



# Reimagining Teaching and Learning in the Age of AI: Inclusive, Student-Centred and Analytics-Driven Approaches for a Transformed SoTL Landscape

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## ABSTRACT

This study explores how Artificial Intelligence (AI) can transform Scholarship of Teaching and Learning (SoTL) by integrating student-centred pedagogy with learning analytics to create more inclusive, adaptive, and equitable educational environments. The purpose of the study is to critically examine how AI-driven systems such as adaptive learning platforms, intelligent tutoring, and predictive analytics can personalise instruction, enhance learner engagement, and inform pedagogical decisions through data-driven insights. Using a qualitative secondary research design, the study systematically reviews and synthesises peer-reviewed literature, institutional reports, and policy frameworks published between 2019 and 2024. The findings indicate that AI technologies can significantly enhance teaching effectiveness and learner inclusion when coupled with evidence-based and ethical implementation. However, challenges persist regarding data privacy, algorithmic bias, and unequal access to digital infrastructure, particularly in the Global South. The discussion underscores the importance of embedding AI integration within a humanistic and ethical framework to ensure transparency, fairness, and contextual sensitivity. The study recommends that higher education institutions develop robust governance policies, strengthen the digital infrastructure, and invest in continuous professional development to improve the literacy and ethical competence of educators. The study contributes to scholarship by providing a conceptual synthesis of how AI, inclusivity, and analytics intersect within SoTL, offering a framework for ethically grounded, student-centred educational transformation. It advances understanding of how evidence-informed AI practices can bridge pedagogical equity gaps and shape the future of inclusive learning in the digital era.

**Keywords:** Artificial Intelligence, Inclusive Pedagogy, Learning Analytics, Student-Centred Teaching, SoTL

## INTRODUCTION

AI's increasing use in education is altering the Scholarship of Teaching and Learning. This trend towards technology-mediated education has sparked discussions about pedagogical innovation, equality, and data-driven learning ethics. AI applications, such as intelligent tutoring systems and adaptive learning platforms,

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are transforming instructional methods and institutional strategies, forcing scholars and practitioners to rethink educational purpose and practice in light of digital realities. Against this environment, SoTL is increasingly seen as a strategic arena for diversity, innovation, and analytics, not just reflective teaching practice.

AI in education analyses student behaviour, predicts performance patterns, and supports individualised learning routes. SoTL also investigates teaching and learning, evaluating pedagogical practices to improve education and student results. The incorporation of AI into SoTL requires a paradigm shift towards evidence-informed and equity-oriented education, not only technology enhancement.

However, AI's transformational potential faces obstacles. The digital gap, algorithmic prejudice, and surveillance fears highlight educational inequality. In many parts of the Global South, inadequate infrastructure access worsens inequality, necessitating culturally grounded and morally sensitive AI deployment. The transparency and accountability of AI system, particularly data privacy and algorithmic decision-making, challenge its use in education.

This paper critiques how inclusive, student-centered, and analytics-driven methods might reshape SoTL in the AI era. It examines the pedagogical and ethical implications of this integration and the possibility of AI-enabled frameworks to create more egalitarian and responsive learning environments.

## LITERATURE REVIEW

### Student-Centred Pedagogy and the AI Imperative

Recent discussions about using AI in education have focused on how well personalised learning and student-centered teaching work together. Zhang and Aslan say that AI technologies make it possible to change the way lessons are taught based on the needs of each student. This supports differentiated teaching that was not possible on a large scale before.<sup>1</sup> Chen et al. stress that AI-enhanced systems, such as learning analytics screens and adaptable feedback tools, make it easier for teachers to step in and help students in the right away, so they can avoid problems before they happen.<sup>2</sup> But Bulathwela et al. warn that these kinds of optimisations can make educational gaps worse if they do not take into account things like socioeconomic position or access to digital devices.<sup>3</sup> Panciroli and Rivoltella say that an "algorithmic pedagogy" could replace human judgment with machine reasoning if it is not put back into human-centered models that include everyone.<sup>4</sup>

Since these problems exist, the move towards student-centered learning with AI needs to be carefully planned to protect the basic principles of inclusive education. We are not trying to automate teaching; instead, we want to improve teaching by using smart tools that give students more voice, control, and input. This means that teachers must rethink their role—not just following computer suggestions, but also as a key figure in ensuring that AI-driven insights are used in a way that makes sense for the classroom and students.

