LITERATURE REVIEW OF COLLABORATIVE LEARNING STRATEGIES BASED ON DIGITAL EDUCATION INNOVATION IN INDONESIA

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ABSTRACT

Objective: This study aims to explore the effectiveness and potential of collaborative learning strategies that integrate digital education innovations in the context of Indonesia's evolving digital education landscape.

Research Design & Methods: A systematic literature review was conducted by selecting and analyzing ten peer-reviewed research articles published between 2020 and 2025. These articles were examined to identify trends, outcomes, and factors influencing digital-based collaborative learning strategies across different levels of education.

Findings: The findings reveal that digital technologies play an important role in facilitating interactive, flexible, and personalized learning experiences. Collaborative digital tools such as Google Classroom, Quizizz, Flipbook Digital, MathTrail, video conferencing platforms, gamification apps, and educational podcasts have been shown to increase student engagement, strengthen group communication, and deepen conceptual understanding. The success of these strategies is influenced by appropriate platform selection, increased digital literacy among teachers and students, and pedagogical design that promotes meaningful and sustained interactions.

Implications & Recommendations: To optimize the impact of digital collaborative learning strategies, it is important to invest in teacher training programs that focus on technological proficiency and pedagogical innovation. Policymakers and educational institutions should support infrastructure development and ensure equitable access to digital resources at all levels of education.

Contribution & Value Added: This study contributes to the body of knowledge by providing a synthesized overview of how digital innovation supports collaborative learning in Indonesia. The study highlights practical tools and strategic factors that can guide educators, researchers, and decision-makers in implementing effective digital learning environments.

Keywords: Collaborative Learning, Digital Education, Educational Innovation

JEL codes: I21, I23, O33

Article type: research paper

INTRODUCTION

The recent rapid advancements in digital technology have been a major catalyst in transforming the entire educational landscape. Today's learning innovations are no longer limited to the integration of technology in the teaching process, but also focus on pedagogical strategies that enhance active participation and collaboration among learners. One prominent approach in this context is digital collaborative learning, which combines technology with cooperative principles to create a more interactive and meaningful learning experience. This approach not only strengthens students' critical and creative thinking abilities but also fosters communication, problem-solving,

and teamwork skills that are much needed in the professional world of the future (Majdi, 2023). The concept of collaborative learning strategies based on digital education innovation is increasingly prominent as the education system adapts to technological developments. The use of digital tools in the educational process not only revolutionizes conventional learning models but also presents new pedagogical approaches that encourage collaboration between students.

The implementation of collaborative learning strategies is highly relevant to recent developments in the field of educational technology. Collaborative learning in an online environment is gaining attention as an effective approach to increase students' active participation and engagement in the learning process. Through the utilization of digital technology, this method allows interaction and cooperation between learners from different locations, thus overcoming geographical limitations that have been a major obstacle in conventional education. The advancement of online technology and various e-learning platforms opens up vast opportunities to implement collaborative methods more effectively and efficiently. Through these platforms, students can interact and work together without being limited by time and space, enabling collaboration across regions and even globally. In addition, these technologies provide a variety of innovative features that support active learner engagement, such as discussion forums, virtual workspaces, and real-time communication tools (Harasim, 2017). The ability to collaborate virtually not only expands access to richer learning experiences but has also been shown to deepen understanding of complex material and increase students' intrinsic motivation for learning (Gopinathan et al., 2022). Especially in the context of distance education, collaborative learning comes as an innovative solution that can bridge the distance and time limitations that often become obstacles in traditional learning models (Wieser & Seeler, 2018).

One of the main advantages of digital collaborative learning lies in its ability to enhance interaction and active engagement of learners in a dynamic educational environment. The transformation from conventional learning to the digital realm has shown that online collaborative approaches can strengthen the interactive knowledge construction process, where students are not only recipients of information but also play a role in creating meaning through collaboration (Strauß & Rummel, 2020). Through active participation in group discussions, project work, and joint reflection, students are encouraged to develop a deeper understanding as well as essential social skills such as communication, empathy, and teamwork. The utilization of digital tools such as Learning Management System (LMS), online discussion forums, and other collaborative applications reinforces this process by providing flexible spaces for dialogue, idea sharing, and collective knowledge building (Jin & Bridges, 2014).

