

# Why Classroom Interaction Still Matters in the Age of AI

Jie Yu<sup>1,2\*</sup>, Ahmadrashidi Bin Hasan<sup>1</sup>

<sup>1</sup>*Philosophy in Design, City University Malaysia, Malaysia*

<sup>2</sup>*Faculty of Art, Lanzhou University of Finance and Economics, China*

---

## Accepted

2026-05-25

## Keywords

Generative AI; University  
classroom; Classroom discussion;  
Collaborative learning; Classroom  
interaction

## Corresponding Author

Jie Yu

## Copyright 2026 by author(s)

This work is licensed under the  
CC BY 4.0



<https://doi.org/10.70693/itphss.v3i3.546>

## Abstract

As generative AI becomes increasingly common in university classrooms, traditional teaching centred on knowledge delivery is gradually losing its dominant role. Although AI improves learning efficiency, it also shortens the processes of discussion, negotiation, and collaborative thinking that are essential to classroom learning. In some cases, classroom discussion has become more superficial, while collaborative learning has turned into fragmented task completion.

This paper discusses the importance of classroom discussion and collaborative learning in the age of generative AI. It argues that AI can support knowledge acquisition and content generation, but it cannot replace real classroom interaction, including immediate feedback, exchange of ideas, and sustained communication among students and teachers. The paper further suggests that future classrooms should shift from knowledge delivery towards interaction organisation, with greater emphasis on authentic discussion, collaboration, and student participation. It concludes that the irreplaceable value of university classrooms in the AI era lies not in knowledge transmission itself, but in the interactive process of communication, negotiation, and collaborative meaning-making.

---

## 1. Changes in Traditional Classrooms After the Introduction of AI

The introduction of generative AI into university classrooms has changed not only teaching tools, but also the way students acquire knowledge and complete learning tasks. In the past, students mainly relied on teachers, textbooks, and classroom materials. Today, tools such as ChatGPT and DeepSeek allow students to search for information, summarise content, generate texts, and conduct basic analysis within minutes. Generative AI is no longer just a supplementary tool; it is reshaping how students approach and process knowledge. Previous studies have shown that generative AI can provide immediate information support and significantly improve the efficiency of content generation (Dwivedi et al., 2023; Kasneci et al., 2023).

This change has weakened the traditional role of classrooms as the primary space for knowledge delivery. If classroom teaching continues to focus mainly on lectures, note-taking, and after-class assignments, the difference between classroom learning and AI-supported self-learning will gradually become smaller. In many knowledge-based courses, AI can already replace some basic learning tasks. Students no longer need to wait for classroom instruction to access information, examples, or initial ideas. The real challenge brought by AI, therefore, is not whether teachers will be replaced, but whether classrooms can still maintain their value if they only function as places for knowledge transmission.

However, this does not mean that university classrooms are becoming less important. On the contrary, as knowledge becomes easier to access, the irreplaceable value of classrooms becomes clearer. AI can generate content, but it cannot fully replace face-to-face interaction, immediate feedback, exchange of perspectives, or collective judgement in real classrooms. The value of classroom learning lies not only in helping students know “what,” but also in helping them understand “why,” “how,” and “what else is possible” through interaction with teachers and peers. In this sense, the more efficient AI becomes in generating knowledge and content, the more classrooms need to emphasise discussion, negotiation, and collaborative meaning-making rather than one-way instruction.

In real classroom settings, discussion and collaboration are not simply teaching activities; they are important parts of the thinking process. Collaborative learning is not defined by whether students work in groups or complete the same assignment together. More importantly, it depends on whether learners engage in continuous communication, negotiation, and shared construction around common problems (Johnson & Johnson, 1999). Similarly, classroom discussion is not just taking turns to speak. It is a process of expressing, listening, questioning, and revising ideas. Vygotsky (1978) argued that learning is fundamentally shaped through social interaction. Communication between people is therefore not a secondary part of classroom learning, but a key condition for developing understanding, judgement, and thinking ability.

