

# Comparing Human-AI and Human-Human Collaboration in Education: A Systematic Literature Review

Emmanuel Nestory Kayuni<sup>1,2</sup>,

(<https://orcid.org/0000-0001-7837-7607>)

Melinda Hestiana<sup>1</sup>, M. Mohanapriya<sup>1\*</sup>, Kashinde Charles<sup>3</sup>

<sup>1</sup> Department of Education, Bharathiar University, Coimbatore.

<sup>2</sup> Department of Education, College of Science Education

Mwalimu Nyerere University of Agriculture and Technology, Musoma, Tanzania.

<sup>3</sup> Department of Rural Planning, Institute of Rural Development Planning (IRDP), Dodoma-Tanzania

Corresponding Author: [mohanapriyamurugusen@gmail.com](mailto:mohanapriyamurugusen@gmail.com)

**Abstract:** *The study sought to investigate the comparisons between human-human and human-AI collaboration and their possible impact on education. The study employed the systematic literature review utilizing the PRISMA methodology. The study found that human-human collaboration is still key in improving communication skills, teamwork, critical thinking, creativity, leadership, empathy, and meaningful social contact. However, its usefulness is typically limited by availability, timing, workload, interpersonal differences, and delayed feedback. On the other hand, human-AI collaboration delivers 24/7 availability, customized learning, instant feedback, instructional efficiency, automated support, and flexible learning options, allowing students and teachers to acquire academic help at their convenience. However, despite these benefits, there are still significant issues such as academic integrity, algorithmic prejudice, data privacy, over-reliance on AI, and limited emotional and social engagement. The study suggests that collaboration between humans and AI, or even between humans alone, is not always the best option. What we need instead are hybrid collaborative models that harness the technological affordances of AI with the pedagogical expertise, ethical judgment, and interpersonal strengths of human collaboration for the betterment of teaching, learning, assessment, and educational sustainability.*

**Keywords:** Artificial intelligence, collaborative learning, education, human-AI collaboration, and human-human collaboration

## I. INTRODUCTION

The advent of artificial intelligence (AI) and, more specifically, generative AI (GAI) has changed the field of education, enabling creative solutions in teaching and learning, assessment, and institutional management (Baidoo-Anu & Ansah, 2023). Schools and universities started to utilize generative AI technologies toward the end of 2022 to help make learning efficient and individualized and to analyze data and support decision-making in the learning process (Lo, 2023). Previous educational technologies in the classroom have mainly enabled access to digital information, but AI has proved the potential to create instructional materials, offer rapid feedback, analyze learning data, and aid with complex learning tasks (Joshi et al., 2026; Onesi-Ozigagun et al., 2024). AI has thus become a part of the modern educational system and has changed the way teachers employ collaboration in the classroom (Shukla et al., 2025). As a consequence, teachers and students are reconsidering the way they work together in the classroom and AI has the potential to revolutionize them (Revolusi & Febriandy, 2025a).



Before proliferation of AI technologies, collaboration in education was mostly teacher-teacher, teacher-student, and/or student-student. Human-human cooperation is regarded as a fundamental instructional approach, as it develops communication, collaboration, critical thinking, problem-solving, and interpersonal and social learning based on shared experiences and interpersonal interactions (Gao et al., n.d.; Shukla & Pandey, 2025). However, the emergence of AI has brought a new form of collaboration, i.e., collaboration between human beings and intelligent systems to attain educational goals (Kwarsick, 2026). Growing collaboration between humans and AI have created the ability to uncover new ways for transforming learning and teaching and improving the quality of learning and also reshape what it means to be a teacher and a student (Revolusi & Febriandy, 2025b).

The goals of human-human and human-AI collaborations are similar in that they both seek to improve educational outcomes, but they have different strengths, shortcomings, and contributions to education (Jiang et al., 2024). Human-human collaboration may offer emotional support, social engagement, co-constructing information, and an opportunity to grow interpersonal abilities that AI cannot replicate (Shukla & Pandey, 2025). On the other hand, human-AI collaboration offers personalized human-AI learning experiences, timely feedback, automated assessment, and readily available information, making it easier for teachers and students to handle repetitious academic activities more efficiently (Farber, 2024; Fox & Signé, 2021; Rane, 2024). Numerous comparisons of the educational advantages of these two forms of collaboration and their optimal applications have been prompted by the growing use of AI.