The implementation of digital collaborative strategies in education, while offering great opportunities for interactive and flexible learning, is faced with a number of complex challenges. One of the main obstacles is the difficulty in establishing authentic collaboration in digital spaces, mainly due to the limitations of face-to-face interactions that lead to low social presence. As a result, many students feel alienated and less emotionally engaged in the online learning process. This situation is exacerbated by technical barriers, such as limited access to devices or stable internet connections, as well as the lack of adequate supporting infrastructure in some educational institutions. In addition, different cultural backgrounds among learners often lead to miscommunication or different interpretations in cross-cultural collaboration, which can hamper the dynamics of group work. Last but not least, the low level of digital literacy among students and educators is a serious barrier to optimally utilizing various digital platforms. Lack of training and pedagogical preparedness in managing online collaborative interactions also contributes to the effectiveness of this strategy (Wieser & Seeler, 2018).

Research of Deb and Ghosh (2025) suggests that while the use of digital collaborative tools such as Zoom, Google Docs, and Microsoft Teams have the potential to increase participation and productivity in learning, their successful implementation is highly dependent on the design of structured learning strategies and students' ability to interact and cooperate actively and effectively in an online environment. Therefore, a well-structured instructional design is key in creating effective collaborative tasks. A systematically designed learning design not only encourages students' academic engagement but also plays an important role in establishing social presence in

the digital environment. This social presence is necessary to create a sense of community, mutual trust, and meaningful communication between learners, which ultimately strengthens the dynamics of group work and improves the overall quality of collaborative learning (Strauß & Rummel, 2020). Thus, the development of innovative, adaptive, and inclusive digital collaborative learning models is a must to support sustainable educational transformation and align with the demands and challenges of the 21st century.

LITERATURE REVIEW

Collaborative Learning

Experts define collaborative learning as an approach in education that emphasizes social interaction between two or more learners who work together through an active, interactive, and mutually engaged process to achieve more effective learning goals together. Lu and Smiles (2022) explain that collaborative learning is a form of active learning where students collaborate to achieve common goals and create knowledge and products through meaningful interactions. This approach also contributes to developing communication skills, metacognitive thinking, and understanding of diverse viewpoints. Collaborative learning is a contemporary educational approach that focuses on group work to solve problems, complete tasks, or create products. In this learning process, interaction between students is central, allowing them to share ideas and actively learn from each other. Huri et al., (2024) concluded that collaborative learning in higher education is effective in forming learning communities that encourage active participation, development of critical thinking, and deeper understanding through interaction with multiple perspectives.

Collaborative learning emphasizes the important role of social interaction as the main basis in the learning process, particularly by utilizing various collaboration tools that enable knowledge exchange between students. One effective technique in this approach is collaborative annotation, where students actively convey their ideas, questions, or responses in writing on the material studied together (Yang et al., 2011). This method not only facilitates a more open and structured exchange of information, but also helps deepen understanding of concepts through discussion and reflection together. Collaborative learning has the advantage of developing students' critical thinking and social skills through interactions that encourage discussion, exchange of ideas, and reflection on multiple perspectives. According to D'Avanzo (2023), collaborative environments also increase student participation and engagement more significantly than traditional learning, as students are given greater autonomy and responsibility in the learning process, so they feel they have an active role and meaningful contribution in achieving learning objectives.

The integration of technology in education, particularly through the Computer-Supported Collaborative Learning (CSCL) approach, has brought significant changes in collaborative learning practices. CSCL allows students to engage in more dynamic and structured interactions through various digital tools and platforms, such as discussion forums, virtual whiteboards, interactive simulations, and other collaborative software. With the support of these technologies, students can work together to complete tasks, have real-time and asynchronous discussions, and develop solutions to complex problems collectively. This approach has proven to be particularly effective in areas that demand logical thinking and systematic problem solving, such as programming education. In this context, technology is not only a means of communication but also plays a role in creating simulated environments that represent real-world scenarios, thus allowing learners to apply their knowledge in a hands-on and contextualized manner (Silva et al., 2020).