At the same time, classroom discussion and collaboration are facing new challenges in the AI era. While AI improves efficiency, it can also shorten the thinking process students would normally experience. Some students rely on AI-generated ideas or solutions at the very beginning of a task, turning classroom discussion into a simple repetition of generated content. Group work can also become fragmented, with students separately completing different parts before combining them at the end. Although tasks may be finished faster, opportunities for real negotiation, collective decision-making, and exchange of perspectives are often reduced. This suggests that classroom reform in the AI era should not focus only on technological convenience, but also on whether students are still experiencing meaningful thinking, communication, and judgement processes.

University classrooms therefore need to reconsider their role in the age of generative AI. The future value of classrooms should not depend on providing more information than AI, but on strengthening the aspects of learning that AI cannot easily replace. Discussion, collaboration, questioning, feedback, and shared meaning-making are becoming increasingly important in distinguishing classroom learning from individual AI-supported learning. In other words, the more AI replaces basic knowledge acquisition, the more classrooms should emphasise deep human interaction. What university classrooms need to preserve is not simply the transmission of

information, but the ability to support students' understanding, judgement, and creative thinking through authentic communication.

## **2. AI Improves Efficiency but Compresses Classroom Interaction**

### **2.1 Easier Access to “Ready-Made Answers”**

One of the most visible effects of generative AI in higher education is the acceleration of learning tasks. Activities that once required substantial time for searching information, organising ideas, and developing content can now be completed within minutes. Students increasingly rely on AI tools to summarise materials, generate texts, search for references, and even produce preliminary design concepts. Recent studies have shown that generative AI significantly improves learning efficiency and task completion speed in educational settings (Kasneci et al., 2023; Dwivedi et al., 2023; Mollick & Mollick, 2023).

However, this efficiency also changes how students engage with classroom learning. In many traditional classrooms, discussion itself was part of the thinking process. Students gradually developed understanding through searching for information, expressing opinions, listening to others, and revising their ideas. With AI-generated content becoming instantly available, parts of this process are increasingly compressed. In some cases, the focus of learning shifts from problem exploration to rapid answer acquisition. Ideas that once emerged slowly through classroom interaction may now be generated within seconds.

Research on AI-supported learning has also raised concerns about cognitive dependence on automated systems. Risko and Gilbert (2016) described this phenomenon as “cognitive offloading,” suggesting that when technologies perform part of the cognitive work, individuals gradually reduce their own mental effort. Similar concerns have appeared in recent AI education studies, which note that excessive dependence on AI-generated responses may weaken students' reflective thinking and independent judgement (Memarian & Doleck, 2025; UNESCO, 2023).

### **2.2 Classroom Discussion Is Becoming More Superficial**

The influence of AI is particularly visible in classroom discussion activities. Although discussion sessions still exist in many classrooms, the depth of interaction has gradually weakened. Some students directly use AI-generated responses as discussion materials, turning classroom interaction into an exchange of prepared answers rather than a process of analysis, questioning, and negotiation. Students continue to present ideas and respond to one another, yet much of the interaction remains at the level of information repetition.

Mercer (2000) argued that meaningful classroom dialogue is not simply the exchange of information, but a process through which learners jointly develop understanding. Wegerif (2013) similarly emphasised that dialogue plays a central role in reflective and critical thinking. When classroom interaction becomes overly dependent on AI-generated content, discussion may gradually lose its original role in cognitive development and collaborative meaning-making.

Another issue is that AI-generated responses often appear fluent and complete, which may reduce students' willingness to challenge ideas further. Instead of treating classroom discussion as a space for uncertainty and exploration, some students begin to regard AI-generated outputs as acceptable final answers. This tendency is particularly concerning in higher education, where critical thinking and perspective negotiation remain essential parts of learning.

Recent research on AI-mediated interaction has also shown that excessive reliance on automated support may reduce the quality of peer engagement and collaborative dialogue (Tan et al., 2022; Zhou & Schofield, 2024). In smart classroom environments, AI can support communication efficiency, but it may also unintentionally weaken spontaneous interaction and deeper peer exchange (Nie et al., 2024).