The literature on AI in education is growing day by day; however, the majority of the research studies have been focused on the human-AI collaboration or the traditional human-human collaboration separately (Cariaga, 2025; Cui, 2024; Farber, 2024; Jiang et al., 2024; Kovari, 2025; Qiu & Mak, n.d.; Revolusi & Febriandy, 2025b; Wu & Liang, 2025). This makes it difficult to comprehend more clearly the impact of the two collaborative approaches on education. This study intended to compare the human-AI and human-human collaboration and their impacts in education. The findings of this study will allow teachers, students, researchers, and policymakers to inform their educational practice and innovation with a balanced perspective on both collaborative approaches.

## **II. LITERATURE REVIEW**

### **2.1 Human–Human Collaboration in Education**

The significance of human-human collaboration in learning has long been widely acknowledged; it is effective in active learning through interaction between teachers and students, as well as between students (Zhang et al., 2025). The technique is founded on collaborative learning and social constructivism that advocates co-construction of knowledge through discourse, teamwork, peer feedback, joint problem-solving, and a sense of belonging at work (Cui, 2024). It has been proved that collaborative learning increases critical thinking, communication skills, creativity, learner involvement, social competence, sense of belongingness and mutual responsibility in learning communities (Ofosu-, 2023). Thus, teaching via human-human partnership is still the most common teaching style in various levels and disciplines in education.

However, there are problems of human-human collaboration that can interfere with its effectiveness. Good collaboration needs the learners' willingness to collaborate, efficient communication, and good group dynamics (Shukla & Pandey, 2025). Differential involvement, social loafing, interpersonal conflict, and aptitude variations among learners reduce collaborative efficiency in many classes (Revolusi & Febriandy, 2025b). In addition, teachers confront the problem of providing personalized support and feedback in a timely manner, which is challenging in large courses when teachers find it hard to keep track of all the students (Kovari, 2025). These constraints have forced educators to explore alternate teaching approaches that will promote collaboration while satisfying some of the constraints of traditional teaching strategies.

### **2.2 Human-AI collaboration In Education**

Artificial Intelligence (AI) has brought a new paradigm of collaboration between teachers and intelligent technologies for educational activities. Human-AI collaboration is not only about using AI as a tool to create teaching materials but



also about using AI as an active collaborator that can create resources while processing, giving instant feedback, tailoring learning to the individual, supporting assessment, and informing educational decision-making (Chisom et al., 2023; Fugener et al., 2021). The paradigm enables opportunities for AI to take on repetitive activities and data processing while providing opportunities for AI-literate educators and learners to engage in more complex thinking, problem-solving, creativity, and critical analysis (Mansfield, 2023). This lead to an increasing human-AI collaboration in contemporary education practice.

However, the implementation of AI in education has brought up some serious pedagogical and ethical concerns. Research has identified problems with academic integrity, algorithmic bias, data privacy, transparency, and overreliance on AI-generated content (UNESCO, 2019). There are also concerns about how AI might change the ability of learners to think critically and interact with others, as it could replace tradition collaboration (Chen et al., 2020). Besides, it is feared that improper usage of AI can affect the development of learners' cognitive flexibility, creativity and innovation (UNESCO, 2023). While the potential learning opportunities are evident, the issues raised point to the need for responsible use of AI, appropriate institutional regulations, and AI literate educators and learners for the effective deployment of human-AI collaboration in education.

### **2.3. Research Gap**

Collaborative learning and use of AI in education have been researched extensively (Chen et al., 2020; Krishna et al., 2024; Revolusi & Febriandy, 2025b; Webb et al., 2025), yet both have evolved substantially independently. Existing studies tend to focus on the success of either human-human collaboration or educational human-AI collaboration and rarely discuss the benefits and drawbacks of both. As a consequence, instructors and policymakers do not have the information to inform decisions about when human cooperation is better than human-AI cooperation, when the latter might be more effective, and how the two forms of collaboration can help different in educational contexts. The present study is an essential step towards addressing this gap and designing evidence-based methods that will improve the quality of education while ensuring that technological innovation does not devalue the role of human connection. Therefore, the purpose of this systematic literature review is to synthesize and analyze the existing evidence in the area of human-AI and human-human collaboration in the present context of education to gain a holistic understanding of their contributions. This systematic literature review is therefore intended to collect and compare the existing evidence on human-AI and human-human collaboration in the existing educational context in order to obtain thorough knowledge of their contributions.

