

STUDENT-CENTERED APPROACH TO ELEMNTARY SCHOOL EDUCATION IN THE ERA OF TECHNOLOGI BASED LEARNING – HOW ACTIVE IS LEARNING?

Raysyah Putri Sitanggang¹

^{*1}Universitas Muhammadiyah Sumatera Utara, Indonesia

^{*1}e-mail: raysyahputri@umsu.ac.id

Abstract: The landscape of primary school education is undergoing a transformative shift, driven by the integration of technology-assisted learning. This study explores the potential of a student-centric approach in this evolving educational environment, focusing on the implementation and efficacy of active learning methodologies. Active learning, characterized by its emphasis on student engagement and participation, is evaluated through various technology-enabled platforms and tools. The research investigates the challenges and opportunities associated with fostering active learning in digital and hybrid classrooms. By examining case studies, empirical data, and theoretical frameworks, the study provides insights into the extent to which active learning can be realized and optimized in technology-assisted settings. The findings highlight best practices, technological affordances, and pedagogical strategies that enhance student involvement, critical thinking, and collaborative learning. The paper concludes with recommendations for educators and institutions aiming to effectively incorporate active learning principles in their curricula, ensuring a holistic and adaptive educational experience for students in the digital age.

Keywords: Primary school education, active learning, hybrid learning, student engagement.

Introduction

By and large, in the 21st century, we see a student-centered approach as the sine qua non of the educational process. It stresses collaboration, student autonomy, engaging with students to create a learning environment that supports, challenges, and aligns with students' needs and goals. A flurry of research has been done. Khoury (2022) argues in his paper that this student-centric approach motivates students, engages them well, producing learning outcomes, particularly in online and distance learning settings. Stone and O'Shea (2019) opined that students who were more vulnerable and so needed additional support were more likely to enroll online. They included mature-age and first-in-family students, those with low socioeconomic status (SES) or disability, and those coming from regional or remote areas.

Active learning is the watchword in education now where students become the center of the educational process and hone their skills and competencies (Katawazai, 2021). Various problems ensue though, including lack of infrastructure and scarce resources. Despite this lacuna, the use of modern information technologies, especially distance learning, provides a beehive of opportunities for interfacing this concept, where the teacher becomes the mentor to help students develop learning motivation and stimulate their active learning activities (Haleem et al., 2022; You, 2019). In the realm of education, there is a body of discourse around the idea of prioritizing students in the learning mechanism, engaging them actively, and tailoring educational experiences to their needs and interests. Numerous studies, including those by Bakar et al. (2013), Neumann (2013a, b), and Komatsu et al. (2021), veer to diverse facets of this educational approach. These investigations plunge into topics such as crafting learning environments that revolve around the learner and the barriers faced when put into practice.

Student-centered learning (SCL) involves active student participation in the education process and the ability for students to select what, when, where, and how they will learn. In the field of teaching statistics, there has been a rapid expansion in the use of SCL; but still, there is a lack of research that integrates the results in this area, particularly in the context of computer technologies (Judi and Sahari, 2013). Schweisfurth (2015) emphasizes the importance of flexible learning methods, and Oyelana et al. (2022) vouch for active participation, individual attention, and motivation. Research by Lahdenperä et al. (2022) shows that teacher support and learning control work behoove regulated learning. Asoodeh et al. (2012) further posit that a student-centered approach improves academic progress and social skills. However, the successful implementation of this approach demands changes in the organization of the educational process and teacher training, as indicated in the study by Burner et al. (2017). At the same time, Tadesse et al. (2021); Zhang et al. (2022) and Knorn et al. (2022) focus on the importance of interactive and constructivist learning, delivering a deeper understanding of the subject.

The socio-cultural view of learning pushes the use of tools and development of artifacts. Teachers are expected to work with student s' phonological awareness in a structured manner, taking as their starting point student s' learning experiences, creativity therein, and interests. There are many communication techniques, such as unidirectional, contributed, and others, used in teaching. In unidirectional communication, teachers dominate the discussion for knowledge transfer, and students passively receive it. In contributed communication, interactions between teachers and students share the knowledge. Multimedia and mobile media also give rise to differences, giving room for student experiences in online learning. Social media such as Facebook, Twitter, WhatsApp, LinkedIn, YouTube, and others are leveraged for engagement and learning. Researchers have also checked multimedia tools for learning and how media differences give rise to different student experiences (Crook and Schofield 2017). This meta-analysis suggests that the use of mobile devices, including tablets, can improve students' academic achievement, especially in more interactive and engaged learning contexts. Tingir, S., et al. (2017)

A student-centered approach to e-learning orients the educational process towards the needs and interests of students. The approach is that students actively pursue their own learning, set their own learning goals, choose a path to achieve the set goals, and independently assess their progress (Kumar & Owston, 2016) - issues that cannot be easily detected. In a student-centered e-learning environment, various tools and technologies are used to help students obtain knowledge through a more interactive and effective format (Santoso et al., 2016; Verstegen et al., 2016; Dolmans 2019; Rodrigues et al., 2019). For exle, chats, forums, web conferences, online quizzes. Research questions, therefore, are:

- What types of technologies can aid active student learning?
- What are the advantages and limitations of technology-enabled learning?
- What recommendations should be followed?