### **2.3 Collaborative Learning Is Becoming Fragmented**

Collaborative learning is also changing under the influence of AI. In theory, collaborative learning involves sustained interaction, shared goals, and collective decision-making among learners (Johnson & Johnson, 1999; Dillenbourg, 1999). In practice, however, some classroom collaboration is gradually becoming fragmented task distribution. Students separately use AI tools to complete assigned sections before combining the results at the end. Although the final product appears collaborative, meaningful interaction and shared thinking are often limited.

This shift reduces the need for mutual dependence among group members. In some cases, students may not fully understand how others developed their ideas because most tasks were completed individually through AI assistance. Collaboration gradually moves away from collective meaning-making towards parallel task completion.

The problem is especially visible in design and creative classrooms. Previously, students often spent considerable time discussing concepts, revising sketches, and negotiating creative directions. Much of the learning process emerged through repeated interaction and feedback. With AI-generated visual references and design suggestions becoming increasingly accessible, some students now bypass parts of this exploratory process and move directly towards generated solutions. While projects can be completed more quickly, opportunities for experimentation, negotiation, and reflective discussion may decline.

Recent studies have suggested that generative AI can improve individual creative productivity while reducing collective diversity of ideas (Doshi & Hauser, 2024). Similar concerns have also appeared in research on collaborative AI learning, where AI-supported environments may unintentionally encourage homogenised outputs and weaker peer interaction (Kovari, 2025; Li & Yu, 2025).

Overall, the impact of AI on classrooms cannot be understood simply in terms of efficiency improvement. A more important question is whether students still experience meaningful thinking, negotiation, and interaction after learning tasks become easier to complete. Classroom discussion and collaborative learning remain important not only as teaching methods, but because students often develop understanding and judgement through disagreement, questioning, and revision. If these interaction processes are excessively compressed, faster task completion does not necessarily lead to deeper learning.

### **3. Why Classroom Discussion Matters More in the AI Era**

#### **3.1 The Value of Discussion Is More Than “Getting Students to Speak”**

In many classrooms, discussion is often treated as a teaching activity: the teacher raises a question, students respond, groups exchange ideas, and representatives present conclusions. However, meaningful classroom discussion is not simply about whether students speak. Its value lies in whether students rethink problems, revise ideas, and develop their own judgement through interaction.

Many forms of thinking in classrooms do not emerge individually, but through continuous processes of expressing, listening, responding, and questioning. Vygotsky (1978) argued that learning is fundamentally social and that interaction plays a central role in cognitive development. Students often build understanding not by passively receiving information, but by adjusting and reconstructing ideas through communication with others. In open-ended discussions, disagreement and perspective exchange frequently encourage students to reconsider assumptions they previously took for granted.

Although generative AI can rapidly generate content and opinions, it cannot fully replace this dynamic process of interaction. AI typically provides organised outputs and completed responses, whereas classroom discussion involves the gradual development of thinking. From this perspective, the value of discussion does not depend on reaching the “correct answer,” but on whether students genuinely experience processes of analysis, comparison, doubt, and revision.

Recent research on AI-supported classroom interaction has similarly suggested that meaningful learning depends not only on information access, but also on sustained peer dialogue and reflective engagement (Memarian & Doleck, 2025; Zhou & Schofield, 2024). Studies on dialogic learning further emphasise that interaction itself is central to critical thinking and collaborative meaning-making (Mercer, 2000; Wegerif, 2013).

#### **3.2 The Core of Collaborative Learning Is Shared Meaning-Making**

Although group work is common in many classrooms, genuine collaboration does not always occur. In some cases, collaborative learning becomes little more than task division: each student completes one part individually before combining the results into a final product. While this approach improves efficiency, meaningful interaction among students remains limited.

Johnson and Johnson (1999) argued that collaborative learning is not simply about completing tasks together, but about sustained communication, negotiation, and shared decision-making around common goals. In other words, collaboration is valuable not because students “work together,” but because they “think together.”

The increasing use of AI in classrooms may intensify fragmented collaboration. Students can quickly complete assigned sections using AI tools, further shortening opportunities for group discussion and collective problem-solving. Although group structures still exist, many

interactions that once supported collaborative thinking are gradually disappearing. Students may not fully understand why others made particular decisions, nor engage in deeper negotiation around shared problems.