## **III. METHODOLOGY**

### **3.1 Research Design**

A systematic literature review (SLR) was applied to compare between human-AI and human-human collaboration in education. A systematic literature review was considered appropriate as it offers a transparent, rigorous, evaluating, and replicable process for identifying, evaluating, and synthesizing evidence from published studies. The evaluation was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework to ensure methodological consistency and transparency in the review process.

### **3.2 Search Strategy**

We conducted a thorough search of the literature using four electronic databases, namely Scopus, Web of Science, ERIC, and Google Scholar. The datasets were selected to span a broad spectrum of educational research and interdisciplinary studies on AI and collaborative learning. The search covered studies published from January 2017 to June 2026, reflecting the latest research in the era of the increasing integration of generative AI into education. Keywords were combined with Boolean operators, such as human-AI cooperation, human-human collaboration, collaborative learning, AI-assisted learning, teaching, learning, assessment, and education.



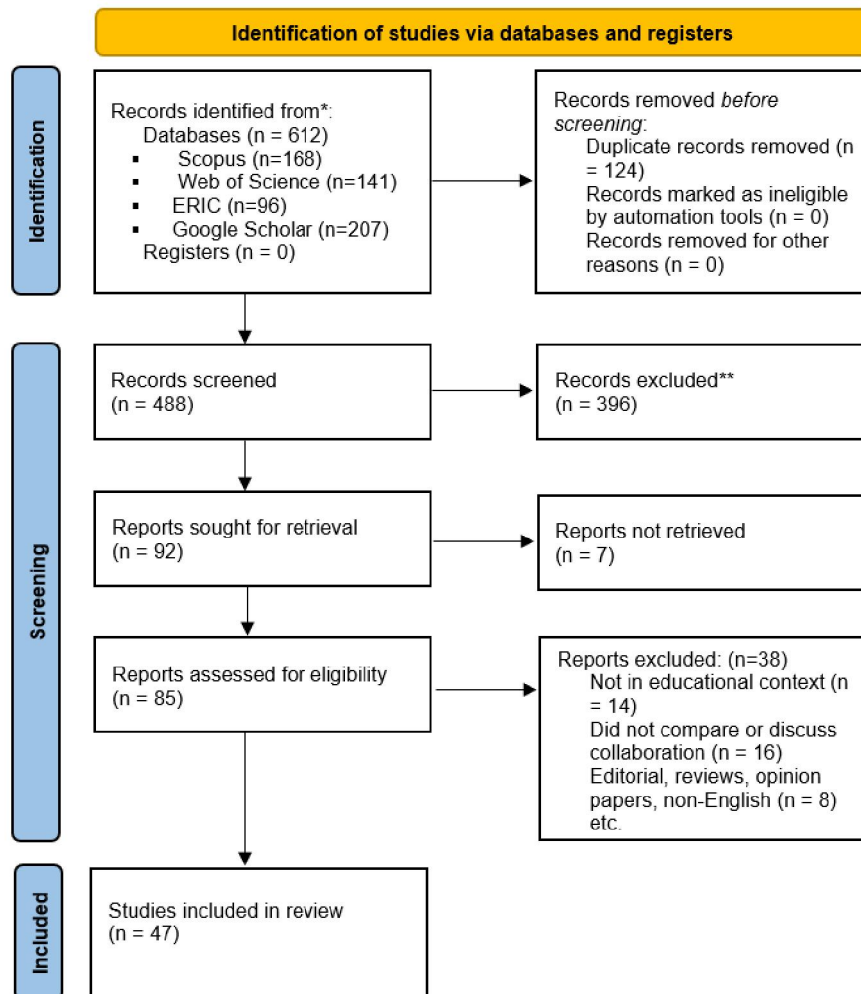


Figure 1; PRISMA 2020 Flow Diagram for New Systematic Review (Comparing Human-AI and Human-Human Collaboration in Education).

### 3.3 Criteria for Inclusion and Exclusion

The inclusion criteria were (i) studies published between January 2017 and June 2026; (ii) studies on human-AI collaboration, human-human collaboration, or both, in an educational context; and (iv) studies that report empirical results of AI in teaching, learning, assessment, educational management, or collaborative educational practices. Studies were excluded if they were editorials, opinion pieces, or if the publication was not in the English language. Some studies did not have technique information, and others were not relevant to education and were eliminated.

