

The Human Teacher, the AI Teacher and the AId-Teacher Relationship

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ChatGPT, an Artificial Intelligence (AI) powered chatbot, has caused a stir in the Higher Education landscape, with fears of plagiarism and a disruption of the student-teacher relationship that has formed the bedrock of teaching. ChatGPT-3 and now four have been reported to pass many exams, including medical, law, and engineering. Overwhelming concerns from academics about students using these generative AI tools to work on their assessments is alarming. These AI tools are here to stay. Teachers should not treat AI as ‘the enemy’, and instead find ways to work with it for the betterment of learning outcomes for students. Working with AI can mean transforming teaching and the AId-teacher relationship, resulting in positive outcomes and learning experiences for teachers and students.

Keywords: artificial intelligence, higher education, student-teacher relationship

INTRODUCTION

Recent Artificial Intelligence (AI) advancements transforming the education landscape, especially in online higher education (Chaudhry & Kazim, 2022). The release of ChatGPT-3 (an AI powered chatbot) in November 2022 and ChatGPT-4 in March 2023 have resulted in strong public interest from academia and the public. Some have viewed this development as ‘the end of high-school English’ (Herman, 2022), while others have viewed AI as a helpful tool for teachers in the classroom (Celik et al., 2022). The potential these new generative AI tools bring to the classroom outweighs the risks associated with them.

The argument is that AI can take over multiple administrative roles and can perform some of the more repetitive tasks that teachers perform, such as assessment extensions and attendance recordings, allowing for a more efficient and effective online learning experience (Salas-Pilco, 2020). In theory, this will in turn allow teachers to have more free time to better focus on developing engaging resources for learning and

teaching and devising new ways of connecting with students. AI can also make education more accessible and inclusive (Koh et al., 2021) by personalization and increased access levels.

However, as AI has started to advance into previously ‘teacher only’ areas, such as the development and creation of study materials, questions and concerns have been raised about the role of AI and the role of the teacher in online higher education (Zawacki-Richter et al., 2019). Some view that AI could provide the solution to many institutions facing resource challenges (Friedman et al., 2020), whilst critical voices have presented AI as a fundamental threat to education (Zhai et al., 2021). Hence, as the role of AI in online teaching and learning continues to evolve (Chen et al., 2020), it is essential to explore the various roles that AI and teachers play and their potential implications for the student-teacher relationship.

This article updates and extends on a concise paper previously presented by the authors (Koh et al., 2022). The study aims to review the way how we can collaborate with AI to better enhance the student-teacher relationship, given recent developments of AI in education (AIed) (Hwang et al., 2020).

A BRIEF LOOK AT ARTIFICIAL INTELLIGENCE IN EDUCATION

The term Artificial Intelligence (AI) was first coined in 1956 during a workshop held in Dartmouth College by the name “Dartmouth Summer Research Project on Artificial Intelligence” (Gardner, 1987). As AI started to progress and develop, there was more development and application of AI in select areas of education. In the 1960s, IBM developed the PLATO (Programmed Logic for Automatic Teaching Operations) system as one of the first computer-based educational systems. This was then widely adopted, allowing learners to interact directly with the computer and receive instant feedback. This was also seen as one of the earliest versions of a Computer Assisted Instruction (CAI) style application of AI in education (Jones, 2015). In 1964, ELIZA, an early Natural Language Processing (NLP) was developed by Joshua Weizenbaum (Weizenbaum, 1983) from MIT. Weizenbaum designed it to simulate a conversation between a human and a computer by matching user inputs (styled as questions) to certain answers and fed as a ‘reply’ to the user. Although ELIZA was initially used to demonstrate the limits of AI and potential dangers, ELIZA can be considered one of the earliest uses of AI in an educational setting, inspiring more advanced conversational agents. In 1970, Jaime Carbonell from Stanford University created what is generally considered the first Intelligent Tutoring System (ITS). SCHOLAR was designed to automatically extract information from text and convert it into data, which it would then process and ‘understand’. Built on CAI, SCHOLAR responded to queries and posted questions to learners on South American geography. Then, based on the learners’ response quality, SCHOLAR would give appropriate feedback.