Accessibility and assignments enable students to communicate and collaborate with each other, exchange ideas, and receive feedback from teachers and fellow students (Serban and Vescan, 2019). Advanced methods, tools, and technologies create an SCL process on electronic platforms. Specifically, machine learning methods and data analysis are used to personalize the educational process according to each student's needs and level of knowledge. Santoso et al. (2018) also adduce the development and testing process of a control panel, which demonstrates that its use can improve the quality of learning in a student-centered e-learning environment.

Literature Review

Kerimbayev et al. (2022) explored the implementation of the T-learning platform in the education system and emphasized the advantages of this innovative platform, which contribute to improving the quality of education and facilitating collaboration between teachers and students. Uskov et al. (2014) describe ways and means of e-learning with a focus on students, delving into the creation of an individual electronic educational environment. Various methods and tools, such as adaptive learning, personalization of the education process, the use of online courses, and other electronic tools, are tested. Faisal et al. (2019) favor machine learning methods and data analysis to create personalized educational materials and enhance interaction among students.

In the age of the Internet, traditional lectures are becoming less appealing to students, leading to a decline in their motivation for learning and exam performance. However, widespread adoption of student-centered teaching methods aiming to address this issue faces certain barriers, such as: (1) limitations in preparing materials for e-learning, (2) significant additional time required for active online communication with students, (3) resistance from students to take an active role in their education, and (4) inadequate confidence of teachers that a student-centered approach covers all necessary topics.

Debiec (2017) describes a thematic study conducted in an introductory course on digital systems using a mix of student-oriented strategies to overcome the aforementioned barriers and improve students' performance. Specific measures addressed include: (1) improving student-teacher relationships, (2) using inductive and counterintuitive ways to introduce new concepts, (3) the use of puzzle-based quizzes integrated with peer learning, (4) the use of the audience response system, (5) substituting lectures with educational programs, (6) reducing the course duration, and (7) using a graphic tablet. Student-centered e-learning thus means the use of technologies that allow teachers and students to personalize learning, such as data analysis and adaptive learning. Courses are developed according to the interests and needs of students, which can enhance their motivation and learning efficiency. Student-centered e-learning also covers assignments, cases, group discussions, and presentations, which enable students to actively participate in the learning process (Hermans et al., 2013).

Student-centered e-learning secures a high level of individualization in education and boosts learning effectiveness. As a result, students can receive quality education that meets their needs and helps them achieve their learning goals. It has been proved that online courses necessitate the application of more effective learner-centered teaching methods. This approach allows students to choose assignments they prefer, including both traditional projects and more active actions such as demonstrations or skill mastery. To determine the length of these changes and their contribution to active learning, course data analysis was conducted. Students successfully did assignments, palpably demonstrating proficiency in various skills, and positively evaluated the flexible learning approach. Hanewicz et al. (2017) confirmed that using student-centered methods that consider their preferences is an effective approach for online courses. Institutional overtones of online learning are crucial for strategic budgeting, policy making, and fertile for future directions of educational services.

Online Learning

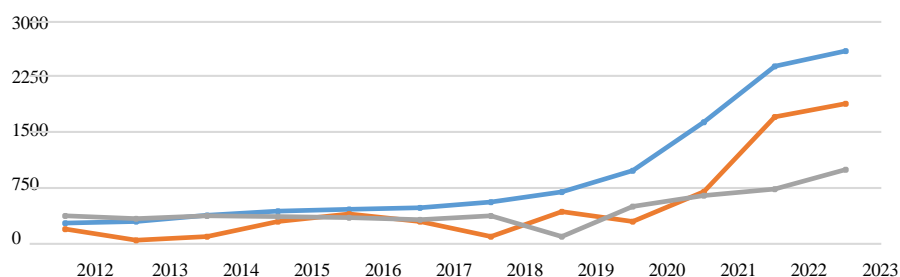
The impact of a student-centered approach to online learning on student satisfaction, particularly for those with little experience in online education, has been studied. Structural equation modeling is used to test hypotheses regarding the influence of five key elements of SCL in online courses: learner relevance, active learning, true learning, student autonomy, and computer competency on students' perception of satisfaction with online courses and distance learning (Ke and Kwak, 2013; Ribeiro-Silva et al., 2022). The results were that all five SCL

structures significantly influenced student satisfaction with online courses and distance online learning. To develop effective online courses, it is important to utilize research-backed principles and practices that are student-centered. It should be theoretically justified and explained based on empirical data. It is crucial to identify evidence-based practices that have proven effective in attracting and retaining students in online courses (McCombs, 2015).

A personalized approach to online learning in higher education considers the individual cognitive and motivational differences of each student, allowing for more student motivation, self-esteem, self-efficacy, intrinsic values, and improving the quality of education and preparation for professional activities. However, the personalized approach may not perceptibly impact students' course-related performance and task value. Data analysis can provide more detailed information about students' learning behavior and help create a variety of intervention strategies to enhance the quality of education (Smit et al., 2014), as measured by their enjoyment and effort. When autonomy is granted within a nurturing context, a learner-focused approach calcify student motivation.