Research has shown that the nature and pattern of collaboration strongly influence learning outcomes in wiki-based collaborative writing contexts. Learning environments that encourage egalitarian and mutually beneficial interactions between participants have been shown to improve learning experiences and participant satisfaction. For example, the use of wikis creates a student-centered learning atmosphere, allows for a more equitable distribution of knowledge power, and forms a more participatory and reflective learning community (Mello, 2017; Ruth & Houghton, 2009). In addition, collaboration in wikis often exhibits patterns of equal and deep contributions when clear structures and goals support interactions. Such interactions aid the formation of social spaces and mutually supportive content, which enhances reflection and critical thinking among

participants (Cullen & Wild, 2018). The effectiveness of this collaboration among participants does not arise automatically. It requires careful structuring and facilitation to encourage active engagement, especially in directing participants to share roles fairly and support each other (Alghasab et al., 2019).

The incorporation of advanced technology-based collaborative tools such as augmented reality (AR) further enriches the collaborative learning process by creating immersive, interactive, and contextualized environments. AR technology allows students to interact directly with digital objects superimposed onto the real world, thus increasing engagement and understanding of complex material. In the context of collaborative learning, AR facilitates teamwork more effectively by presenting information visually and in real-time, which can be accessed and explored together by all group members. Studies show that the use of AR can not only improve student task performance but also reduce errors and create a more positive and productive collaborative experience (Upadhyay et al., 2023). Online collaborative learning environments expand the exchange of knowledge and ideas between learners. These digital spaces encourage students to consider and respond to multiple perspectives, thus strengthening critical reflection. This kind of interaction stimulates higher-order thinking skills and self-awareness of the learning process. The flexibility of access to materials allows students to evaluate their understanding and progress independently and continuously. Altınay (2017) emphasizes that this strongly supports the creation of a culture of lifelong learning and critical engagement, two crucial components in building a relevant and effective education system in the evolving digital age.

Collaborative learning theory highlights the important role of social interaction, cooperation, and achieving shared goals in the educational process. This pedagogical approach involves students in small group work to complete a task, solve a problem, or produce a product, with the primary goal of strengthening understanding through mutual support and contribution. Through active involvement in the group, students not only learn from the material but also from the perspectives, experiences, and ways of thinking of their group mates. This approach is in line with the principles of constructivism, which emphasizes that individuals actively form knowledge through engagement in meaningful social interactions and cultural contexts. In this context, learning becomes more than a transfer of information but rather a dynamic process where students construct understanding together through collaboration (Zajda, 2021).

Digital Education Innovation

Innovation in digital education refers to the strategic use and integration of digital technologies to transform and improve learning experiences at all levels of education. These changes include important aspects such as the conversion of learning materials to digital formats, the utilization of the latest technological tools and applications in the teaching process, and the development of learning environments that are more adaptive, flexible, and welcoming to different backgrounds of learners. These innovations not only expand access to learning resources but also enable more interactive, personalized, and efficient learning methods. Digital education no longer serves as a supplement but has become a core element in designing a modern, adaptive, and inclusive learning system.

The use of digital technology has revolutionized education by fundamentally changing the way students acquire and process information. Learning is no longer limited to physical classrooms, but can be done in various places and times, thus offering great flexibility for learners (Alenezi et al., 2023). Various online learning platforms, educational applications, and digital learning resources such as videos, interactive simulations, and e-learning modules allow students to learn material at their own pace and learning style. This technology also supports personalized learning, where the content and difficulty level of the material can be automatically adjusted to individual abilities and needs. In addition, the presence of learning analytics features gives educators the ability to monitor student progress in real-time and provide faster and more precise feedback. Interactivity in digital education is further enhanced through online discussions, cloud-based collaboration, and learning projects that involve participants from various locations.