By the 1980s, it became more apparent to many researchers that education and AI were overlapping rather than two separate fields where AI could just be applied in education. Since then, AIed has advanced quite tremendously. From the creation of language models such as LISP in the 1960s to expert models in the 1970s to the rise of the ‘Fifth-Generation’ computer software in the 1980s and after that the neural networks in the 1990s and led to finally the intelligent systems that we currently have (Cantú-Ortiz et al., 2020).

The current features of AI applications in education today can be viewed in three main areas:

- Adaptive teaching
- Personalised Delivery
- Instant feedback (Technavio, 2021)

Adaptive teaching is the idea that AI can spot and point out gaps in the educational delivery and give the necessary feedback to the teacher. Coursera (a MooC), for instance, alerts the teacher whenever many students submit an incorrect answer to a particular assignment (Goli, 2020). This gives the teacher instant feedback on possible gaps in the delivery and the student's subsequent understanding of the concept. From the student’s perspective, Coursera will also provide hints when approaching the topic.

Additionally, AI can also be used to point out the areas where students struggle with the course material. Data collected on the length of time spent on each particular page or the amount of clicks/learning interactions all help paint a picture for the teacher where students are struggling.

Personalized delivery is the idea that AI can use the data to create learning tools or feedback specific for each student. Content Technologies, Inc. (CTI) is one such application that purports to turn any textbook into a bite-sized study guide catered for each student's progress. This is done by leveraging deep learning (DL) to interpret student progress and customize the learning tool (CTI, n.d.).

This can also refer to the application of AI in chatbots. Qbot (Microsoft, 2020) leverages AI technologies to direct students to specific pages based on their own queries and query history. At the end of the trimester, the AI is able to create individualized study packages based on the queries raised to best prepare the students for their examinations.

Instant feedback is perhaps the oldest feature of AI currently. It includes providing feedback instantly, based on question-answer pairs and the interpretation of big data provided. For instance, Thinkster Math (an AI math teaching app) utilizes AI to visualize the student's thinking process and provides immediate, personalized feedback (Thinkster Math, n.d.). This will also allow the teachers to follow up on the gaps in the student's thinking and logic process. Instant feedback also increases the availability of learning, as the technology is available and accessible 24/7 as long as the student has access to the internet and the tool is not undergoing maintenance.

Instant feedback has also evolved somewhat to include some level of adaptivity due to AI. Different from the use of stock responses that have been used in the earlier versions, adaptive feedback systems can adjust its responses accordingly to suit learners' characteristics, needs, and preferences (JONES, 2011).

However, the recent release of ChatGPT, a free publicly available large language model (LLM) AI, seems to have further disrupted that. ChatGPT is a form of generative AI that utilizes natural language processing to understand and respond to queries in a human-like fashion, allowing it to compose various long-form responses, including articles, essays, write-ups, posts, programming code, and even text-based communications such as emails. Naturally, this development has also meant that every student can simply prompt ChatGPT to compose an essay for their assessments and even examinations.

LARGE LANGUAGE MODELS – THE NEXT HIGHER EDUCATION DISRUPTION? RESPONSE TO AIED

However, the recent release of ChatGPT, a free publicly available large language model (LLM) AI seems to have further disrupted that. Large language models are a form of generative AI that utilizes natural language processing to understand and respond to queries in a human-like fashion, allowing it to compose various long-form responses, including articles, essays, write-ups, posts, programming code, and even text-based communications such as emails. Naturally, this development has also meant that every student can simply prompt ChatGPT to compose an essay for their assessments and even examinations.

As AI technology, including ChatGPT, becomes more accessible, higher education institutions face increasingly difficult decisions on how to adapt their teaching and assessment methods to this new change. One option is to dig their heels in and ban or limit the use of AI. One way this is done is by using more advanced anti-plagiarism software such as GPTZero. Others have revisited their policies to include that text generated using ChatGPT will be treated as Contract Cheating and deal with AI tools that way. A third method could also mean doubling down on physical exams. For instance, the prestigious Group of Eight (Go8) Universities in Australia have decided to further increase the use of 'pen and paper exams' (Cassidy, 2023). Students could be asked to take high-stakes standardized tests as a means to evaluate learning in students.