Realted Work With Distance Learning

Chui et al. (2020) point to the use of machine learning in virtual learning environments, specifically the creation of personalized learning plans for students. Machine learning algorithms can be used to analyze student data like test scores and system activity, and based on that, create individualized learning plans taking into account each student's unique needs and abilities. Kerimbayev et al. (2020) explored the use of the learning management system (LMS) Moodle as a virtual educational environment to enhance interactive communication in education. The authors discuss the advantages of this approach in facilitating collaboration among students and instructors and thus improving overall education quality. Practical approaches to virtual learning environments in the context of distance learning and online education have been researched. Almarzooq et al. (2020) discuss the advantages and disadvantages of virtual learning compared to traditional classroom-based learning, considering virtual learning as an effective tool for educating medical professionals both during the pandemic and in the long term. Marín-Díaz et al. (2022) analyzed how universities transitioned to virtual learning, the technologies they used, and how it impacted the educational process and student engagement. To enhance student self-efficacy in virtual learning through mobile educational applications, Hussain et al. (2021) outline d the use of mobile apps and suggested recommendations for their use. They also discussed the impact of mobile educational apps on improving students' confidence in their knowledge, skills, and abilities, as well as boosting their motivation to learn. The use of artificial intelligence technologies the principles underlying explainable artificial intelligence and the application of machine learning and data analysis methods to enhance student-virtual learning interaction are also examined (Alonso and Casalino, 2019; Laužikas and Miliutė, 2021). This includes online courses, webinars, virtual classrooms, interactive textbooks, which can involve both synchronous (real-time) and asynchronous (non-real-time) learning. Virtual learning can be beneficial for



— Online learning — Virtual course of study — e-learning

Figure 1: Growth and use of e-learning (Online learning, Virtual course of study, e-learning) from 2012 to 2023

Table 1 Comparison of learning modalities: online learning, virtual course of study, and e-learning

Learning modality	Characteristics	Diferences
e-learning	The use of computer programs and electronic resources for learning, including interactive textbooks, tests, and simulations	Can be used as a standalone form of learning or as a supplement to traditional classroom instruction Typically requires the use of a computer or laptop to access learning materials Can be organized in self-paced or instructor-led formats
Online learning	Education that takes place entirely online, without the need for physical presence in educational institutions	Usually conducted on dedicated online platforms Enables education to be accessed from anywhere in the world May include the opportunity to communicate with instructors and fellow students through chats and video conferences
Virtual course of study	Online learning utilizing virtual classrooms, where instructors and students can interact in real-time	Typically includes lectures, discussions, and group assignments Allows learners to gain a unique experience of communication and interaction in a virtual environment, which can be valuable in the real world Requires participation at designated times

It can be seen that the use of e-learning has increased significantly since 2012 and continues to grow (Figure 1). Specifically, in 2023, the highest usage was recorded for “Virtual learning,” followed by “Online learning” and “e-learning.” Additionally, it is worth noting that the usage of “Virtual learning” reached its peak in 2023, while the usage of “Online learning” and “e-learning” continues to go up. As for scholarly articles, it can be inferred that the number of articles on this topic correlates with the popularity of these learning modalities. The highest number of articles was published in 2023, while the lowest was in 2012.

This Table 1 provides a description and characteristics of three learning modalities: e-learning, online learning, and virtual course of study. It allows for comparing their differences, advantages, and features. For each learning mode, their main characteristics and distinctive features are given. As an exle, e-learning involves the use of computer programs and can be both a standalone form of learning and a complement to traditional learning. The important

elements that should be considered for e-learning are - control of the self-learning process, classification of cultural profiles, learner's feedback, content, and delivery mode of instruction (Kaizer et al., 2020). Through the lenses of technological, pedagogical, and content knowledge, strategies such as clear and consistent design, developing a detailed syllabus, creating a learning community, instructor presence, and prioritizing free educational materials (Mucundanyi, 2021) can be given priority.

Research Gap And Study Objective

Currently, despite extensive scientific discussion, research issues related to the concept of a student-centered approach and the successful integration of student-centered educational tools when using various educational technologies in the context of e-learning remain the subject of active discussion and research. Several systematic reviews and meta-analyses have attempted to evaluate the effectiveness of a variety of educational technologies in creating learning environments that are tailored to students' needs and interests. Shehata et al. (2023) conducted a systematic review of literature reviews to assess the current state of student-centered learning facilitated using educational technology. Ochôa and Wise (2021) discuss the role of student-centered analytics in supporting the digital transformation of education. Zhang et al. (2023) examine student-centered learning in the context of the case method and conduct an analysis of online and offline discussions within this teaching method. Shemshack and Spector (2020) conducted a systematic review of terminology associated with personalized learning. Yang et al. (2023) focused on student engagement in the context of emergency distance learning. Khaldi et al. (2023) conducted a systematic literature review on gamification in e-learning in higher education.