### 3.4 Study Selection and Data Extraction

The selection of studies was performed according to PRISMA 2020 as presented in Figure 1. The retrieved records were then imported to a reference management system and duplicate records removed. All collected research papers were first examined by their titles and abstracts, and then the complete text was assessed based on the pre-determined qualifying criteria. Relevant data from each of the listed studies were extracted, including the authors, year of



publication, educational setting, research design, type of AI application/collaborative methods, and conclusions. The retrieved topics from the studies were analyzed by thematic analysis.

## **IV. RESULTS AND DISCUSSION**

### **4.1 Teaching and Instruction**

The literature examined indicates that human-human and human-AI collaboration has large positive impacts on teaching and instructional practices but in different ways. In general, human-human collaboration has been at the center of classroom education, as this enables teachers to guide the learning process through direct communication, dialogue, observation, and continual modification to the intellectual and emotional requirements of students (Radika et al., 2025). In the classroom, the teachers observe the learners' facial expressions, gestures, engagement, and emotions and change their teaching methods accordingly (UNESCO, 2019). In addition, mutual collaboration between teacher and students supports trust, motivation, and meaningful knowledge generation in classroom, in addition to transmission of content knowledge (Zhang et al., 2025).

While humans can work together effectively, there are practical barriers that limit human-human collaboration in educational context. The availability, workload, health, and interest of both teachers and students in learning are all important in effective human-human collaboration in education (Zawacki-richter et al., 2019). Many schools and colleges having large class sizes, face criticism since teachers cannot attend all learners learning problems on time, and they cannot devote sufficient time to consulting students, which reduces the possibilities for individual tutoring (Cui, 2024). In tradition classroom learners also may be afraid to ask questions out of fear of being criticized, feel anxious about asking for help, or may not have enough opportunity to ask teachers outside of learning time (Singh, 2023). For this reason, instructional support is often uneven across institutions and within institutions based on types of resources and context.

The human-AI collaboration offers a wealth of opportunities to solve those problems with on-demand instruction help, anytime, anywhere (Shukla et al., 2025). Teachers can use artificial intelligence (AI) tools to write lesson plans, construct teaching materials, plan classroom activities, develop multimedia resources, and suggest teaching methods that align with curricular goals (Farber, 2024). Learners can also get explanations, summaries, examples, and other learning resources instantaneously without waiting for teacher availability (Ida & Gyonyoru, 2024). The capabilities save administrators time and allow teachers to focus on stimulating class discussion, supporting students, and tackling hard learning issues.

However, all the analyzed research has demonstrated that AI technologies are not a substitute for excellent human-human collaboration, as instruction is not only about information. Skills like empathy, professional judgment, ethical dilemmas, classroom management, and the capacity to react to unanticipated learning situations are crucial to teaching and cannot be properly simulated by AI (Jiang et al., 2024). AI can write grammatically correct and precise content, but it has limited capacity to understand the emotional subtleties, cultural settings, motivational differences, and classroom dynamics (Tlili et al., 2023). This study suggests that human-AI collaboration should be seen as a teaching assistance instrument or tool, not a teacher replacement. The biggest contribution of AI to education is when it helps teachers become more effective, supporting them in their pedagogical decision-making and in managing learners' learning.

### **4.2 Student Learning and Engagement**

One of the most commonly explored issues in the surveyed literature is student learning. Traditional human-to-human interaction supports learning through discussion, group learning, group projects, cooperative learning, class discussions, and collaborative problem-solving (Zawacki-richter et al., 2019). Students are encouraged to engage in these learning experiences through discussing ideas, debating arguments, negotiating meaning, and creating knowledge together (Hu, 2024). These interactions promote communication skills, teamwork, leadership, confidence, and social competence and contribute to a sense of belonging in learning communities. Human-human collaborative learning also exposes students to other opinions, which promotes critical thinking and results in a deeper comprehension of subjects.



But not all learning is as effective with human-human collaboration. In a group learning activity, there are chances of unequal involvement, social loafing, interpersonal conflict, and variances in personality and learning aptitude. There are certain students who dominates the discussion, and there are some passive individuals. Coordination is a common characteristic of collaborative learning, which may hinder students with conflicting schedules from actively participating in the learning process (Joshi et al., 2026). Another adverse factor affecting learning efficiency is the lack of academic support from peers and teachers, particularly in online and remote learning.

Human-AI collaboration delivers an alternate learning experience that is personalized, illustrated, flexible, and quick academic help (UNESCO, 2019). AI teaching systems can personalize explanations to students' questions, recommend further reading, break down complex ideas into simpler ones, and generate infinite practice without running out of patience (Dabingaya, 2022; Zu, 2023). AI is constantly available and can help students learn at their pace and their own time, without any time limit or location restrictions, unlike human partners. The characteristics of human-AI collaboration are especially useful for self-paced learning, lifelong learning, and customized academic advice.