This issue is especially visible in design and creative classrooms. Valuable ideas often do not emerge immediately, but develop gradually through repeated discussion, critique, and revision. Interaction among students is therefore not merely an exchange of information, but a process that actively shapes thinking itself. When collaborative learning is reduced to simple content integration, opportunities for deeper classroom interaction also decline.

Recent studies on AI-supported collaborative learning have similarly warned that overreliance on AI tools may weaken peer interaction and collective creativity (Tan et al., 2022; Kovari, 2025). Research in higher education has also shown that collaborative learning remains essential for developing problem-solving ability, creative thinking, and reflective judgement in AI-mediated learning environments (Li & Yu, 2025; Alyoussef et al., 2025).

### **3.3 AI Can Provide Answers, but Classrooms Help Students Develop Judgement**

One of the greatest strengths of generative AI is its ability to provide content quickly. Whether in information searching, text generation, or preliminary design development, students can now obtain large amounts of information within a short time. However, the easier information becomes to access, the more important judgement becomes.

In the past, classrooms devoted much of their time to knowledge delivery. Today, students often do not lack information itself; instead, they struggle with analysing, selecting, and evaluating information critically. AI can generate responses and suggestions, but it cannot automatically determine which ideas are more reasonable, which solutions are more appropriate, or which perspectives are worth keeping. If students simply accept AI-generated outputs without reflection, they may gradually lose the ability to analyse problems independently.

Doshi and Hauser (2024) found that generative AI can increase individual creative productivity while reducing the diversity of collective outputs. As more students rely on similar AI systems, classroom ideas and expressions may become increasingly homogeneous. Under these conditions, classroom discussion becomes even more important. Meaningful interaction does not simply repeat existing answers; it encourages students to compare perspectives, question assumptions, and make informed judgements.

Recent research on AI-mediated classrooms has also highlighted the growing importance of critical evaluation and reflective interaction in higher education (UNESCO, 2023; Surendhranatha Reddy & Leelavathi, 2026). AI may support information access, but classrooms remain essential spaces for developing judgement, negotiation, and critical engagement with knowledge.

In this sense, the value of classrooms in the AI era is gradually shifting from knowledge delivery towards helping students develop judgement. Discussion and collaboration are therefore not secondary classroom activities, but central processes through which students learn how to think, evaluate, and make decisions.

### **3.4 Real Classroom Interaction Remains Irreplaceable**

Although AI can support learning in many ways, many forms of interaction in real classrooms remain difficult to replace. Immediate feedback, teacher questioning, peer responses, emotional engagement, and disagreement continuously push students to reconsider their understanding. This dynamic process cannot be reproduced through information generation alone.

When dealing with complex problems, students often do not simply lack answers; they lack motivation to continue questioning and thinking more deeply. Classroom interaction plays an important role in interrupting habitual ways of thinking. A teacher's follow-up question, a peer's disagreement, or an unexpected issue raised during discussion may all encourage students to reconsider their initial assumptions. This constantly changing process of exchange is itself one of the core values of classroom learning.

At the same time, classroom interaction also involves emotional and relational dimensions. Encouragement, criticism, agreement, and response among students directly influence participation and learning engagement. Compared with one-way interaction between humans and AI systems, real classroom communication is more open, unpredictable, and emotionally connected. Such uncertainty is often an important condition for creativity and reflective thinking to emerge.

Recent studies on AI-mediated classrooms have similarly suggested that meaningful learning depends not only on information access, but also on sustained social interaction and emotional engagement (Nie et al., 2024; Memarian & Doleck, 2025). Research on collaborative and dialogic learning has further shown that interaction, uncertainty, and peer negotiation remain central to critical and creative thinking development (Mercer, 2000; Wegerif, 2013).

Therefore, the development of generative AI does not mean the disappearance of classroom value. On the contrary, as technology increasingly takes over knowledge acquisition and content generation, university classrooms need to return to authentic human interaction. What may remain truly irreplaceable in future classrooms is not who possesses more information, but whether students can continuously develop understanding and judgement through communication, discussion, and collaboration.