While the study by Peng et al. (2019) focuses on a personalized adaptive learning approach implemented using smart learning environments. Both of these studies are highly relevant for better understanding the impact of modern educational technologies on teaching methods and contribute to the creation of more personalized educational scenarios. Conducted research Mustafa et al. (2023) examines the impact of gamification on students' online learning behavior and academic performance, taking into account the perspective of learning analytics. Huang et al. (2023) work explores educators' readiness to implement Online Merge Offline (OMO) learning in the context of digital transformation. At the same time, Topuz et al. (2022) considered current trends in online assessment systems in the context of an emergency transition to distance learning. Kerimbayev et al. (2023), is engaged in the development of computational thinking in online collaborative learning using educational robotics. Wang et al. (2022) examined the temporal aspect of gender differences in online learning behavior. These studies make important contributions to the understanding of various aspects of modern educational technologies and their impact on learning and teaching.

Method

Several studies in the field of education and information technology have explored various aspects of technology integration in the educational process. One article examined the role of teachers, the internet, and technology in the education of the younger generation (Szymkowiak et al., 2021). Another study investigated students' perceptions of e-learning platforms (Moodle, Microsoft Teams, and Zoom) in the context of the COVID-19 pandemic (Alameri et al., 2020; Gamage et al., 2022). Another research focused on bridging the digital divide and acquiring digital skills among elderly individuals (Blažič & Blažič, 2020). Influencing factors on the acceptance of mobile learning (m-learning) in higher education were explored in another article (Qashou, 2021). A review of digital transformation in education was presented in a study (Bilyalova

et al., 2020). The use of artificial intelligence in higher education was investigated using structural equation modeling (Chatterjee & Bhattacharjee, 2020). Augmented and virtual reality technologies in anatomical education underwent a systematic review (Uruthiralingam & Rea, 2020). Overall, these studies reflect different aspects of information technology application in education and highlight the role of teachers, the internet, digital skills, and various technological platforms in student learning.

In Fig. 2 the use of various modern technologies in education is described. Each technology has its own advantages and contributes to the improvement of the learning process. The use of modern technologies in education has a significant impact on the educational process. Interactive e-textbooks offer engaging learning experiences, where students have access to up-to-date information and can instantly assess their knowledge. Web and video conferencing enable students to communicate remotely, participate in discussions, and engage in virtual lectures and seminars. Online learning platforms provide convenient access to educational materials and interactive tools, facilitating self-paced learning and knowledge assessment. Virtual laboratories allow for hands-on practical learning in a safe virtual environment, developing skills in working with technical devices and software. Mobile learning applications offer flexibility and accessibility to educational materials and assignments, allowing students to learn anywhere and anytime. Artificial intelligence and machine learning support personalized learning, automate assignment grading, and offer individual recommendations. Virtual and augmented reality create engaging and immersive educational environments, visualizing complex concepts and enabling practice of practical skills. The use of social networks fosters collaboration and knowledge sharing among students. All these modern technologies greatly enrich the educational process, making it more engaging, effective, and accessible for learners.

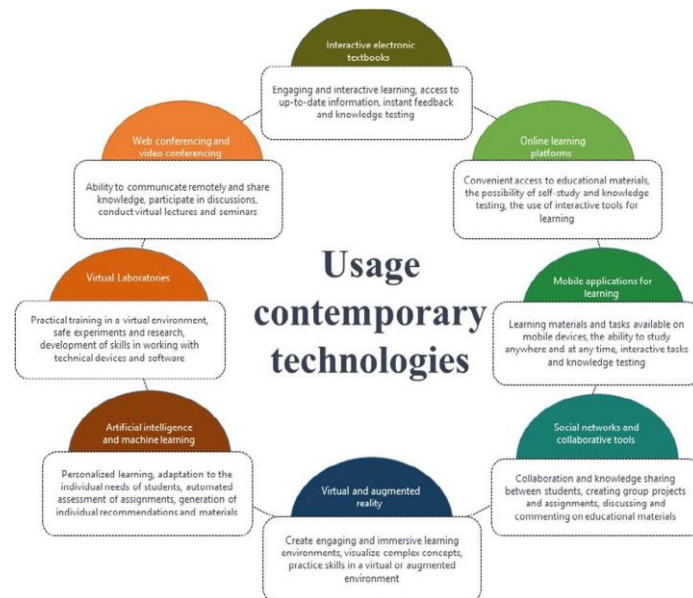


Figure. 2 Utilization of Modern Technologies In Education

Overall, the use of modern technologies in a student-centered approach opens up significant prospects for enhancing education. However, for successful implementation of this approach, it is necessary to consider limitations and challenges, develop effective implementation strategies, and provide appropriate support and training for the teaching staff. Only then can we fully leverage the potential of modern technologies in education and create more effective and SCL environments.