### Theoretical Frameworks and Epistemological Shifts

Integrating Artificial Intelligence (AI) tools into the Scholarship of Teaching and Learning (SoTL) is reflective of a dramatic philosophical shift from conventional reflective models toward data-informed and relational paradigms. Traditionally, the reflective SoTL focused on the qualitative reflective and peer reviewed teaching activities.<sup>5</sup> However, in the era of AI, this reflective model is beginning to expand into

<sup>1</sup> Ke Zhang and Ayse Begum Aslan, "AI Technologies for Education: Recent Research & Future Directions," *Computers and Education: Artificial Intelligence* 2 (2021): 100025, <https://doi.org/10.1016/j.caeai.2021.100025>.

<sup>2</sup> Xieling Chen et al., "Application and Theory Gaps during the Rise of Artificial Intelligence in Education," *Computers and Education: Artificial Intelligence* 1 (2020): 100002, <https://doi.org/10.1016/j.caeai.2020.100002>.

<sup>3</sup> Sahan Bulathwela et al., "Artificial Intelligence Alone Will Not Democratise Education: On Educational Inequality, Techno-Solutionism and Inclusive Tools," *Sustainability* 16, no. 2 (January 16, 2024): 781, <https://doi.org/10.3390/su16020781>.

<sup>4</sup> Claudia, Panciroli and Pier Cesare Rivoltella, *Pedagogia Algoritmica. Per Una Riflessione Educativa Sull'Intelligenza Artificiale* (Brescia: Scholé-Morcelliana, 2023).

<sup>5</sup> Massimo Chiriatti et al., "The Case for Human-AI Interaction as System 0 Thinking," *Nature Human Behaviour* 8, no. 10 (October 22, 2024): 1829–30, <https://doi.org/10.1038/s41562-024-01995-5>.

evidence-based predictive learning models that draw inferences from behavioural data analytics. Chiriatti et al. refer to this change as System 0 thinking and describe it as a type of symbiotic reasoning through which human and algorithmic thinking engage in cyclic feedback loops that reinterpret learner activities in real time. This paradigm change poses new challenges to educators as it requires the functioning in blended spaces where human judgement and machine thinking collaboratively construct meaning.<sup>6</sup> Holmes and Tuomi point out that SoTL has to transform from the uncritical incorporation of technology to the more sophisticated multi-disciplinary synthesis of pedagogy, data science, and ethics of teaching for prudent educational change.

AI mediated classrooms, as interpreted by Bisconti, McIntyre and Russo, are synthetic socio-technical system ecosystems where learners, teachers, and algorithms collaboratively interact to meaningfully redefine the educational purpose.<sup>7</sup> This integration conjunction closes the persistent gap between the social and technological spheres, situating SoTL as a dynamic system rather than a stagnant field of study.

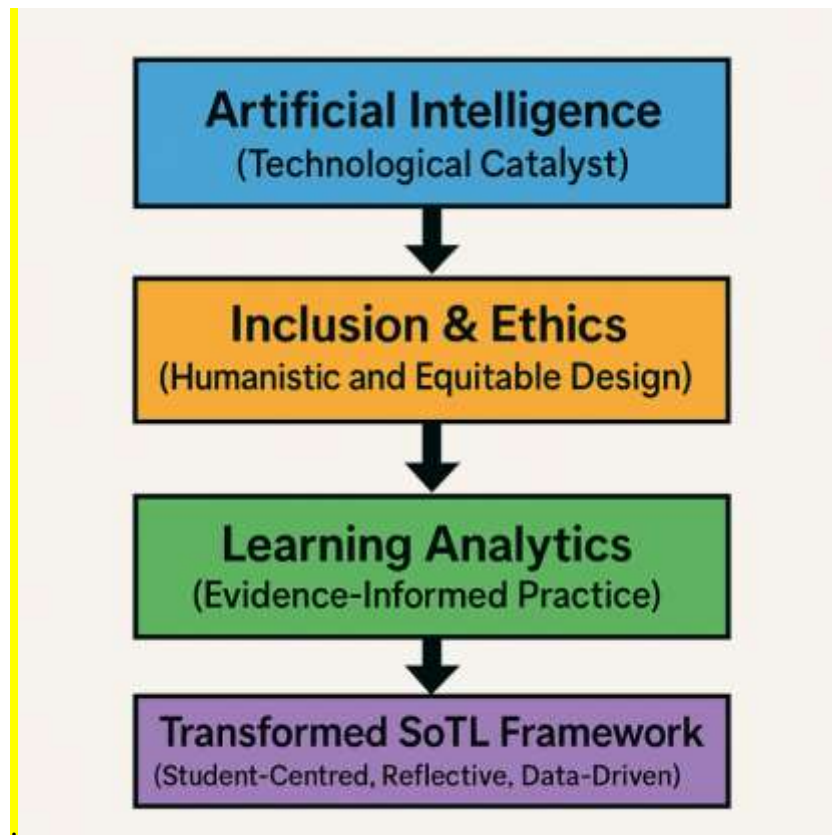
Tuomi proposes a socio developmental ethical framework that intersects with co-learning, dialogue, and democratized AI design. Such frameworks encourage educators to think about AI not as a substitute for human intuition, but as a collaborator both ethically and intellectually. Similarly, the guidelines on generative AI in education and teaching published by UNESCO emphasize the importance of equity and transparency as foundational principles for the transformation of SoTL.<sup>8</sup> Together, these perspectives offer teaching and learning as ethically engaged, with participation from the AI aimed at stimulating the ‘passive’ and not ‘active’ pedagogy. Below, the diagram illustrates the relationship between AI, Inclusion, Analytics, and SoTL Transformation, demonstrating how these elements intersect to transform educational practice.