## **4. From Knowledge Delivery to Interaction Organisation**

The integration of generative AI into classrooms does not simply introduce a new technological tool; it is gradually reshaping the organisational logic of teaching itself. In the past, classrooms were largely centred on how teachers delivered knowledge. Today, as students can rapidly obtain information and content through AI systems, the more important question is becoming how classrooms can organise meaningful interaction among learners.

If classrooms continue to focus mainly on one-way knowledge transmission, the difference between classroom learning and AI-supported self-learning will become increasingly limited. The future value of classrooms may therefore lie less in providing information and more in helping students develop understanding, judgement, and sustained thinking through discussion, collaboration, and interaction. In this sense, the centre of classroom learning is gradually shifting

from instruction towards interaction.

#### **4.1 Teachers Need to Become Organisers of Discussion**

In traditional classrooms, teachers were often viewed primarily as providers and explainers of knowledge. However, in an environment where AI can instantly generate information and content, teachers are no longer students' only source of knowledge. As a result, the teacher's role is increasingly moving from information delivery towards organising classroom interaction and thinking processes.

Deep learning in classrooms rarely develops simply because students “understand” content after listening. More often, it emerges through questioning, guidance, and interaction organised by the teacher. In discussions involving open-ended problems, the way teachers raise questions, encourage responses, and connect different perspectives directly shapes the quality of classroom interaction.

Future teachers may therefore function less as lecturers and more as facilitators of discussion and collaborative thinking. Beyond deciding what to teach, teachers increasingly need to consider whether students are genuinely participating, whether meaningful dialogue is taking place, and whether different perspectives are being critically examined. In AI-mediated classrooms, the ability to organise interaction may become more important than the simple transmission of knowledge.

Recent studies on AI-supported learning environments have similarly emphasised the growing importance of teacher facilitation, classroom interaction, and reflective dialogue in higher education (Hu et al., 2023; Memarian & Doleck, 2025). Research on AI-teacher collaboration has also suggested that the teacher's role is shifting towards guiding discussion, supporting engagement, and sustaining meaningful interaction among learners (Surendhranatha Reddy & Leelavathi, 2026).

#### **4.2 Classroom Tasks Should Emphasise Process Rather Than Only Results**

Although AI improves task completion efficiency, it may also encourage classrooms to focus increasingly on final outputs. Students can now use AI tools to generate texts, proposals, and even complete projects within a short time. If classroom evaluation focuses only on final products, however, the thinking, discussion, and revision processes behind learning may gradually be ignored.

In reality, much of the value of learning emerges during the process itself. Moments of hesitation, disagreement, revision, and rethinking are often important parts of intellectual development. This is especially true in design and creative classrooms, where ideas typically evolve through repeated discussion, feedback, and modification. What drives learning is often not the final outcome, but the problems, negotiation, and reflection that occur throughout the process.

For this reason, future classroom tasks may need to pay greater attention to how students complete learning activities rather than simply what they produce. Classroom evaluation should not focus only on results, but also consider whether students genuinely participated in discussion, experienced negotiation and revision, and developed their own judgement through interaction.

Only by re-emphasising learning processes can classrooms prevent discussion and collaboration from being replaced entirely by AI-generated content.

Research on collaborative and creative learning has similarly shown that reflective interaction and iterative discussion remain central to higher-order thinking development (Li & Yu, 2025; Wegerif, 2013). Studies in AI-supported classrooms have also suggested that process-oriented interaction is closely related to student engagement, cognitive development, and creative participation (Nie et al., 2024; Tan et al., 2022).

### **4.3 Collaborative Learning Needs to Avoid Fragmentation**

In some classrooms, group work appears efficient but involves limited meaningful interaction among students. This issue becomes more visible with the widespread use of AI tools. Group members can separately use AI systems to complete assigned sections before simply combining the results into a final product. Although tasks are completed efficiently, the collaborative process itself becomes increasingly compressed.