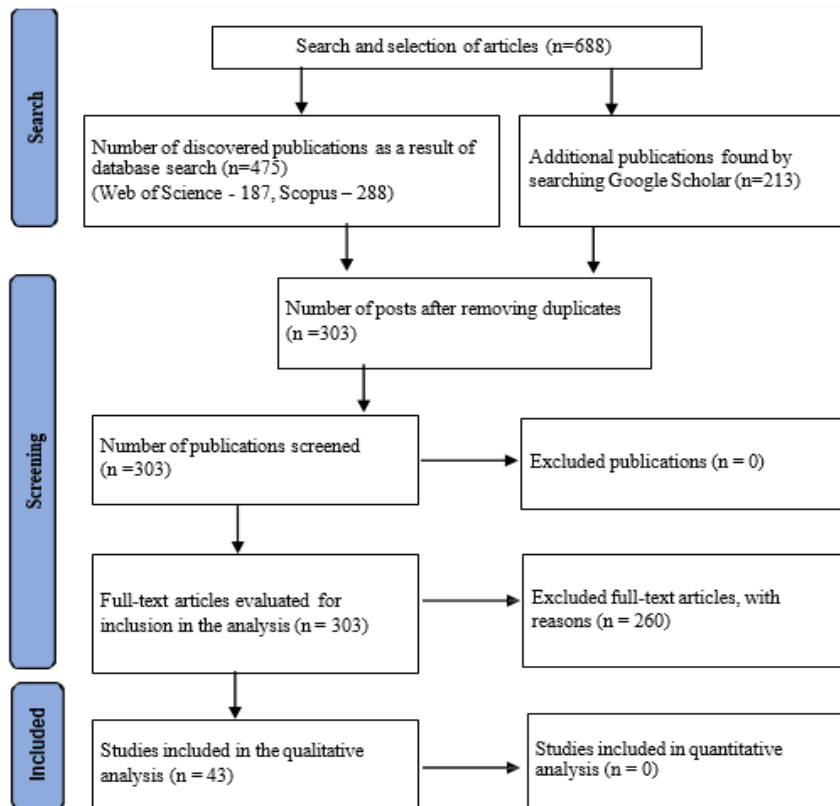


Figure. 3 Flowchart Of The Process Of Identification And Selection Of Studies In Accordance With The PRISMA Guidelines

Result and Discussion

Result

The systematic literature review revealed that the student-centered approach and modern technologies play a significant role in distance learning. Numerous studies confirm that the student-centered approach promotes active student engagement in the learning process and enhances their motivation to learn. It also contributes to the development of self-regulated learning and critical thinking skills among students. Dunbar and Yadav (2022) analyzed the effects of implementing a summer educational program involving students through service learning on the transition to SCL. The work by Rapanta (2021) explored the potential of integrating a dialogic argumentation method, oriented towards students, in various subject areas. The report by Grammens et al. (2022) presents a systematic review of the roles and competencies of teachers in synchronous online learning using video conferencing technologies. Ashiru et al. (2022) presented a student-centered approach to studying the choice of business education programs at the university level. A study by Muller and Mildemberger (2021) provides

a systematic review of blended learning in higher education, aimed at providing flexible learning by replacing some face-to-face time with online environments. Lastly, Bremner et al. (2022) research presents a systematic review of the outcomes of student-centered pedagogy. These works contribute to understanding the effectiveness and benefits of SCL in various educational contexts.

In recent years, virtual learning has significantly expanded its use and overtaken e-learning, becoming the second most popular form of learning after online learning. This indicates the growing popularity of virtual learning and its importance in the modern educational context. According to the data in Fig. 4, e-learning was used in 21%, virtual learning in 37%, and online learning in 42%. This diagram provides information about the distribution of different forms of education and helps understand which forms are the most popular and in demand in the educational environment.

In recent years, numerous studies have been conducted on the use of virtual educational tools and technologies. For example, Kerimbayev (2016) research explores the possibilities and implementation of virtual learning, providing insights into its advantages, challenges, and significance in modern education. The study contributes to a better understanding of virtual learning environments and their impact on teaching and learning processes. Radianti et al. (2020) contribute to understanding virtual educational environments and their application in various areas of learning and education. These studies deepen our understanding of virtual educational environments and their influence on teaching and learning processes in different fields of education.

Aull (2020) examines student-centered assessment and feedback on written assignments in the online environment. Cavalcanti et al. (2021) conduct a systematic review of automatic feedback in the online learning environment.

There are also studies addressing artificial intelligence and its application in online education, such as the research conducted by Ouyang et al. (2022). Other studies in this list examine online entrepreneurship education, the impact of online learning on students with cognitive impairments, as well as the challenges associated with the online component of blended learning and the issues faced by teachers in the online environment (e.g., works by Rasheed et al., 2020; Martin et al., 2020). The study by Juliantara et al. (2022) focuses on student-related factors in online learning.