However, these methods have disadvantages, such as inaccuracies in measuring student knowledge, cost efficiency, added student stress, and a lack of preparation for the evolving work landscape that will include AI. Additionally, high-stakes standardized tests also come with their own set of disadvantages, such as inaccuracies in measuring student knowledge or skills, cost efficiency, added student stress or even the motivation for learning. Students have reported lower levels of motivation, engagement and knowledge retention (Demir & Keleş, 2021) when facing high-stakes standardized tests. The amount of stress that students feel is also significantly higher, and there is a stronger feeling of being invisible as individual differences were not accounted for (Demir & Keleş, 2021).

The other option is to integrate AI into the teaching and learning process. Australian Academic Integrity Network, for instance, has taken out a guide on how to use the ChatGPT and guides the appropriate use of these AI tools in higher education aligned with the Higher Education Standards Framework (Threshold Standards) 2021 (HESF) (AAIN, 2023). Some of this can be achieved by adapting AI into formative and summative activities, using a task-based assessment system, or testing higher-order of skills. Using ChatGPT to support learning, students can focus on developing higher order skills, such as critical thinking and reflection, while teachers can contextualize learning. Integrating AI into teaching and learning can help institutions and students stay competitive and adapt to the evolving work landscape.

The approach of integration is also not without its drawbacks. The amount of training needed and the constant re-adaptation could prove to be a costly endeavor and is generally a reactive approach to the constant improvements of AI. With each new development of AI technologies, will this ignite another round of the teaching and learning process re-adaptation, with the pedagogy constantly trying to catch up to the development of the technologies?

THE AI-TEACHER GAP

The reaction to AI exposed a schism between the rate of development of these AI tools and the way that higher education has adapted to it. As AI continues to take meaningful steps forward, higher education has been forced to adapt to the proliferation and incorporation of AI technologies into the classroom. However, these reactions are not without merit, and the reasons and context of these reactions should be considered when looking at the gap that has started to form.

Lack of Theoretical Grounding

One of the biggest issues regarding how AI tools are adapted and adopted is that most AI tools were not developed with a theoretical grounding in mind (Shao et al., 2022; Zawacki-Richter et al., 2019). This meant that many of these AI tools were developed with a 'technology first' approach rather than considering how it would and could be applied. As a result, when AI is forcibly adopted en masse into the classroom at such a short notice, practices that were previously fit for purpose have been rendered unable to adapt to this new technology (Ayanwale et al., 2022). This is especially true in the realm of education, where the use of AI tools has challenged traditional teaching methods. For example, AI-powered systems such as chatbots and virtual assistants can provide students with instant feedback, personalization, and support. This can potentially transform the traditional classroom model, which has relied on face-to-face interactions between teachers and students. However, the lack of theoretical grounding means that these AI tools, while able to do those functions, are not always created with validated pedagogical theories that will improve and assist learners in a manner that is beneficial for learning. For example, many AI systems are designed with a "one size fits all" approach that fails to take into account the diverse learning needs of students. Even with 'personalized' teaching, these AI tools still follow an algorithm that is broadly applied and may not be able to fit into the existing educational ecosystem. This has led to fears that using these AI tools may result in the standardization of education, limiting students' creativity and critical thinking skill (Jan Bieser, 2022).

Reactive vs. Proactive

AI has been used in education since the 1960s, but the speed and scale of public adoption of LLM AI systems was somewhat unprecedented. This also meant that higher education had to adopt a reactive stance. As such, this reactivity has resulted in a range of responses, from outright bans on the use of AI to the implementation of strict rules around these tools, highlighting and exacerbating the schism between AI and educators. The implications of this schism are far-reaching. By doubling down on physical 'paper and pen' exams or outright banning AI tools, questions will emerge about the job readiness of graduates to deal with the future work environment, which is increasingly reliant on these technologies.

Pace of AI Development in Education

Finally, the rate of change in AI means that a new way of understanding or making sense of AI is needed. The speed at which AI technologies are advancing means that traditional models of teaching and learning are quickly becoming outdated. This has created a sense of uncertainty among educators struggling to keep up with the latest developments in AI. (Popenici, 2022). Furthermore, the rapid pace of change in AI has resulted in a gap between the skills that students learn in the classroom and the skills that are required in the workplace, as there will inevitably be a time lag between the industry and the classroom. This can create a mismatch between the education system and the job market, leaving students ill-prepared for the demands of the modern workplace.