Digitalization in education is a gradual process that consists of three main phases: digitization (conversion of materials to digital format), digitalization (conversion of materials to digital format), and digital transformation (comprehensive change that includes technology-based learning strategies). The first phase, digitization, refers to converting learning materials from physical form to digital form, such as converting printed books into e-books or digital documents. Furthermore, in the digitalization phase, digital technology begins to be integrated into the teaching process, for example, by utilizing Learning Management System (LMS) platforms, educational videos, and interactive learning applications. The final phase, digital transformation, reflects a comprehensive change in the education system, where technology no longer serves only as a tool but becomes the main foundation in an integrated learning strategy (Kim, 2025). In higher education, this digital transformation contributes greatly to improving academic quality, both in curriculum development, teaching methods, and assessment mechanisms. The use of cutting-edge technologies such as artificial intelligence (AI) enables live monitoring and analysis of the learning process to support personalized learning. Cloud computing technology enables access and collaboration without geographical barriers, while blockchain technology ensures security and transparency in academic data management (Imran & Almusharraf, 2024).

Innovation in digital education does not simply focus on adopting the latest technologies, but rather reflects a paradigm shift in teaching and learning approaches. This shift emphasizes the importance of building an education system that is more effective, efficient, and relevant to the needs of the 21st century (Sych et al., 2021). In this context, technology is not only used as a tool but as a catalyst that reforms the teaching-learning process as a whole. The conventional one-way approach is replaced by a more interactive, personalized, and collaborative learning model. Teachers act as facilitators who guide students in actively exploring knowledge, while students are given greater freedom and responsibility in their learning process. Through digital innovation, learning becomes more adaptive to individual differences and is able to reach more learners through online, hybrid, or blended learning methods.

One of the main characteristics of digital education innovation is the thorough integration of technology into pedagogical practices, which not only changes the way teaching and learning are conducted but also demands a fundamental shift in learning objectives. This innovation has led to the emergence of new competencies for educators, including technological skills, the ability to design digital learning, and an understanding of pedagogical approaches relevant to the digital age (Stumbrienė et al., 2024). The COVID-19 pandemic has been a watershed moment that has forced many teachers to upgrade their ability to use various digital tools. However, for this technology adoption to be sustainable, it requires strong institutional support, adequate training, and the right pedagogical approach. Factors such as perceived value, personal readiness, and organizational support have been shown to be key determinants of teachers' motivation to adopt digital innovations.

The development of technology-based education cannot be separated from the foundation of learning theories that provide direction and conceptual frameworks in designing effective teaching strategies. One widely adopted theory is constructivism, which views learning as an active and meaningful process that occurs in a social and practical context. This theory is highly relevant in the implementation of educational technology, especially in fields such as nursing and midwifery, where learners need to experience learning that is interactive, contextual, and applicable (O'Connor et al., 2022). In addition, Task-Technology Fit (TTF) and Communication Theories enrich this approach by emphasizing the importance of the fit between the technology used and the characteristics of the learning task. This fit is believed to increase efficiency, effectiveness, and student satisfaction in the learning process (Al-Rahmi et al., 2023). All of these elements synergistically form the basis for the development of adaptive and innovative pedagogical strategies that are able to respond to the dynamics and challenges of today's education while maximizing the opportunities offered by technological advances and changing learning needs.

METHOD

This research was organized using the Systematic Literature Review (SLR) method to systematically identify, review, and evaluate relevant literature to answer predetermined research

questions. This approach generates a thorough understanding of the topic, reveals key findings, and identifies research gaps that can be used as a basis for further research. In an effort to compile a comprehensive literature review, the Systematic Literature Review (SLR) method was used as the main approach to review and identify journal articles in a systematic and structured manner. This method allows researchers to review relevant scientific findings, evaluate the quality of previous studies, and identify trends, gaps, and contributions in the topic under study. To support the data collection process, researchers used the Google Scholar database accessed through the help of the Publish or Perish (PoP) application, which is known to display academic search results efficiently and in-depth. The articles sampled in this study focused on publications published in the 2020-2025 timeframe. This time restriction aims to ensure that the information reviewed reflects the current conditions and cutting-edge developments in the field under review.

