student. In addition, content creation tools give teachers the flexibility to modify and update course materials in real time, which is vital in fast-paced fields where information is constantly changing.

Assessment tools play a critical role in helping teachers evaluate student learning outcomes. Platforms like Google Forms, Blackboard, Moodle, QuestionMark, and ProProfs provide teachers with tools to monitor student progress, offer timely feedback, and adapt their teaching strategies as necessary. These tools are applied in various ways during distance learning, including online quizzes and tests, assignments and projects, and peer assessment.

Online quizzes and tests are commonly used in order to evaluate student knowledge and application of concepts. They can be timed or untimed and can be automatically graded, which allows teachers assessing student performance efficiently. Online quizzes and tests also enable to offer immediate feedback to students, enhancing the learning experience. However, there are limitations to online quizzes and tests, including the possibility of cheating and the inability to evaluate higher-order thinking skills like critical thinking and problem-solving.

Assignments and projects, on the other hand, are designed to assess higher-order thinking skills such as analysis, synthesis, and evaluation. They also encourage active learning and student engagement by providing opportunities to demonstrate knowledge and skills in various formats, including written papers, presentations, and multimedia projects. The limitations of assignments and projects, moreover, are the possibility of plagiarism, the difficulty of evaluating subjective content, and the time required to provide feedback. The peer assessment is used to evaluate group projects, presentations, and other assignments. It helps students to develop critical thinking and evaluation skills while facilitating collaborative learning. Additionally, teachers can assess how effectively students work together and communicate during peer assessment.

Nowadays, the prospects for developing tools for distance education are associated with artificial intelligence (AI). The main purpose of employing AI in education is to help improving the teaching and learning in classrooms because AI help instructors with teaching, classroom work, evaluation, as well as help students to learn (Jameel et al., 2020; Shen et al., 2021).

AI technology is widely used in such educational tools as AI-enabled learning management systems, Chatbots for Virtual Tutoring, AI translators, and personal learning. In distance education, AI

is used to improve the learning process by personalising the content and pace of learning to students' individual needs. A well-designed and user-friendly AI-based learning tool is able to track the pace of learning, academic performance, and identify gaps in students' knowledge. By customising the learning process based on a student's individual learning style, preferences, and needs, AI tools provide personalised learning schedules and content recommendations that help students become more effective in their studies. The AI system can adapt, learn and comprehend knowledge based on performance, and guide students' work. This increases the system's knowledge base, creating a more powerful AI learning environment. The use of AI also provides teachers with valuable information about subjects that require more attention, enabling them to optimise their teaching strategies and achieve the desired learning outcomes (Shen et al., 2021).

Another potential application of AI in distance education is the use of chatbots. Chatbots are programmed to answer frequently asked questions, provide feedback on assignments, and offer guidance on how to improve performance. Chatbots like ChatGPT, Brainly, My Study Life have been used as conversational agents. The use of AI-based chatbots as pedagogical agents has proved to be highly effective in educational settings. Google Duplex and AI-based WhatsApp chatbots use AI technology to offer personalized assessments, problem-solving, and content recommendations for students studying at home. These chatbots also encourage students to complete tasks quickly.

Conversational chatbots have a range of advantages in the education environment, including their ability to provide instant accessibility and respond naturally, much like an interview. They facilitate easy-going interactions with students, helping to support engagement, as well as to set learning and engagement goals, strategies, and outcomes. Chatbots also offer a dedicated and unique learning environment for students to ask questions in the absence of teacher. Chatbots answer basic and frequently asked questions from large amounts of big data. They analyse data collected during student interactions to help teachers improve the learning process and student experience. This is a valuable source of information that can be used to identify aspects that need improvement and enhance the overall learning experience. AI chatbots help students prepare for exams by offering practice questions and quizzes. They also track a student's progress and give feedback on subjects that the student needs to focus on more. Artificial intelligence is used to automate administrative tasks such as grading and assessment, freeing up teachers' time to focus on more meaningful tasks such as designing learning content. AI can play an important role in the administration of online exams.

There are also some worries about the use of AI. For instance, there are concerns that AI could completely replace teachers, which could have negative consequences for the quality of education and the role of teachers in the education system (Sethi et al., 2021; Shen et al., 2021). Currently, this fear seems to be somewhat early. Because AI is not able to create an emotionally comfortable ambience, which is one of the keys to a successful class. AI's capabilities are limited in terms of getting students interested in the topic at hand or responding to instant requests from students during a group lesson. While AI has many benefits, it is important to consider potential risks and work to reduce them. This necessitates careful design and regulation of AI systems to ensure they are safe, reliable, and ethical.