Hence, a new way of making sense of the AIed-Teacher relationship is warranted. How teachers interact, utilize and leverage new AI tools while improving and utilizing pedagogical best practices will very much shape the way that teaching is conducted in the classroom shortly.

TEACHER-AI TASK SPECTRUM

Teaching has always been a complex job (Grossman, 2020), and teaching online even more so, as students get disengaged very quickly in an online mode due to the difference in expectations of the students' and teachers' roles (Maimaiti et al., 2021) and limited nonverbal cues (Al Tawil, 2019; Koh & Hulbert, 2022). During covid-19, when universities globally were conducting classes online because of the government-imposed social distancing rules, it has been reported that students were not engaged well with online delivery (Simon et al., 2022). With changing times, students' expectations have changed, and teachers now have to juggle many aspects of teaching on top of the shift to teaching online, with limited success for both teachers and students (Arslan, 2021; Collie, 2021). One of the key concerns is the student-teacher disconnect from online teaching and learning (Almahasees et al., 2021; Arslan, 2021). Even as general pandemic restrictions gradually ease globally, online study is likely to continue for many reasons, one being lingering pandemic concerns (Bashir et al., 2021), and the other being student flexibility in studying online (Driscoll et al., 2012). However, this development does not undermine the importance of student-teacher relationships (Dhawan, 2020; Koh & Hulbert, 2022), despite the disruptive effects of studying online.

With AIed entering the picture of online higher education, it may be useful to look at the spectrum of tasks that constitutes what teaching online with AI could look like. There are a few different perspectives on how these tasks will look like, such as the Technology Acceptance Model (TAM), the Community of Inquiry (CoI) model etc, but a model that might be useful is by (Koh et al., 2022) which is built on Bloom's taxonomy (Bloom & Krathwohl, 2020), and updated it with the evolution of teaching practices and tasks (Joshi et al., 2021). Bloom's Taxonomy was first posited in 1956 by Benjamin Bloom as a framework to organize educational goals and identify the six levels of learning (Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). Each level builds on the previous one, with higher levels of cognitive processing requiring more complex thinking and deeper understanding. Typically they are presented in the form of a pyramid, even though Bloom has not explicitly used it in the presentations.

Remembering tests the ability of the learner to be able to recall knowledge. They provide descriptions of various concepts and ideas, often recalling this information from memory.

Understanding tests the ability of the learner to comprehend the meaning of the information. This is often tested in the form of explaining an idea or concept in their own words.

Applying involves the ability of the learner to take the information or concept and apply it in new or real-world scenarios.

Analysing involves the learner using the knowledge learned and understood, applying it in the relevant scenario, and then delving deeper into the knowledge by breaking down information or concepts into their component parts and examining their relationships, such as identifying patterns or causes and effects.

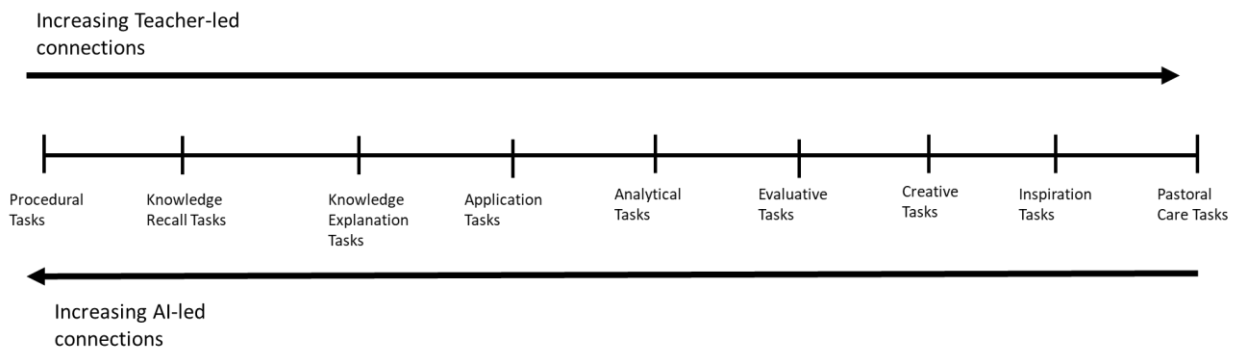
Evaluating is the level that requires students to make judgments about the value or quality of information or concepts, such as evaluating the credibility of sources or assessing the strengths and weaknesses of arguments.