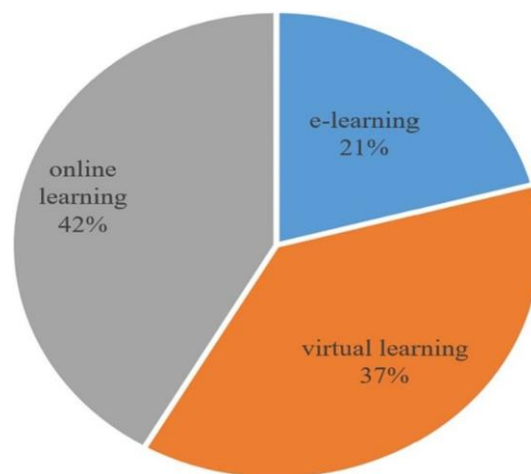


Figure. 4 Frequency of Use Of Various Forms Of Education

Saleem et al. (2022) provides a literature review on the application of gamification in e-learning. Giannakos et al. (2022) conduct a systematic literature review, exploring the potential of e-learning to enhance organizational learning.

The overall trend in these studies indicates the importance of a student-centered approach, the use of various technologies and tools, as well as the development of students’ skills and competencies in online learning. They also emphasize the significance of feedback, collaboration, and flexibility in the online environment.

In general, these studies provide valuable information and recommendations for the development and implementation of student-centered online learning. They also under- score the importance of continuous improvement and the application of new approaches and technologies in this field.

In relation to the use of modern technologies in distance learning, research also high- lights the importance of developing information and communication skills among stu- dents. It has been shown that the use of technologies can contribute to the development of collaborative learning, online processing, and other forms of active interaction among students. Online learning also enables students to receive feedback and support from their teachers and peers.

The presented diagram is the result of a synthesis of literature analysis, based on the analysis of a number of studies conducted in the field of distance education, taking into account the use of modern technological solutions (Fig. 5). This literature review pro- vides a quantitative assessment of academic work on each of the identified technologies and provides valuable insight into the direction and scope of research in the field.

The learner-centered approach to education has been investigated by several research- ers, and the results of these studies show that such an approach can take various forms and be individually determined. Furthermore, significant differences in the key findings of these studies have been identified. Kang and Keinonen (2018) examine the influence of different learner-centered approaches on students’ interest and achievements in the field of science, emphasizing their positive impact on the learning process. Zhang et al. (2021) explore factors related to the implementation of learner-centered teaching meth- ods, revealing the challenges and difficulties faced by educators. However, overall, the learner-centered approach is considered more effective and appropriate in informal learning settings as it allows students to develop their skills and knowledge, taking into account their individual needs and interests.

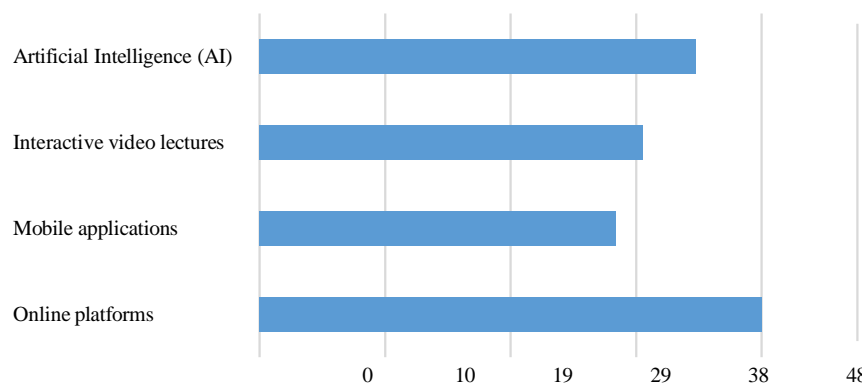


Figure. 5 Analysis of The Number Of Studies In The Field Of Modern Technologies In Distance Education