So, the main theses of the social constructivism theory can be considered as: learning is a learner-centered process, knowledge is co-constructed during interaction with other people, interaction and collaboration have important role in the learning process, learner must be engaged in the learning process. Their implementation through distance education tools were also discussed. The types of tools for distance education in their correlation with the principles of social constructivism are presented in the table below (Table 1).

Table 1

Tools for Distance Education and Their Correlation with the Principles of Social Constructivism

Types of distance education tools	The principles of social constructivism
Communication tools	
Zoom, Webex, Google Meet	Interaction with teacher Interaction with peers Engagement
Skype	Interaction with teacher Engagement
Instant messaging apps (Slack, Microsoft Teams)	Interaction with teacher Interaction with peers Engagement
Learning management systems (LMS)	
Google classroom	Interaction with teacher (limited) Interaction with peers (limited) Engagement Problem-solving and decision making
Moodle, Canvas, Blackboard	Interaction with teacher Interaction with peers Engagement Problem-solving and decision making
Content creation tools	
Camtasia, Audacity, Articulate Storyline	Interaction with teacher Engagement
Google Forms, Blackboard, Moodle, QuestionMark, ProProfs	Interaction with teacher Engagement
Artificial intelligence (AI)	
Conversational chatbots ChatGPT, Brainly, My Study Life	Engagement Problem-solving

Source: authors' own research.

It can be concluded, the presented tools for distance education are able to implement the basic principles of the theory of social constructivism. The most suitable are LMS as integrated platforms that cover interaction at the student-teacher and student-student levels, and simultaneously implement the tasks of engagement, problem-solving and decision making. Communication tools, Content creation tools and Assessment tools perform the tasks of interaction and engagement. AI has the ability to solve teaching tasks related to engagement and problem-solving.

Discussion

As we can see, the crucial types of distance education tools able to effectively implement the main principles of social constructivism such as interaction, communication, engagement, problem-solving and decision making. The use of Communication tools, LMS, Content creation tools and AI demonstrates its effectiveness if teachers are well thought out and planned in their use. The positive impact of distance education tools is also rightly emphasised by colleagues from different countries (Brown, 2014; Radovan & Makovec, 2022; Sayaf, 2023). In particular, Radovan and Makovec (2022) conclude that "during distance learning, cooperation between the teacher and the students and between the students themselves should be encouraged".

The benefits of modern tools for distance education are discussed in terms of student learning outcomes, teacher effectiveness, and institutional management. Learning can be facilitated through

various communication and collaboration means, allowing students sharing data in real-time or asynchronously using different media formats like images, sound, and video recordings. It can also boost students' commitment, motivation, and sense of responsibility while promoting individualised, social interactive, and contextualised learning. Sayaf (2023) comes to similar conclusions, arguing that “peer interaction, interactive lectures ... are the characteristics that influence users' satisfaction and collaborative behavior of distance learners”. With the use of their familiar devices, learners can often reduce cognitive load and enhance their problem-solving skills by accessing information when and where they need it. It demonstrates the advantages of learning in supporting students' growth and development. On the other hand, there are studies that demonstrate the difficulty of students' perception of distance education if this process is continuous and takes a long time. Thus, Taner et al. (2021) conclude that distance education could not provide the motivation of undergraduate students and expectation of students should be taken into account in the distance education process. Such results should not be ignored, and ways should be found to overcome the difficulties that arise. One of these ways is to provide teachers with thorough methodological training and to provide them, as well as students, with appropriate technical learning tools.

Modern tools for distance education enhance teacher effectiveness by providing them with a wide range of tools and resources able to create engaging and interactive learning experiences. Teachers can use these tools to create personalised learning content adapted to individual student needs and learning styles, as well as to monitor student progress and provide timely feedback. The use of modern tools also allows teachers tracking student engagement and adjust their teaching strategies as needed. By using these tools, teachers can provide a more personalised and effective learning experience for their students.