This research began with a search for relevant literature related to collaborative learning strategies that integrate innovation in digital education. From the various references obtained, the researcher selected 10 articles that specifically discussed the use of digital technology to support collaboration in the learning process. The selection of articles was based on the credibility of the source, clarity of information, and relevance to the focus of the study. Each article was analyzed in depth to explore approaches, methods, and outcomes related to the implementation of digital collaborative learning strategies. The data obtained from the articles were then organized systematically to facilitate the analysis process. Furthermore, it was analyzed to identify the patterns, advantages, and obstacles faced in the implementation of this strategy. From the results of the analysis, the researcher draws conclusions that provide a comprehensive picture of the effectiveness and potential of collaborative learning strategies in the digital education era.

RESULT

Article Classification Results

Recent innovation trends in education have brought profound changes to traditional learning approaches. This transformation is not only related to the replacement of learning tools or media, but also touches the philosophical and pedagogical aspects of education itself. Educational innovation now places learners at the center of the learning process, with an approach that is more personal, adaptive, and interactive. This approach provides space for students to learn according to their individual style and pace, while still building social skills through collaboration. The integration of digital technology plays an important role in supporting this change, allowing learning to take place across time and space and enriching the learning experience with a variety of sources and methods.

Detailed information on the contribution and focus of each analyzed article is presented systematically in Table 1, which serves as the main basis for classification and in-depth analysis of educational innovation trends in Indonesia. The table summarizes important aspects of each article, such as research objectives, methodological approaches, types of innovations developed, and the context in which they are applied in educational settings. Through this mapping, it is possible to identify common patterns as well as the uniqueness of each study, enabling a more rigorous exploration of the direction of development of educational innovation in the country. In addition, this table also provides a more structured picture of the real impact of the use of digital technology in improving the quality of the learning process, both in terms of method effectiveness, increased student engagement, and support for collaborative and competency-based learning.

Table 1. Classification of Research Articles

No.	Reference Source	Article Title	Main Result	Classifying Collaborative Support
1.	Deb and Ghosh (2025)	A Study on the Impact of Social Media and Online Collaboration Tools on Student Learning	Social media and online collaboration tools increase engagement and teamwork, but require high digital literacy.	Platform-based collaboration (Google Docs, Zoom)
2.	Fonseca et al., (2024)	Collaborative Learning Ecosystems in Digital Spaces	Digital ecosystems strengthen collaborative learning between different professional fields.	Community-based collaborative ecosystem design
3.	Steglich et al., (2021)	An Online Educational Hackathon to Foster Professional Skills	Online hackathon builds cooperation, communication, and creativity in a virtual context	Project-based collaboration (online hackathon)
4.	Osman et al., (2025)	Enhancing Collaborative Learning in Online Flexible Distance Learning Institutions	Online collaboration needs to be supported by tutor engagement, social interaction, and trust.	Learning community-based collaboration
5.	Paterson and Prideaux (2020)	Exploring Collaboration in Online Group-Based Assessment	Instructional design strategies such as individual accountability and instructor presence are effective in strengthening collaboration	Collaboration in online group assessment
6.	Kwiatkowska and Wiśniewska-Nogaj (2022)	Digital Skills and Online Collaborative Learning	Students with high digital skills show better collaborative interactions	The influence of digital competence on online collaboration
7.	Gqwabaza and Maqoqa (2024)	The Role of Collaboration and Networking in the Digital Age	Limited digital infrastructure weakens collaboration; the importance of technology investment	Digital collaborative infrastructure needs
8.	Xiaodi et al., (2024)	Digital Collaborative Learning in Higher Education: A Systematic Review	Effective digital interactions are enhanced by strategies such as active feedback and technical support	Online interactive and reflective systems
9.	Lara and González (2020)	Computer-Supported Collaborative Learning at PhD Level	Computer technology enables remote team collaboration in higher education environments.	Collaboration based on structured digital systems
10.	Zamiri et al., 2023)	Supporting Mass Collaborative Learning Communities Through Digital Innovation Hubs	Digital Innovation Hubs increase cross-country collaborative participation & capabilities.	Large-scale collaborative service facilities