While AI-powered learning offers substantial educational advantages, it is not without its concerns, though. The studies explored suggests that over-reliance on AI can result in fewer opportunities for collaborative debate, autonomous thinking, and interpersonal development (Krishna et al., 2024). If students are using AI-generated responses as a matter of course, they may become information consumers instead of knowledge producers. AI also cannot provide the motivation, encouragement, empathy, and social connection that naturally occur in human-human collaboration (Jian, 2025). The results showed that human-AI collaboration has a significant effect on boosting learning accessibility and personalization, although human-human collaboration is still important in promoting interpersonal competency, collaborative learning, and social development. Therefore, the combination of various human-human and human-AI collaboration strategies provides a more comprehensive and balanced learning environment than merely depends on either one.

### **4.3 Evaluation and Feedback**

Assessment and feedback were another significant area of comparison. The traditional assessment allows teachers to evaluate the whole student holistically, taking into account cognitive abilities, creativity, communication, involvement, ethical behavior, weaknesses, problem-solving abilities, and emotional development (Kamalov et al., 2023). Teachers also give qualitative feedback that is relevant to their unique requirements and the challenges of each learner's development, strengths, and shortcomings and support continual improvement by speaking to learners and engaging with them directly (Popenici & Kerr, 2017). This form of feedback can often motivate learners because it reveals professional judgments and acknowledges their learning path.

Institutional limitations, time, and workload can constrain traditional assessment. Marking assignments, creating tests and giving individualized comments is an extremely time-consuming process, especially in large classrooms (Zawacki-richter et al., 2019). Consequently, teachers may delay feedback to learners, which reduces the opportunities for learners to improve their performance abilities before the next learning session.

AI has completely transformed the way evaluation is done in education and how feedback is delivered. AI systems can automatically evaluate objective examinations, analyze learners' responses, identify gaps in knowledge, and generate quick formative feedback in seconds (Jiang et al., 2024; Masciari et al., 2024). This means that students are encouraged and led throughout the learning process and not just at the time of official evaluations. AI-powered assessment also works in favor of instructors by reducing the time-consuming process of marking papers, allowing them more time for instructional planning and for helping learners (Majid, 2026). They are intended to boost productivity and facilitate data-driven decision-making in education.

All of the analyzed research indicates the importance of a collaborative human-AI assessment process, while acknowledging that AI can improve the efficiency of assessment considerably. AI is not accurate in judging originality, ethical reasoning, creativity, teamwork, verbalization, and higher-order thinking skills. Other concerns are algorithmic bias, mis assessment, and reliance on automated assessment (Shukla et al., 2025; Shukla & Pandey, 2025). This means



human judgment continues to be crucial for the verification of assessment outcomes and for the promotion of justice, openness, and integrity in the education system. The comparison reveals that working together between people and AI can provide more efficient and faster outcomes, while collaboration between humans and humans can offer more in-depth qualitative assessment and context. Therefore, hybrid assessment models that merge automation by AI with human teacher evaluation appear to be the most successful answer for education today.

#### **4.4 Critical thinking, communication and social interaction**

Dimensions such as critical thinking, communication, and social interaction are regarded as important educational outcomes that are built through human-human collaboration. The literature explicitly identifies human-human collaboration as a real opportunity for students to communicate, exchange ideas, challenge their own thinking, develop shared understanding, and work together on complicated challenges (Radika et al., 2025). Learners build reasoning skills through face-to-face conversations and debates, presentations, and collaborative projects while developing communication, persuasion, leadership, empathy, and conflict resolution skills (Masciari et al., 2024). These skills are acquired by continual contact with people of varied origins, opinions, and personalities.

However, there are several interpersonal and contextual aspects affecting human-human collaboration. Successful cooperation demands a willingness to work together, communication, emotional maturity, and respect. There are a number of reasons that can impede participation, such as personality, confidence, academic skills, and cultural differences. Interpersonal conflict, the fear of criticism, and differential contribution can reduce the effectiveness of collaborative learning. In addition, some learners may refrain from asking questions because of instructor and peer feedback and unfavorable appraisal, which can lead to a loss of learning opportunities.