Creating is the level that uses current and existing knowledge to generate something new.

However, with the inclusion of AI in education, teaching will go beyond cognitive levels of teaching and learning (Schiff, 2021). This is because, with AI, learning can be tailored and adapted to every student's individual needs, goals and abilities through personalized programs, which can help fill any gaps in learning and teaching. Other aspects, such as administrative tasks and pastoral care, have been added to give more context to the types of tasks a teacher would expect in today's world of online learning. Administrative tasks like applying for assessment extensions were expected to be undertaken by AI (Zawacki-Richter et al., 2019). However, learners in online learning still fully expect their teachers to perform pastoral care tasks in the online learning environment (Szilagy et al., 2022) and still turn to them for such support (Spears & Green, 2022). Although AI has advanced significantly in performing many teaching tasks, pastoral care tasks are still expected to be conducted by human teachers/counselors by students (Im & Ham, 2020).

Bearing all these in mind, the level of AI involvement depends on the type of task, which can be led more by a teacher, AIed, or even co-led. Naturally, as the type of task moves from a more procedural task to a more pastoral care task, the teacher must also increasingly lead the way student-teacher connections are formed.

FIGURE 1
SPECTRUM OF TEACHER-AI TEACHING TASKS



Procedural tasks refer to the tasks that are usually administrative in nature, such as a request for deadline extensions and reuploading of correct documents. AIed can lead these tasks and the teacher will be playing a smaller role in these automated and repetitive tasks, as these are routine tasks and AIed can with its own algorithm is very capable of performing it.

Teaching tasks involving lower order thinking activities such as knowledge recall and explanation work can also be more AI-led. The delivery of content, especially in an online learning environment, can be conducted more by the learning platform such as MATHiaU from IBM. MATHiaU seeks to model behavior from a human coach and is able to provide feedback and advice concerning the knowledge recall and explanation tasks. Explanatory questions can also be programmed within AIed to be answered, although teachers would have to play a bigger role in ensuring that the context and content are appropriate. Similarly,

as the teaching tasks start to involve higher-order thinking skills, the teacher would have to play an increasingly larger role. This would involve evaluative and creative tasks, where a more ‘humanistic’ approach would need to be adopted towards teaching. AIed cannot create and support critical thinking, however, can generate and regenerate from the database it is trained on. So in the higher order tasks where critical thinking is required, AI would be able to even portray having “a heart to think emotionally” but ironically not actually having the “brains to think critically”.

However, some of the essential components of teaching are also in non-academic skills, such as motivating students, inspiring them and broadening their horizons by delivering intellectual talks. These works must be teacher-led as the all-important student-teacher relationship takes center stage around the relationships developed between student and teacher. AIed can help in a limited aspect, for instance, by providing a record of past interactions or possible new aspects, but the teacher must connect with the student to complete these tasks. Pastoral care tasks involve the actual care and counsel of the student’s well-being; the human touch is even more important in this aspect.

Moving from the extremes, teaching tasks involving application and analytical thinking skills tend to be more of a co-led area. AIed can show how well students have been applying certain concepts, but the teacher must also provide the context and the relevance of how a concept is applied. Additionally, teachers can provide their personal stories and experiences on how concepts are applied and understood, providing additional opportunities for reconnection.

With this view of teaching online, especially in light of teaching online with AI, a quick view on the current responses to ChatGPT-3 (Openai Beta version) and 4 (\$20 per month for the paid version) can shed light on the role of teachers and the role of AI and what could be the path forward.

AIED AND THE ROLE OF THE TEACHER

Looking now at the different responses to AI in the education space, the big elephant in the room is what then, is the role of the teacher?