Institutional management also benefits from the use of modern tools for distance education. By offering distance learning courses, institutions can reach a wider audience and attract students who may not have been able to attend traditional on-campus classes. This can result in increased enrollment and revenue for the institution. Distance education tools also help institutions to streamline administrative tasks, such as grading and record-keeping, and to reduce costs related to physical classroom space and materials.

However, there are also some limitations to these tools. One of the primary limitations is the pedagogical challenge of adapting teaching strategies to the online environment. In traditional face-to-face learning, teachers rely on non-verbal signals and feedback to engage students and adjust their teaching strategies. In an online environment, teachers do not have access to these signals and must find alternative ways to engage students. In addition, students may have different learning styles and require different types of support to succeed in an online environment. Teachers need to adapt their teaching strategies to take these differences into account.

Another limitation may be the lack of social interaction and collaboration among students. In a physical classroom, they interact, ask questions and work on group projects. In the online environment, students may feel more isolated and disconnected from their peers, which can impact their motivation and engagement (Barfi et al., 2023; Taner et al., 2021).

There are also some technical limitations in distance education, such as the small screens, slow text input on devices, limited battery life, insufficient storage capacity of devices, connectivity problems. Several ways to overcome the limitations of distance education tools can be used:

The responsive design. Distance education programs have used responsive design in their course materials to adapt the content to the screen size of different mobile devices. This allows students accessing course materials on mobile devices without compromising the readability and usability of the content.

- Collaboration tools. Able to overcome the lack of social interaction and collaboration, distance education programs have incorporated collaboration tools such as discussion forums, group projects, and virtual classrooms.

- The cloud-based storage. To address the limited storage capacity of mobile devices, distance education programs have used the cloud-based storage solutions such as Google Drive or Dropbox. This allows teachers and students to store and access course content without taking up space on their mobile devices.

- Training and support. Distance education programs have provided training and support to teachers and students on how effectively use learning mobile devices. This includes providing tutorials, resources, and technical support to help them navigate the limitations of their devices.

Conclusions and Implications

Distance education offers new opportunities for individual and collective learning. With the tools for distance education, teachers incorporate key concepts of social constructivism into the learning process, such as collaboration, co-construction of knowledge, engagement, problem solving and decision-making. Communication tools like video conferencing software and instant messaging apps are essential for group projects, and peer-to-peer collaboration in distance education. Learning management systems like Google Classroom, Moodle, Canvas, and Blackboard offer various features that facilitate the presentation and management of educational content, improve the critical thinking skills, and promote soft skill development. The content creation tools, such as Camtasia, Audacity, and Articulate Storyline, allow teachers creating and offering educational materials in various formats, including video, podcast-style lectures, and self-study modules. Assessment tools, such as online quizzes, tests, and assignments, are used to evaluate student learning outcomes and facilitate collaborative learning.

Today, AI is the most promising tool for distance education. Artificial intelligence is increasingly used in distance education to personalise learning to individual student needs. AI-based learning tools monitor students' progress and identify knowledge gaps to provide personalised study schedules and content recommendations. Chatbots provide personalised support by engagement and using problem-solving tasks. But AI cannot replace live interaction with a teacher and other students.

While these modern tools for distance education have many benefits, there are also challenges. Adapting teaching strategies to the online environment and addressing the diverse needs of learners can be difficult. The lack of social interaction and collaboration among students is also a limitation. Technical issues such as small screens, limited battery life, and connectivity problems affect the effectiveness of distance education. Responsive design, collaboration tools, cloud-based storage, and training and support help overcome these limitations.

In conclusion, in the article the benefits and limitations of modern tools for distance education are highlighted. The use of these tools facilitate the communication, collaboration, and personalised learning, improve student motivation and problem-solving skills. However, there are also challenges

that need to be addressed. A careful design and regulation can help reducing risks and overcoming limitations, making distance education a valuable option for learners and institutions.

Modern distance education tools have changed the way education is provided and obtained. The benefits of these tools are evident in the success of various distance education programs. However, limitations still exist, and there is room for improvement. The future of distance education is promising, and modern tools will undoubtedly play a crucial role in shaping it.

Suggestions for Future Research

Based on the proposed research, several main prospects for further research can be identified. In the context of pedagogical strategies, it is advisable to investigate specific pedagogical strategies that can be implemented together with distance education tools in order to overcome the limitations and challenges identified in this article. Exploring innovative approaches that can improve social interaction, collaboration and collaborative learning in a digital learning environment is of great importance. It is interesting analysing the implementation of project-based and problem-based learning in the context of distance education; to find out how these pedagogical strategies can be facilitated by collaborative tools, online simulations and virtual laboratories. The impact of these approaches on learners' problem-solving, critical thinking and application of knowledge in real-world situations is worth examining.