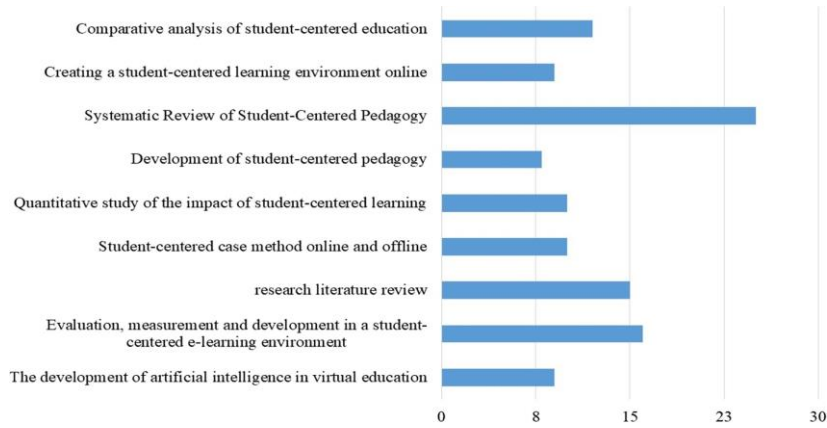


Figure. 6 Methodology and amount of research in education

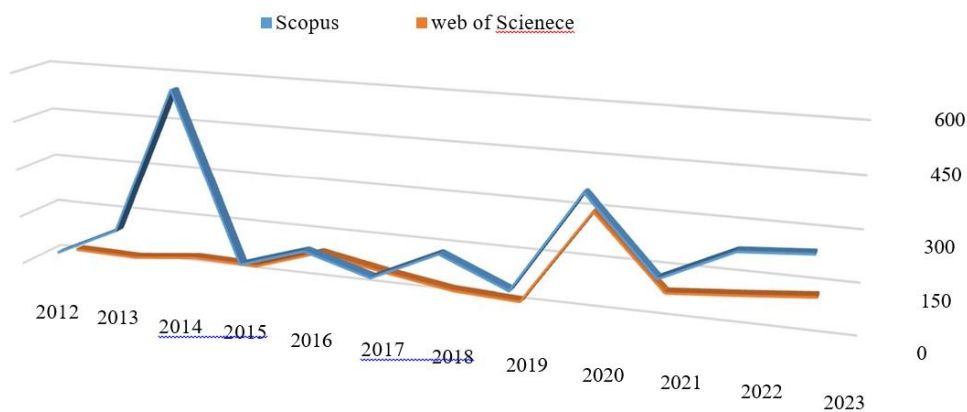


Figure. 7 Publications In Scopus And Web Of Science By Years (2012–2023)

The diagram represents various student-centered methodologies related to education and indicates the number of studies conducted in each of these methodologies (Figure. 6). The types of methodologies include the development of artificial intelligence in virtual education, assessment and development in student-oriented e-learning environments, literature review studies, student-centered case method in online and offline modes, quantitative research on the impact of SCL, development of learner-centered pedagogy, systematic review of student-centered pedagogy, and the creation of a student-centered online learning environment.

From the presented data, it can be observed that the number of publications indexed in the Scopus and Web of Science databases is unevenly distributed across years (Figure. 7). In 2012, Scopus registered more articles than Web of Science. In the subsequent years, the situation changed, and in 2014, Scopus registered significantly more articles than Web of Science. In 2020, the number of publications in both databases was substantial, but Scopus still surpasses Web of Science. Overall, it can be concluded that the number of publications in Scopus and Web of Science is unstable and can vary from year to year.

However, the systematic literature review also identified some challenges and limitations associated with the implementation of student-centered approaches and modern technologies in distance learning. Some studies highlight the need for more effective training of teachers in technology use and the application of student-centered

approaches. It is also noted that individual needs and differences of students should be taken into account when designing and implementing educational programs.

Overall, the systematic literature review confirms the significance of student-centered approaches and modern technologies in distance learning. It emphasizes their positive impact on student engagement, the development of self-regulation and critical thinking skills, as well as the creation of conditions for more flexible and personalized education. However, for the effective implementation of these approaches and technologies, further work is required in terms of teacher training, program adaptation, and providing support to students in the online learning environment.

Thus, the findings of the systematic literature review confirm that student-centered approaches and modern technologies play an important role in distance learning. They contribute to active student participation, educational individualization, and the development of necessary skills. However, further work is needed for the effective implementation of these approaches and technologies in educational practice.

The results of the study confirmed that there is considerable experience in the field of distance learning in applying a student-centered approach. Modern technologies such as interactive platforms, adaptive learning systems and virtual reality are closely related to this approach. The advantages of introducing a student-centered approach and modern technologies are the individualization of learning, improved interaction and accessibility of education. However, limitations include the need for access to technology and the difficulty of adapting traditional models to a remote format. For effective implementation, it is recommended to ensure the availability of technology, integrate a student-centered approach, organize interaction and support for students, and conduct ongoing research on the effectiveness of implementation.

Discussion

This section discusses the relationship between the student-centered approach and the use of modern technologies in distance learning based on the conducted systematic literature review. It assesses the advantages and challenges associated with implementing such an approach in the context of distance learning and discusses the prospects for its development and recommendations for practice.

In this study, various works related to the topic of student-centered approaches and modern technologies in distance learning were examined. The study by Wang and Zhang (2019) explores the relationship between the student-centered approach, deep learning, and self-assessment of skill improvement among higher education students in China. The work by Xie et al. (2020) and Yin et al. (2021) examines motivation, engagement, and academic achievement of students in the context of an inquiry-based approach. Chen and Tsai (2021) delve into the utilization of mobile technologies in education and teachers' perceptions of this approach. Brouwer et al. (2019) explore interaction and a sense of belonging within learning environments that prioritize learners. Cheng and Ding (2021) make a comparison between the behavior and motivation of Chinese teachers and students in this educational context. Al-Balushi et al. (2020) examine teachers' and their supervisors' perceptions of student-centered classrooms and the learning process. Overall, these works enrich our understanding of the impact of the student-centered approach and the use of modern technologies in distance learning on student motivation, interaction, and achievement.

In addition to the previous works, the following studies related to the topic of student-centered approaches in education have also been explored. Polly et al. (2015) examine the relationship between teacher professional development, their outcomes,

and student achievement using a mathematics program for elementary school teachers as an example. Marioara (2015) discusses the changes in education associated with the implementation of a student-centered approach. The work by Rich (2021) investigates teacher agency when using mathematical instructional programs and their impact on SCL. Haber-Curran and Tillapaugh (2015) examine transformative learning with an emphasis on a student-centered approach in leadership education. Frambach et al. (2014) study student behavior in discussions in student-centered education across different cultures. Baeten et al. (2013) explore student-centered teaching methods and their impact on students' approaches to learning in higher professional education. Adam et al. (2017) conduct a systematic review of self-regulated learning and online learning. Aytaç and Kula (2020) perform a meta-analysis of studies on the impact of student-centered approaches on the development of students' creative thinking. Finally, Metsälä and Törnroos (2021) conduct a literature review on the benefits and effectiveness of student-centered strategies in healthcare education. These works provide additional scientific evidence for the significance of the student-centered approach in modern education and its impact on student learning and development.