As mentioned previously, the initial purpose of AIed was to shift administrative burdens from the teachers to allow teachers to theoretically focus on the more human aspects of education (such as empathy, personal guidance etc). However, AI is encroaching into many ‘teacher-only’ spaces (Chaudhry & Kazim, 2021; UNESCO Education 2030, 2019). Many teachers see this as a first step to reducing the teacher’s role to that of a facilitator, which also has implications for the student’s learning experience (Celik et al., 2022; Shen & Su, 2020). The impending sense of unease is made worse by the fact that many existing online higher education institutions have already implemented the practice of using pre-designed educational packages (Koh, Cowling, Sim, et al., 2022), forcing the teacher to be more focused on facilitating of the knowledge delivery aspect of teaching.

As with the introduction of any technology (not just AIed) into education, the role of the teacher will evolve to meet this newest disruption, for instance, an AI-powered chatbot, Qbot (Microsoft, 2020) can pick out struggling students and flag them out to the teacher. They use a series of markers to identify the student who exhibits the behavior of struggle, and this information then gives teachers a chance to intervene just in time with the right approach given the right background information. This gives students an opportunity to reconnect with their teachers in a meaningful manner, allowing a human touch to be present in the aspect of teaching. AI can also provide a personalized study guide for each student, but the human teacher can add to the study guide by including personal stories relevant to the student to learn and even ways to motivate the student based on their past interactions with the student.

But this is not only for connecting with struggling students. AI can be used to create engaging content for the teachers who may understandably not be well versed in some software or to help re-enforce certain ideas. Instead of choosing between a ‘sage on the stage’ and ‘a guide on the side’, teachers can work with AI to play both roles, providing knowledge and encouragement simultaneously. AI can then help tweak or personalize the knowledge, and the teacher can then add their final personal touch for the student (Joshi et al., 2021).

Another perspective is the philosophical idea that self-awareness and personal identity is developed through personal interaction with what is considered as fellow human beings (Sartre, 1984). People adapt and react to different situations through mutual interactions. This also includes learning as learners learn through the ‘hidden teachable moments’ that AI cannot replicate. For instance, students challenging the perspective of the content can be a teachable moment depending on how the teacher reacts. Fellow students can observe the reaction of the teacher and other fellow students. AI cannot replicate that ‘human-ness’ of interaction, and the long-term psychological impact of AI in education on students is still relatively unknown, (Felix, 2020).

As these examples show, the role of the teacher will slide up in the spectrum of AI-Teacher teaching tasks to occupy more of the cognitively demanding tasks as well as the motivational, inspirational, and pastoral care tasks. In short, the role of the teacher will shift from a more traditional ‘sage on the stage’ to a ‘guide on the side’.

NEW WAYS OF LEARNING THAT RECONNECT

AIed will create new opportunities for connection via new ways of learning. Using the spectrum above, this can be broadly categorized as AI-led and teacher-led (which also implies that it is AI-empowered). AI-led teaching can be seen in the delivery of content and assessments. Personalized content delivery and data-driven productive learning activities can be designed by AIed (Hwang et al., 2020) as part of the teaching tasks of content delivery. In practice, students will get access to the course material and a study guide that is catered to their learning behaviors and previously identified content. Teachers can complement this process by conducting higher-level teaching tasks such as inspiring and motivating students. This could be supported by AIed as the information gathered from the student’s learning behavior can be applied contextually and appropriately to promote learning performances, enhance motivation, and increase engagement.

While AI-graded assessments are still in development (Manyika et al., 2017; UNESCO Education 2030, 2019), it also proposes a new way of student-teacher connection. Assessments will typically fall under the ‘middle’ level of teaching tasks, where both AIed and teachers must co-lead in varying degrees. AI-led assessments can be applied in explaining and describing concepts (Gardner et al., 2021; Jia, 2009). Teachers can provide context to some of the answers provided but should take the lead in the assessment higher-order skills such as creativity and analysis (Jimenez-Mavillard & Suarez, 2022). This new assessment collaboration will also necessitate a new way for students to connect with teachers. Students will now connect with teachers on the higher order teaching/learning tasks, such as application and analysis, rather than more foundational tasks, such as explanation and information recall. Theoretically, AIed can potentially develop to the point where it will conduct a continual assessment of students’ learning progress (Restrepo-Calle et al., 2018) and allow thus enhancing student-teacher reconnection without worrying about looming examinations.