The analysis of distance education tools also suggests the need for a comparative study of distance education tools in different educational contexts, such as higher education institutions and vocational training programmes. One more prospect is to investigate how the effectiveness of these tools depends on factors such as age group, subject, learning objectives and specific needs of learners. Such research would help determining which tools are best suited for specific educational settings.

Synchronous and asynchronous interaction is an important educational factor. In this context, it is worth exploring the optimal balance between synchronous and asynchronous interaction in distance education, finding out how live video sessions, chat platforms and virtual classrooms can facilitate the real-time communication and collaboration between learners, as well as between learners and teachers. In addition, explore the benefits of asynchronous communication tools such as discussion boards and email, which provide flexibility in the learning process.

In terms of learning analytics, it is important to perform a comparative analysis of distance education tools. Specifically, to explore how the data generated by these tools, such as learner engagement, progress, and performance, can be analysed to identify patterns and correlations. The impact analysis of different tools on categories such as student engagement, problem solving and decision making is of great importance.

Finally, the ethical implications of using AI in distance education become a polemic topic. Issues related to data privacy, algorithmic bias, and potential impacts on student well-being should be explored. To explore the ways to address these issues and develop guidelines or policies to ensure responsible use of technology in distance education is one of the main tasks for the future researches.

These research perspectives can help to further develop distance education, address its current limitations, and develop and implement effective tools and strategies for online teaching and learning.

References

- Bandeira, F. & Cardoso, J. C. (2021). Quality practices in higher education distance learning: The perspective of practitioners. In A. Moura, P. Reis, & M. Cordeiro (Eds.), *Handbook of research on determining the reliability of online assessment and distance learning* (pp. 1–23). IGI Global. <https://doi.org/10.4018/978-1-7998-4769-4.ch001>
- Barfi, K. A., Arkorful, V., Appiah, F., Agyapong, E. M., & Acheampong, E. (2023). The impact of blended learning on students using the IBOX platform: Initial perspectives of teachers. *Heliyon*, 9(3), Article e14297. <https://doi.org/10.1016/j.heliyon.2023.e14297>
- Berge, Z. L. (2018). Mobile learning and distance education. In M. G. Moore & C. D. William (Eds.), *Handbook of distance education* (4th Edition) (pp. 207–213). Routledge.
- Bhise, A., Munshi, A., Rodrigues, A., & Sawant, V. (2022). Overview of AI in education. In P. P. Churi, S. Joshi, M. Elhoseny, & A. Omrane (Eds.), *Artificial Intelligence in higher education: A practical approach* (pp. 31–62). CRC Press. <https://www.taylorfrancis.com/chapters/edit/10.1201/9781003184157-2/overview-ai-education-archana-bhise-ami-munshi-anjana-rodrigues-vidya-sawant>
- Brown, L. (2014). Constructivist learning environments and defining the online learning community. *Journal on School Educational Technology*, 9(4), 1–6. <https://doi.org/10.26634/jsch.9.4.2704>
- Cleveland-Innes, M. F., & Garrison, D. R. (Eds.). (2020). *An introduction to distance education: Understanding teaching and learning in a New Era* (2nd ed.). Routledge. <https://doi.org/10.4324/9781315166896>
- Goksel, N. & Karadeniz, A. (2022). Promises and pitfalls of open and distance learning: Course design during the corona lockdown. In G. Durak & S. Çankaya (Eds.), *Handbook of research on managing and designing online courses in synchronous and asynchronous environments* (pp. 233–250). IGI Global. <https://www.irma-international.org/viewtitle/292367/?isxn=9781799887010>
- Grooms, L. D. (2000). *Interaction in the computer-mediated adult distance learning environment: Leadership development through online education* [Doctoral dissertation]. Regent University. <https://www.proquest.com/openview/2e678afcdb80923090f398540b5ba33a/1?pq-origsite=gscholar&cbl=18750&diss=y>
- Grynyuk, S., Kovtun, O., Sultanova, L., Zheludenko, M., Zasluzhena, A., & Zaytseva, I. (2022). Distance learning during the COVID-19 pandemic: The experience of Ukraine's higher education system. *Electronic Journal of E-Learning*, 20(3), 242–256. <https://doi.org/10.34190/ejel.20.3.2198>
- Hurajova, A., Kollarova, D., & Huraj, L. (2022). Trends in education during the pandemic: modern online technologies as a tool for the sustainability of university education in the field of media and communication studies. *Heliyon*, 8(5), Article e09367. <https://doi.org/10.1016/j.heliyon.2022.e09367>
- Hussein, E., Daoud, S., Alrabaiah, H., & Badawi, R. (2020). Exploring undergraduate students' attitudes towards emergency online learning during COVID-19: A case from the UAE. *Children and Youth Services Review*, 119, Article 105699. <https://doi.org/10.1016/j.childyouth.2020.105699>