Human-AI collaboration is a new kind of interaction based on accessibility, efficiency, and tailored academic help. Learners don't have to worry about exposing themselves in asking inquiries, can ask queries again if needed, and can explore various views and get answers as soon as they ask a query, no matter how complex (Jiang et al., 2024). AI is a psychologically secure environment for learning where learners can explore, make mistakes, and expand their understanding further (Zu, 2023). This gives a certain amount of freedom to explore the possibilities of learning and investigation, particularly from learners who are not inclined to join in with class discussions.

However human-AI collaboration cannot substitute for the interpersonal experiences of human-human interaction. AI doesn't negotiate meaning, doesn't express genuine emotion, and doesn't build genuine interpersonal relationships in similar ways as humans do. This, however, means that persons who predominantly employ AI can get right academic guidance without getting the abilities of teamwork, public speaking, active listening, negotiation, emotional intelligence, or collaborative leadership (Baidoo-Anu & Ansah, 2023). The results of this study suggest that human-human cooperation continues to be an important factor in the development of social and communication skills and that human-AI collaboration can be used as a beneficial resource in support of autonomous inquiry and academic self-confidence. The research examined therefore suggests that the two strategies are most effective when used in combination to promote balanced cognitive and social development.

#### **4.5 Creativity and Innovation**

Creativity and innovation also emerged as another important dimension that differentiated human-human from human-AI collaboration. Traditionally, working with other humans has been a very successful technique to stimulate creativity among learners (Tlili et al., 2023). They throw ideas back and forth, argue about different views, question each other's views, and come up with new ideas together. The collaboration allows students to learn from viewpoints that spark imagination, uniqueness, and contemplation. Teachers also foster creativity through experimentation, providing feedback, delivering constructive praise, and creating space for learners to voice fresh issues (UNESCO, 2023). But the creative process in human-to-human collaboration may be hampered by time limits, unequal participation, group uniformity, and limited information. On other ways, brainstorming sessions during human-human collaboration can be typically limited by the expertise, experience, and participation of the participants and the amount and range of ideas



they can generate (Singh, 2023). Participants may lack inventiveness or lack bravery to propose their views, which are not commonly accepted owing to peer pressure and fear of criticism.

In a short period of time, collaboration between humans and AI can dramatically boost the amount of ideas, alternative solutions, visual materials, academic writing, computer code, and instructional design aid that is produced (Webb et al., 2025). Learners and teachers can unlock many choices using AI that would probably take a lot of time and effort. The processes of invention are more efficient, and the users can develop their notions instead of generating new ones. These have been notably helpful in project-based learning, curriculum creation, instructional materials development, and research.

Nevertheless, the reviewed research shows that real human creativity is not able to be construed in AI products. AI doesn't generate anything from personal experience or ethics or imagination. It creates stuff by recognizing patterns in its current data. But significant innovation depends on humans to evaluate, analyze, and extend ideas generated by AI. The comparison reveals that human-human collaboration continues to be crucial for promoting originality and contextual creativity, whereas human-AI collaboration is a significant accelerator for idea development and creative output. The most educational value lies in aiding, not replacing, human creativity with AI.

#### **4.6 Ethical, Privacy, and Equity Issues**

As AI is increasingly used in education, it poses important ethical, legal, and societal challenges that distinguish human-AI collaboration from human-human collaboration. Academic integrity is frequently mentioned as a major obstacle in the examined papers, which suggests it is a prominent issue in the context of AI-supported learning. The growing availability of AI-generated essays, code, exam answers, and research summaries increases the risk of plagiarism, cheating, and less student responsibility (Nursalim et al., 2022). In addition, algorithmic bias, transparency, data privacy, copyright, and ownership of AI-generated content are also important considerations in the context of responsible education practices.

Technological dangers are often less of a concern in human-human collaboration. However, there are ethical concerns. In conventional collaborative learning, the learning experience may be influenced by unequal participation, favoritism, discrimination, subjective evaluation, interpersonal conflict, and power imbalance (Nursaputri & Aisyah, 2024). Fairness and motivation can also be affected by the teacher's personal opinions, unconscious prejudice, and uneven evaluation processes in the classroom. Both these collaborative tactics, however, carry ethical difficulties with each, albeit of different kinds.

The second issue is the issue of educational justice. Human-human collaboration depends on institutional resources, teacher availability, and classroom environment. In contrast, human-AI collaboration requires solid internet connections, digital gadgets, technological infrastructure, and AI literacy. Thus, disadvantaged learners may, for instance, have less access to the advantages of AI-assisted education and exacerbate the gap in educational disparities (Nursalim et al., 2022). Also, the inequalities between the levels of digital competency of teachers and students influence the quality of the human-AI collaboration and the educational outcomes.