Referring to the ten scientific articles that have been analyzed in the previous table, it can be concluded that the integration of digital technology consistently has a significant positive impact on improving collaboration in the learning process at various levels of education. Digital technology no longer only serves as a communication tool between learners, educators, and teaching materials, but has developed into an important element that forms a dynamic learning ecosystem. Its role as the main facilitator allows the creation of interactive learning spaces, encourages active participation, and is able to adapt to the needs and characteristics of today's learners. In addition, technology also contributes to creating a more inclusive and personalized learning experience, where each individual can engage in the learning process flexibly and sustainably in accordance with the needs of the times and the challenges of education in the digital era.

Some articles, such as those by Deb and Ghosh (2025) and Steglich et al., (2021), highlight how digital platforms can increase engagement in teamwork and support online collaboration, especially through the use of collaborative tools such as Google Docs and Zoom. Other studies, such as those by Fonseca et al., (2024) and Xiaodi et al., (2024), show the importance of collaborative ecosystem design and interactive learning systems in supporting cross-disciplinary learning processes. Meanwhile, Osman et al., (2025) and Paterson and Prideaux (2020) emphasize the need for support structures such as learning communities and online group assessment strategies to strengthen collaboration. Articles by Kwiatkowska and Wiśniewska-Nogaj (2022) and Gqwabaza and Maqoqa (2024) highlight the role of digital skills and technological infrastructure as important aspects in creating effective collaboration. In the context of higher education, Lara and González (2020), and then Zamiri et al., 2023) underline how technology-enabled collaborative systems can increase participation and effectiveness of learning across institutions.

Based on the overall findings that have been analyzed, the use of digital technology plays a central role in supporting and strengthening collaborative learning practices. Technology not only serves as a technical tool but also as a bridge capable of connecting learners from different locations, backgrounds, and time zones. The success of technology integration in collaborative learning is greatly influenced by several important factors, such as the selection of digital platforms and tools that suit learning needs, strengthening digital competencies for both students and educators, and pedagogical design that encourages meaningful interaction, critical reflection, and active engagement in the learning process. When strategically designed and implemented, digital technology has great potential to create learning environments that are inclusive, flexible, and responsive to today's learning challenges, while facilitating the growth of more creative, productive, and sustainable collaboration.

Tools for Collaborative Learning

In implementing collaborative learning strategies based on digital education innovation in Indonesia, there are various tools and approaches that can be optimally utilized to improve the effectiveness of the learning process. One of the key components in this strategy is digital literacy, which has a significant role in determining the quality and achievement of student learning. Digital literacy not only includes the technical ability to use digital devices, but also includes critical thinking skills, information evaluation, and ethics in the use of technology. The emphasis on strengthening digital literacy has been shown to improve the quality of learning experiences and student academic outcomes, not only at the primary and secondary education levels, but also in higher education settings (Ervianti et al., 2023).

The development of artificial intelligence (AI) tools has significantly impacted both personal and collaborative learning environments by strengthening the quality of communication, increasing learner engagement, and expanding opportunities for individualized learning. AI technology provides various facilities that support cooperative learning, such as learning recommendation systems, virtual assistants, and learning behavior analysis, all of which can create a richer, more targeted, and responsive learning experience to individual needs. However, to ensure that the integration of AI in education truly provides long-term benefits, a wise and balanced approach is required. This includes serious attention to ethical aspects, data privacy, and the importance of maintaining the quality of human interaction in the learning process so that technology does not replace, but rather strengthens the role of educators and social relationships in a healthy and inclusive educational environment.