The value of collaborative learning does not lie in whether work is evenly divided, but in whether students engage in sustained communication around shared problems. Many important classroom interactions occur not during final presentations, but during the ongoing processes of discussion, disagreement, questioning, and revision among group members. When collaboration becomes “everyone completes their own part,” opportunities for collective meaning-making gradually weaken.

Collaborative learning in future classrooms therefore cannot remain limited to formal group tasks. Instead, classrooms need to create conditions for genuine interaction. Teachers may need to increase process-based discussion, staged feedback activities, and opportunities for comparing perspectives across groups. The goal should not only be task completion, but active participation in one another’s thinking processes. In the AI era, preserving the depth of communication within collaboration may become more important than simply improving efficiency.

Recent research has similarly warned that AI-supported collaboration may unintentionally encourage fragmented participation and weaker peer interaction if discussion processes are not carefully designed (Kovari, 2025; Zhou & Schofield, 2024). Studies on collaborative AI learning further suggest that sustained dialogue and peer negotiation remain essential conditions for meaningful learning (Alyoussef et al., 2025; Tan et al., 2022).

### **4.4 AI Should Support Discussion Rather Than Replace It**

The integration of AI into classrooms does not mean that teachers should reject AI tools. On the contrary, AI itself can become a valuable resource for classroom discussion. The key issue is not whether students use AI, but how AI is positioned within classroom learning.

When AI is used simply to generate direct answers, classroom discussion can easily become compressed. However, when AI-generated content is brought into classrooms for comparison, analysis, critique, and revision, it can instead become a starting point for interaction. Different interpretations of AI-generated outputs may themselves become part of classroom dialogue.

For example, different AI systems may produce different responses to the same question, while the same design task may generate multiple visual directions and solutions. The important issue is therefore not which answer is “most correct,” but how students evaluate, compare, and discuss these outputs. Rather than allowing AI to replace thinking, classrooms need to help students understand why certain decisions are made, why ideas are revised, and why some solutions may be more appropriate than others.

The role of AI in future classrooms should therefore extend beyond efficiency improvement alone. AI should serve classroom interaction rather than replace it. Only when AI is reintegrated into processes of discussion, critique, and collaborative reflection can it genuinely function as a tool that supports learning instead of weakening classroom interaction.

## 5. Conclusion

Generative AI is increasingly entering university classrooms and gradually changing the way students learn. Many learning tasks that previously depended heavily on teachers, such as knowledge acquisition and content organisation, can now be completed quickly through AI systems. As a result, if university classrooms continue to focus mainly on one-way instruction and the delivery of standard answers, their traditional advantages may gradually weaken.

However, the development of AI does not mean that classroom learning is losing its value. On the contrary, as access to information becomes easier, the irreplaceable role of classrooms becomes even clearer. The importance of classrooms is gradually shifting from knowledge transmission towards interaction, exchange of perspectives, and collaborative meaning-making among people. Many forms of deeper understanding and judgement are not formed simply by receiving ready-made answers, but through continuous discussion, questioning, response, and revision.

Problems such as superficial discussion, fragmented collaboration, and task-based “content assembly” in some classrooms also suggest that improving efficiency alone does not automatically improve learning quality. If opportunities for thinking, negotiation, and interaction are continuously reduced, students may complete tasks more quickly without necessarily experiencing meaningful learning processes. In this sense, the key issue for AI-era classrooms is not simply whether technologies are advanced, but whether students continue to engage in authentic communication, sustained thinking, and shared judgement through classroom interaction.

From this perspective, the future value of university classrooms may no longer lie primarily in “teaching knowledge,” but in helping students develop understanding, judgement, and creative thinking within increasingly complex information environments. Discussion and collaboration should therefore not be treated merely as teaching activities, but as important processes that support intellectual development. Especially as AI becomes increasingly capable of generating content, classrooms need to return to genuine human interaction.

The integration of generative AI into higher education is therefore not simply a technological

change, but a shift in the organisational logic of classrooms. What may remain truly irreplaceable in future classrooms is not who possesses more knowledge, but whether students can gradually develop their own understanding and judgement through communication, negotiation, and collaborative meaning-making.