The evidence examined suggests that neither collaborative method alone can assure the egalitarian and ethical provision of education. Rather, educational institutions need to establish comprehensive governance frameworks that encourage responsible AI use while preserving the humanistic foundations underlying effective education. Thus, teacher professional development, AI literacy, transparent institutional regulations, learner awareness, and ethical guidelines are required to make sure that the use of AI does not undermine academic integrity, privacy, and fairness. This contrast illuminates the additional ethical issues that come when humans work with AI but also demonstrates that collaboration amongst humans themselves requires attention to equity, inclusion, and professionalism.

#### **4.7 Availability, Accessibility and Responsiveness**

The other clear distinction between human-human collaboration and collaboration between a human and an AI is access to and availability of educational help. Human collaboration is entirely dependent on the presence and openness



of teachers, peers, supervisors, or mentors to the process of learning. The supply of academic support is limited in most educational environments due to issues like institutional schedules, consultation hours, workload, meetings, personal responsibilities, holidays, and geographical location (Farber, 2024). Thus, students may not get the criticism or academic help they need, especially during out-of-class hours. Furthermore, effective collaboration depends on having collaborators available, since learners may not be available when they need aid owing to conflicting demands or personal reasons.

The human-human collaboration is affected by availability, psychological and emotional factors. The effects of fatigue, stress, illness, mood swings, and lack of motivation are experienced by teachers and learners, affecting the quality of communication and collaboration. Or it could be that someone just doesn't want to work with you, whether because of a personal quarrel or some other pressure. Such challenges may also cause students to feel reluctant to seek help because they believe they might have to wait a long time or that their queries could inconvenience others.

By contrast, when humans work with AI, these obstacles are greatly lowered, with the option for continued academic help at any time, from any location, regardless of institutional schedules. Students can use the AI-powered tools 24/7/365 to obtain help with clarifications, create ideas, seek explanations, and resolve academic problems whenever they need it (Lo, 2023). AI is not tired, busy, irritable, or emotionally unavailable like humans. It is consistent in its responses, does not mind being asked again and again, and, importantly, does not mind students coming back to it in the future (Ofosu-, 2023). AI features are crucial for distance learning, self-directed learning, and people who want flexible study schedules.

The literature studied indicated that the AI, although providing many benefits, does not ensure meaningful learning alone. AI is always there, but it can't compete with the power of human-human collaboration when it comes to creating rapport, trust, mentorship, and encouragement. Academic explanations alone are insufficient to reassure students, stimulate them, and provide emotional support to them, especially when they are immersed in academic stress or personal troubles. Human-AI collaboration then offers unparalleled accessibility and responsiveness, but human-human collaboration is crucial to nurturing supportive educational connections and promoting holistic development of learners.

#### **4.8 Time Efficiency and Productivity**

The other important difference between the two human-human and human-AI collaboration is time efficiency. Often, learning activities need to take place as a group, in the classroom, in the office or via a meeting before human-human collaboration can be realized. Teachers spend a lot of time making lesson plans, evaluating work, answering emails, setting up events, etc., and delivering personalized comments. Similarly, students' learning is often a collaborative effort, and it is complicated by the need to coordinate schedules, especially in higher education and in an online learning environment where students have varied duties.

Time restrictions can significantly impact the effectiveness of learning, particularly when students need quick academic support. Students may suspend or delay assignments or learning activities while awaiting responses from teachers or during group meetings. Delayed input may also reduce the likelihood of implementing timely improvements before subsequent reviews. Thus, human-human interaction enables rich interaction; but this interaction may take time for both teachers and students (Revolusi & Febriandy, 2025a).

The human-AI collaboration increases the total efficiency of the learning process by providing teachers with immediate academic assistance and relieving them of the effort of repetitive activities. AI can give summaries, mentors, lesson plans, quizzes, presentation outlines, translations, explanations of complex ideas, and feedback in seconds (Rane, 2024). This frees up time for administrators to focus on instructional leadership, coaching, and student support. Students, similarly, get the chance of rapid feedback and the possibility to learn without interruption.

But the efficiency that AI provides also carries potential hazards. The easy availability of solutions may impair the persistence, patience, health, conditions, and willingness of learners to engage in persistent intellectual work. Traditional human-human collaboration generally involves learners waiting, negotiating, and working through complex challenges together, experiences that build resilience, perseverance, and joint responsibility. Therefore, human-AI



collaboration indeed boosts productivity to a great extent. However, human-human collaboration still contains significant educational values that cannot be simply measured by speed or efficiency.