- Jameel, T., Ali, R., & Toheed, I. (2020). Ethics of artificial intelligence: Research challenges and potential solutions. In *2020 3rd international conference on computing, mathematics and engineering technologies (iCoMET)*. IEEE. <https://doi.org/10.1109/icomet48670.2020.9073911>
- Long, H. B. (1983). *Adult learning: Research and practice*. Cambridge.
- Moore, M. G. (1989). Editorial: Three types of interaction. *The American Journal of Distance Education*, 3(2), 1–7. <https://doi.org/10.1080/08923648909526659>
- Moore, M. G. (2018). Preface. In M. G. Moore & W.C. Diehl (Eds.), *Handbook of distance education*. (pp. xi–xviii). Routledge.
- Poláková, P., & Klímová, B. (2021). The perception of Slovak students on distance online learning in the time of Coronavirus — A preliminary study. *Education Sciences*, 11(2), Article 81. <https://doi.org/10.3390/educsci11020081>
- Radovan, M. & Makovec, D. (2022). This is not (the new) normal. Students' attitudes towards studying during the COVID-19 pandemic and the determinants of academic overload. *Electronic Journal of E-Learning*, 20(3), 257–269. <https://doi.org/10.34190/ejel.20.3.2366>
- Sarsar, F., Kişla, T., Karasu, M., Arıkan, Y. D., & Kılıç, M. (2020). The usability of mobile devices in distance learning. In G. Durak & S. Çankaya (Eds.), *Managing and designing online courses in ubiquitous learning environments* (pp. 262–278). IGI Global. <https://doi.org/10.4018/978-1-5225-9779-7.ch014>
- Sayaf, A. M. (2023). Adoption of E-learning systems: An integration of ISSM and constructivism theories in higher education. *Heliyon*, 9(2), Article e13014. <https://doi.org/10.1016/j.heliyon.2023.e13014>
- Sethi, K., Chauhan, S., & Jaiswal, V. (2021). Artificial Intelligence in higher education: First attempt. In S. Verma & P. Tomar (Eds.), *Impact of AI technologies on teaching, learning, and research in higher education* (pp. 1-29). IGI Global. <https://doi.org/10.4018/978-1-7998-4763-2.ch001>
- Shen, L., Chen, I., Grey, A., & Su, A. (2021). Teaching and learning with Artificial Intelligence. In S. Verma & P. Tomar (Eds.), *Impact of AI technologies on teaching, learning, and research in higher education* (pp. 73–98). IGI Global. <https://doi.org/10.4018/978-1-7998-4763-2.ch005>
- Shih, M., Li, G.-Y., & Chang, W.-S. (2021). Keeping things normal during an uncommon time: A lesson from National Taiwan University. *Journal of Teaching and Learning with Technology*, 10(1). <https://scholarworks.iu.edu/journals/index.php/jotlt/article/view/31470>
- Taner, A., Akyıldız, S., Gülay, A., & Özdemir, C. (2021). Investigating education faculty students' views about asynchronous distance education practices during Covid-19 isolation period. *Psycho-Educational Research Reviews*, 10(1), 34–45. <https://perrjournal.com/index.php/perrjournal/article/view/90>
- Thompson, M. M. (2018). The ethical character of distance education. In M. G. Moore & W.C. Diehl (Eds.), *Handbook of Distance Education* (4th Edition) (pp. 189–206). Routledge. <https://www.taylorfrancis.com/chapters/edit/10.4324/9781315296135-16/ethical-character-distance-education-melody-thompson>