Baeten et al. (2010) examine the use of SCL environments to stimulate deep approaches to learning. Bower and Hedberg (2010) conduct a quantitative multimodal analysis of teaching and learning discourse in a web-conferencing environment and assess the effectiveness of student-centered learning-based designs. Hew and Cheung (2014) investigate the motivation and issues faced by students and instructors in Massive Open Online Courses (MOOCs). Rabin et al. (2019) conduct an empirical study on the antecedents of achievement of student-centered outcomes in MOOCs. Cela et al. (2015) explore social network analytics in e-learning. Chen et al. (2021) conduct a systematic review of technology adoption in online and blended entrepreneurial education. Cinquin et al. (2019) investigate online learning and cognitive impairments. Garcia et al. (2018) conduct a systematic review of self-regulated learning using electronic tools in computer science education. Wong et al. (2015) describe a model for integrating learning management systems, MOOCs, and flipped classrooms in an integrated Moodle learning system. Harris et al. (2013) provide a literature review confirming the significant impact of student-centered schools on learning. Hernández-Velázquez et al. (2021) conduct a systematic review of literature on the relationship between mobile learning and student-centered design. Margot and Kettler (2019) review teachers' perceptions of integration and education in STEM fields. Marín (2022) critically analyzes SCL in higher education during the COVID-19 pandemic. Mousavinasab et al. (2021) conduct a systematic review of intelligent learning systems, their characteristics, applications, and assessment methods. O'Donnell et al. (2017) present a systematic review of personalized approaches to studying traumatic events. Rukmini et al. (2018) conduct a meta-analysis and systematic literature review on student-centered learning and its relationship with academic achievement and soft skills. Shah and Kumar (2020) present concepts of student-centered learning.

Student-centered teaching strategies are approaches to education that emphasize the needs and interests of students rather than the requirements of the curriculum or the teacher. These strategies take into account individual differences among students, their cultural and social context, and different learning styles. They help students develop critical thinking, self-esteem, and self-regulation (Andersen & Andersen 2017). However, research shows that student-centered teaching strategies may have a negative impact on the academic performance of students from different socioeconomic backgrounds. Therefore, for the effective implementation of student-centered teaching

strategies, it is necessary to consider the context of their application and provide the necessary support and resources to students so that they can successfully meet their educational needs and goals.

Conclusion

This systematic literature review examined the impact of a student-centered approach and modern technologies on distance learning. The analysis of the presented studies allows for the following conclusions.

Firstly, a student-centered approach plays a crucial role in the effectiveness of distance learning. Considering students' needs and preferences, as well as actively involving them in the learning process, contributes to increased motivation and better outcomes. The use of personalized approaches, adaptive technologies and tools, as well as feedback, helps create a learning environment tailored to each student's individual needs.

Secondly, modern technologies play an important role in the development of distance learning. They provide access to educational resources, create interactive and collaborative environments, and enable the use of gamification and virtual reality in education. Tools such as electronic platforms, online communication, cloud technologies, and data analytics facilitate the effective delivery of materials, interaction between students and instructors, and adaptation of the educational process to changing needs.

Lastly, the student-centered approach and modern technologies in distance learning are interconnected and mutually reinforcing. The combination of these approaches allows for the creation of effective and innovative learning environments that promote active and interactive student engagement. They provide flexibility, accessibility, and personalization of learning, which are particularly relevant in the context of distance learning.

Overall, the systematic literature review allows for the conclusion that a student-centered approach and modern technologies play a significant role in enhancing the quality of distance learning. They contribute to active student engagement, personalization of the educational process, and the creation of an interactive learning environment. However, successful implementation of this approach requires consideration of the diversity of student needs and overcoming associated limitations. Therefore, further research and development in this field will contribute to the continued advancement of distance learning and the provision of quality education for students.

The student-centered approach includes the active involvement of students in the educational process, taking into account their needs and preferences, as well as the development of self-regulation and autonomy skills. It focuses on individualizing learning and supporting students in their educational journey. Modern technologies, in turn, provide a wide range of tools and resources for creating interactive and adaptive educational environments, ensuring accessibility and convenience in learning.

The use of modern technologies such as electronic platforms, virtual classrooms, multimedia materials, and communication tools enables the creation of an effective and flexible educational environment. They enrich learning by making it more interactive and engaging for students. They also facilitate personalized learning, allowing students to choose their own time and pace of learning.

However, for the full implementation of the student-centered approach and effective use of modern technologies in distance learning, it is necessary to consider limitations and challenges. This includes ensuring technology accessibility for all

students, the quality of educational content, support and training for instructors in technology use, as well as organizational and managerial aspects.

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