Finally, the social presence aspect should also not be excluded. Studying online can be an isolating experience (Dixon, 2015), and AIed can help breach that divide by supporting a community of inquiry approach. AIed can help draw connections for students who seem to be struggling in similar areas, setting up breakout rooms with teacher support or even enforcing some rules within online discussion spaces. Relevant content can be selected to support the discussion, and the teacher can use that selected content to enrich the discussions.

NEW WAYS OF TEACHING THAT RECONNECT

Rather than play a cat-and-mouse game with AI, would a more dialogic approach to education be the solution? As its name suggests, dialogic education highly emphasizes dialogue and conversation in the learning process, as opposed to a traditional ‘sage on the stage’ approach.

One key benefit of dialogic education is that it allows for a more collaborative and interactive learning environment. Students are encouraged to engage with each other and the material rather than simply

passively receiving information from the teacher. Often referred to as the ‘guide on the side’ approach, dialogic education can help lead to a more in-depth grasp of the concepts since students will have rigorously tested and debated the ideas. AIed can help support this via virtual discussion forums where learners can ask, post, and respond to other questions or posts by their peers. This encourages discourse, discussion, and even critical thinking, as the social dimension of learning promotes collaboration and interaction within and between teachers and learners.

Students can also bring their own experiences and perspectives into these dialogues and discussions. This allows the promotion of critical thinking and problem-solving skills. By introducing new perspectives and different lived experiences, learners are encouraged to explore new angles and ask different questions to analyse and comprehend new information. This allows a more nuanced approach to information, respecting cultural perspectives and giving a voice to all learners. These are vital skills for today's ever-changing landscape. AIed's ability to provide a discussion platform goes a long way in supporting this, but it can also create scenarios where this can happen. AIed can help support collaborative problem-solving activities by giving students nudges or challenges that can only be solved by teamwork or considering additional perspectives. Teachers support this discourse by ensuring students stay the course and not get derailed by other distractions.

The core difference between a dialogic education and a digital dialogic education is not only its medium of delivery, but also its accessibility. Digital dialogic approaches are more accessible to the learner, being available 24/7 as long as the learner has an internet connection. Learners can connect via the discussion forums, fostering a sense of community in the online classroom at any time of the day. They are no longer bound by physical limitations, allowing them to engage in deep discussions despite their geographical locations. Students may influence the power dynamic in an online classroom, allowing the teacher to function more like a ‘guide on the side’ than the ‘sage on the stage’. Following the spectrum of Teacher-AI teaching tasks mentioned above, AIed could provide the information (under knowledge recall and knowledge explanation tasks) with further support from the human teacher to contextualize the learning.

SUMMARY AND FUTURE WORK

Although it may be tempting to say that the role of teachers will dwindle once AIed is implemented, that is simply not likely to happen (UNESCO Education 2030, 2019). Teachers still provide the ‘human touch’ in learning, which help develop non-academic skills such as emotional intelligence, creativity, and communication skills (Manyika et al., 2017; Martin et al., 2018). Above and beyond the non-academic skills, human teachers are able to inspire and encourage accordingly, using their own experiences and knowledge, even in an online environment (Singh, 2021). In an AI-enhanced online post-Covid-19 educational landscape, the student-teacher relationship still remains as critical as ever. As with any tool, AIed can be both disruptive and supportive. However, a good awareness of the task at hand would allow for a better collaborative effort between teachers and AI which in turn aids the way that teachers and students reconnect. In this ‘new normal’, AIed can enhance student-teacher reconnection and build better connections depending on how AIed is deployed.

Given the impending march of AI into the online classrooms, a positive AI-Teacher collaboration can be built by understanding where each task sits on the AIed-Teacher spectrum. Future work can take this understanding into the design of future AIed applications, where the application will be designed to facilitate collaboration with the teachers depending on the task on the spectrum. Future refinements of the spectrum are also welcome. This will provide a fine-grained definition of each point of the spectrum, updating it as the relationship between technology and the human teacher evolves. This will also allow for new avenues of the student-teacher connection to be established, which will then inform future refinements of the spectrum.

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