In the context of collaborative learning based on digital innovation, the use of various learning tools becomes a crucial element that determines the success of the teaching and learning process. These digital tools not only function as supporting media but also as facilitators of interaction, collaboration, and personalization of learning. Through proper integration, these tools are able to create an interactive, flexible, and adaptive learning environment while strengthening the relationship between students and between students and teachers. Here are some examples of tools commonly used in digital technology-based collaborative learning strategies:

Table 2. Tools of Collaborative Learning

No.	Tools Name	Main Function	Explanation Usage	Reference Source
1.	Google Classroom	Learning Management System (LMS)	Used to manage assignments, deliver materials, and support collaboration between teachers and students online. Allows interaction in the form of comments, shared tasks, and discussions.	(Suhada et al., 2023)
2.	Quizizz	Interactive evaluation	Allows teachers to create quizzes or exercises that students can do in real-time or asynchronously. Supports competition-based learning as well as collaboration.	(Munawaroh et al., 2022)
3.	Flipbook Digital	Interactive media for literacy	Digital quotient-based learning media to strengthen literacy through interactive visual displays and navigation that support understanding of complex topics.	(Nugraheni et al., 2022)
4.	MathTrail	Collaborative numeracy learning model	Outdoor activity-based collaborative learning with a math task is to be completed as a group. Promotes understanding and cooperation.	(Adawiyah & Prihandini, 2023)
5.	Google Meet / Zoom	Video conferencing & synchronous learning	Used for virtual face-to-face between teachers and students, facilitating group discussions, online presentations, and live collaborative learning.	(Mahsus & Latipah, 2021)
6.	Classcraft	Gamification of learning	Transforming the classroom into an educational Role-Playing Game (RPG) that encourages teamwork, social interaction, and student motivation through a point system and learning missions.	(Saroh & Nurhamidah, 2024)
7.	Kahoot	Game-based assessment	Used to create interactive quizzes that can increase learning motivation through collaborative competition between students. Very effective for online and classical learning.	(Halimah, 2021)
8.	Podcast Audio	Supplementary learning resources	Used as supplementary learning media to strengthen concept understanding flexibly. Suitable for distance learning and independent assignments.	(Hutabarat, 2020)

The utilization of various digital tools in collaborative learning in Indonesia has shown a significant contribution in improving the quality of student interaction and engagement during the learning process. These digital tools not only support effective two-way communication that takes place in real-time, but also facilitate active collaboration between students in completing tasks and projects together. Another advantage of using this technology lies in the visual and multimedia approach it presents, which is proven to be able to attract student interest in learning, stimulate creativity, and strengthen understanding of concepts in a deeper and contextualized manner. In addition to providing a more engaging learning experience, the integration of digital technology also enables a more adaptive approach to students' individual needs, strengthens the relationship between teachers and learners, and encourages an inclusive, democratic, and participatory learning atmosphere. With optimal utilization, digital innovation not only functions as a complement but as the main strategy in realizing collaborative learning that is more effective, relevant, and meaningful in the current era of educational transformation.

DISCUSSION

Collaborative learning strategies that adopt digital education innovations in Indonesia are an attempt to face the challenges while capitalizing on the opportunities of educational transformation in the digital era. This approach emphasizes collaboration between students, educators, and technology to create a more active, effective, and contextually relevant learning environment. The implementation of this strategy can be done through the utilization of various digital media such as podcasts, interactive learning applications, and e-learning platforms that support online and offline learning processes. The presence of this technology not only expands access to learning resources but also enriches interaction and collaboration between students and between students and teachers. Thus, this strategy is believed to be able to shape a more adaptive and relevant learning environment, as well as encourage an overall improvement in the quality of education at various levels.

The utilization of digital technology, especially in English language learning in a number of universities in Indonesia, has proven to have a significant positive impact on strengthening language skills and increasing student participation. Various online platforms, such as language learning applications, Learning Management System (LMS), and internet-based interactive media, are able to create a more flexible, responsive, and interesting learning atmosphere. Through these technologies, students have independent access to learning materials and can hone their listening, reading, writing, and speaking skills with the help of interactive features. In addition, they also get direct feedback from both lecturers and peers. Not only that, digital technology also opens up space for inter-university and intercultural collaboration through discussion forums and virtual projects, which enriches the English language learning process in a more contextual and meaningful way (Hidayat et al., 2022).