#### **4.9 Reliability, Flexibility, and Personalization**

When comparing the two collaborative approaches, reliability and consistency are crucial factors. Human-human collaboration is inherently variable; people differ in their knowledge, communication styles, personality, experience, motivation, and emotional state. A teacher's efficacy may be affected by the workload, stress, health or classroom conditions, and the uneven academic assistance from peers depending on their grasp of the subject matter. As a result, students may receive varying levels of support for the identical academic problems (Hu, 2024).

Human-AI collaboration reveals a lot higher consistency in the treatment of the learners' requests. AI systems do not get tired, moody, frustrated, or unmotivated (Sawicki et al., 2022). They can use different examples to explain the same idea, break down complex concepts, customize explanations according to the learners' demands, and offer ongoing support without getting impatient. The flexibility allows students to work at their own speed and receive personalized academic support to meet their learning needs.

AI responses are sometimes constant and sometimes not, yet they can also be correct or incorrect, deceptive, or even contrived. AI may not have the contextual awareness, the disciplinary judgment, and the ability to notice the subtle misconceptions that experienced educators have in complex educational circumstances (Chen et al., 2020). Human-human collaboration is still needed for validation of information, professional interpretation, and instructional accuracy. Therefore, the analyzed research shows that AI gives higher reliability for availability and consistency, while human-human collaboration provides higher reliability for contextual knowledge, professional judgment, and educational legitimacy.

#### **4.10 Trends of Future Educational Collaboration**

The contrast presented in this research argues that human-human and human-AI collaboration should not be seen as competing educational models but rather as complementary approaches that can respond to diverse educational demands. However, working with other human beings still provides unique opportunities to develop communication skills, cooperation, empathy, leadership, ethical reasoning, emotional intelligence, and collaborative problem-solving. These skills remain important for personal development and eventual career success for learners, which AI cannot fully imitate.

However, human-AI cooperation brings educational benefits that are impossible to attain in traditional collaboration, such as continuous availability, tailored learning, quick feedback, automated grading, fast content development, and data-driven educational decision-making. These qualities help teachers and learners to overcome various practical restrictions of time, workload, and availability of resources. As AI technology advances, it will presumably go from supporting ordinary academic work to supporting more and more sophisticated types of educational collaboration.

This study, therefore, suggests the future of education is hybrid collaborative models that intentionally embed the strengths of human-human and human-AI collaboration. In such settings, AI should be utilized to boost the efficiency of instruction and to enable personalized learning, while teachers should offer pedagogical leadership, ethics, emotional support, and the development of social and cognitive skills of learners (UNESCO, 2023). This balance will demand continuous investment in AI literacy, teacher professional development, institutional governance, and equitable access to digital technology (UNESCO, 2019). Therefore, educational institutions should not seek to substitute human interaction with AI but rather build collaborative learning environments where human expertise and AI capacity complement each other and, in this way, improve the quality, inclusiveness, and sustainability of education.

## **V. CONCLUSION**

This systematic literature review synthesizes the strengths, limitations, effectiveness, and educational implications of human-AI and human-human collaboration in education across key dimensions of teaching, learning, assessment,



communication, creativity, accessibility, efficiency, and ethical practice. The results imply that neither collaborative strategy is necessarily superior to the other under all educational conditions. Human interaction continues to be important for the well-rounded development of learners to foster communication, cooperation, critical thinking, emotional intelligence, leadership, ethical reasoning, and meaningful social interaction. On the other hand, human-AI collaboration offers great benefits in personalized learning, constant availability, instant feedback, instructional efficiency, automated support, and data-driven decision-making, which are especially helpful in meeting the growing needs of modern education. However, concerns such as academic integrity, algorithmic bias, data privacy, unequal access to technology, and the possibility for learners to become overly dependent on AI must be carefully considered for responsible adoption. In conclusion, the evidence points to a future for education that is not a choice between human-AI or human-human collaboration but rather a shift to hybrid collaborative models that combine the efficiency and adaptability of AI with the pedagogical expertise, ethical judgment, empathy, and social values that can only come from human collaboration. Such an integrated approach has the opportunity to develop more inclusive, effective, and sustainable education systems that are capable of responding to the changing needs of twenty-first-century learners and educators.

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