### Acknowledgements

The author would like to thank the students who participated in this study for their valuable time and contributions. The author also appreciates the constructive feedback provided by colleagues during the development of this research.

### References

Alyoussef, I. Y., Drwish, A. M., Albakheet, F. A., Alhajhoj, R. H., & Al-Mousa, A. A. (2025). AI adoption for collaboration: Factors influencing inclusive learning adoption in higher education. *IEEE Access*, 13, 81690–81713. <https://doi.org/10.1109/ACCESS.2025.3567656>

Dillenbourg, P. (1999). What do you mean by collaborative learning? In P. Dillenbourg (Ed.), *Collaborative-learning: Cognitive and computational approaches* (pp. 1–19). Elsevier.

Doshi, A. R., & Hauser, O. P. (2024). Generative AI enhances individual creativity but reduces the collective diversity of novel content. *Science Advances*, 10(28), eadn5290. <https://doi.org/10.1126/sciadv.adn5290>

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., et al. (2023). So what if ChatGPT wrote it? Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, 71, 102642. <https://doi.org/10.1016/j.ijinfomgt.2023.102642>

Hu, X., He, W., Chiu, T. K. F., & Zhao, L. (2023). Using a teacher scheme for educational dialogue analysis to investigate student–student interaction patterns for optimal group activities in an artificial intelligence course. *Education and Information Technologies*, 28(7), 8789–8813. <https://doi.org/10.1007/s10639-022-11556-w>

Johnson, D. W., & Johnson, R. T. (1979). *Learning together and alone: Cooperative, competitive, and individualistic learning* (5th ed.). Allyn & Bacon.

Kasneji, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günemann, S., Hüllermeier, E., et al. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274. <https://doi.org/10.1016/j.lindif.2023.102274>

Kovari, A. (2025). A systematic review of AI-powered collaborative learning in higher education: Trends and outcomes from the last decade. *Social Sciences & Humanities Open*, 11, 101335.

<https://doi.org/10.1016/j.ssaho.2025.101335>

Li, S., & Yu, S. (2025). Transforming higher education for the knowledge economy: Enhancing creative thinking and problem-solving skills through collaborative learning. *Thinking Skills and Creativity*, 57, 101853. <https://doi.org/10.1016/j.tsc.2025.101853>

Memarian, B., & Doleck, T. (2025). A systematic review of interaction in teaching and learning with artificial intelligence (AI). *International Journal for Educational Media and Technology*, 19(2).

Mercer, N. (2000). *Words and minds: How we use language to think together*. Routledge.

Mollick, E., & Mollick, L. (2023). Assigning AI: Seven approaches for students, with prompts. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4475995>

Nie, J., Yuan, Y., Chao, X., Li, Y., & Lv, L. (2024). In smart classroom: Investigating the relationship between human–computer interaction, cognitive load and academic emotion. *International Journal of Human–Computer Interaction*, 40(13), 3528–3538. <https://doi.org/10.1080/10447318.2023.2190257>

Risko, E. F., & Gilbert, S. J. (2016). Cognitive offloading. *Trends in Cognitive Sciences*, 20(9), 676–688. <https://doi.org/10.1016/j.tics.2016.07.002>

Surendhranatha Reddy, C., & Leelavathi, R. (2026). Reimagining classroom dynamics: The impact of AI-teacher collaboration on student engagement in higher education. *International Journal of Educational Management*, 40(1–2), 158–175. <https://doi.org/10.1108/IJEM-12-2024-0843>

Tan, S. C., Lee, A. V. Y., & Lee, M. (2022). A systematic review of artificial intelligence techniques for collaborative learning over the past two decades. *Computers and Education: Artificial Intelligence*, 3, 100097. <https://doi.org/10.1016/j.caeai.2022.100097>

UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO.

Vygotsky, L. S. (1979). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Wegerif, R. (2013). *Dialogic: Education for the Internet age*. Routledge.

Zhou, X., & Schofield, L. (2024). Using social learning theories to explore the role of generative artificial intelligence (AI) in collaborative learning. *Journal of Learning Development in Higher Education*, (30). <https://doi.org/10.47408/jldhe.vi30.1031>