A study by Sari et al., (2024) has focused on the crucial role of collaboration and innovation in digital learning from an early age, known as Digital Learning in Early Childhood (DLEC), and how it relates to sustainable education in Indonesia. The research asserts that the implementation of collaborative and innovative digital learning strategies from the early stages of education can form a strong foundation for the development of sustainability values. Through dynamic interactions between learners, educators, and technology, learning becomes more contextualized and meaningful, encouraging children to understand and apply sustainability principles from an early age. The findings suggest that collaborative efforts in advancing digital learning have a positive impact on sustainability understanding. It suggests the need for policy initiatives that support collaboration and innovation in educational practices.

The education digitalization program in the context of Society 5.0 places technology-based learning innovation as a key element in efforts to improve national competitiveness (Muzakki et al., 2024). This initiative emphasizes that technology integration in the education system is not just a trend, but a strategic necessity to prepare a generation that is adaptive to the times. At the early childhood education level, attention to increasing teacher capacity in mastering and implementing information technology-based learning strategies is very important. Research by Syakur et al., (2023) suggests that intensive training and mentoring of teachers can produce learning approaches that are more creative, collaborative, and in accordance with the characteristics of early learners. As a result, the teaching and learning process becomes more dynamic and fun, and is able to foster 21st-century skills from an early age. Thus, the digitization of education is not only relevant for higher education, but also plays a crucial role from the early stages of education, because its application from an early age can form a foundation of skills, encourage creativity and collaboration, and become a strategic foundation in building the quality of human resources that are superior, adaptive, and ready to face global challenges in the future.

CONCLUSION

A collaborative learning strategy that adopts digital education innovation in Indonesia is a strategic step in answering the challenges of education in the era of digital transformation. By utilizing various technologies such as e-learning platforms, interactive applications, and other digital media, this approach is proven to be able to create a more dynamic, flexible, and relevant learning ecosystem. Various studies have shown that the implementation of this strategy can

significantly increase students' active engagement, strengthen collaboration skills, and boost overall academic achievement. More than just technology adaptation, this strategy is also part of a big agenda in preparing young people who are resilient, adaptive, and ready to compete in the Society 5.0 era, which emphasizes the integration of technology and human values. In fact, the implementation of digital-based collaborative strategies since early childhood education is believed to instill basic 21st-century skills such as critical thinking, communication, creativity, and collaboration, while strengthening awareness of the importance of sustainability. However, the success of this strategy is highly dependent on the readiness of educators, especially in terms of increasing the capacity and competence of teachers in mastering and implementing learning technology effectively at various levels of education.

Digital technology is no longer just a tool in the learning process, but has become a key component in shaping an educational ecosystem that is dynamic, interactive, and oriented to the individual needs of learners. In the context of collaborative learning, the success of technology integration is greatly influenced by a number of important factors, such as the selection of platforms that are suitable for learning objectives and characteristics, increasing digital literacy and competence for both teachers and students, and designing pedagogical strategies that can encourage meaningful and sustainable interactions. Various digital tools such as Google Classroom, Quizizz, Flipbook Digital, MathTrail, Google Meet or Zoom, Classcraft, Kahoot, to audio-based media such as podcasts, have been proven to have a positive impact on increasing students' active involvement, the quality of communication in groups, and understanding of concepts more deeply and contextually. The use of these tools also allows the learning process to take place flexibly, creatively, and collaboratively, both inside and outside the classroom. With proper and targeted utilization, digital innovation becomes a central strategy in realizing collaborative learning that is not only effective and relevant but also meaningful and sustainable in the midst of the current global education transformation. The research concludes that the use of digital technology now plays a central role in creating a dynamic, interactive, and learner-centric education ecosystem, where collaborative learning strategies are a key element in driving the transformation process.

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