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<sup>6</sup> Wayne Holmes and Ilkka Tuomi, “State of the Art and Practice in AI in Education,” *European Journal of Education* 57, no. 4 (December 30, 2022): 542–70, <https://doi.org/10.1111/ejed.12533>.

<sup>7</sup> Piercosma Bisconti, Andrew McIntyre, and Federica Russo, “Synthetic Socio-Technical Systems: Poiësis as Meaning Making,” *Philosophy & Technology* 37, no. 3 (September 16, 2024): 94, <https://doi.org/10.1007/s13347-024-00778-0>.

<sup>8</sup> UNESCO, *Guidance for Generative AI in Education and Research* (Paris: UNESCO, 2023).



*Figure 1: Interplay Between Artificial Intelligence, Inclusion & Ethics, Learning Analytics, and the Transformed SoTL Framework*

*Adapted from Chiriatti et al. (2022), Holmes and Tuomi (2023), and UNESCO (2023)*

As a growing field, some universities have begun experimenting with the use of AI analytics dashboards, which track learning, attendance, and the participation level of students for making pedagogical choices. Adaptive analytics capture the “what, why, and how” of usage and context, enabling timely interventions that transform the SoTL from looking back to a proactive science of learning, as described by Chen et al.<sup>9</sup> And similarly, Linderöth, Hultén and Stenliden note that the documents of policy have increasingly started to frame AI not only as a means of saving time but also a socio-technical agent which restructures the governance of the education system and the role of teachers.<sup>10</sup> However, this shift does have its downsides, for A.I. is likely to commodify learning behaviour, and intensify learning inequities, especially in context of low resource settings, unless ethical measures are taken. There is a need to rethink the AI usage to encompass context-sensitive approaches that algorithmic governance is tempered by situated ethical relations and inclusive design.

Mouta, Pinto-Llorente and Torrecilla-Sánchez assert that the shift in the SoTL framework requires the acceptance of pluralistic methodologies to investigate the impact of AI on the boundaries of knowledge.<sup>11</sup> Calvo and Saura Garcia assert that democratic regulation of the use of AI in education helps ensure that the AI-driven outcomes promote the pluralistic values of education.<sup>12</sup> Panciroli and Rivoltella reinforce this by

<sup>9</sup> Chen et al., “Application and Theory Gaps during the Rise of Artificial Intelligence in Education.”

<sup>10</sup> Cornelia Linderöth, Magnus Hultén, and Linnéa Stenliden, “Competing Visions of Artificial Intelligence in Education—A Heuristic Analysis on Sociotechnical Imaginaries and Problematizations in Policy Guidelines,” *Policy Futures in Education* 22, no. 8 (November 22, 2024): 1662–78, <https://doi.org/10.1177/14782103241228900>.

<sup>11</sup> Ana Mouta, Ana María Pinto-Llorente, and Eva María Torrecilla-Sánchez, “Uncovering Blind Spots in Education Ethics: Insights from a Systematic Literature Review on Artificial Intelligence in Education,” *International Journal of Artificial Intelligence in Education* 34, no. 3 (September 1, 2024): 1166–1205, <https://doi.org/10.1007/s40593-023-00384-9>.

<sup>12</sup> Patrici Calvo and Carlos Saura García, “Generative AI and Democracy: The Synthetification of Public Opinion and Its

proposing a model of algorithmic pedagogy that expands the role of AI to the augmentation of deeper inquiry rather than its automation.<sup>13</sup> SoTL, under such transformative conditions, becomes more flexible, integrating reflective teaching with evidence-based reasoning and ethical responsibility. This new SoTL paradigm is not the elimination of the conventional SoTL but rather its transformation, which is, in essence, the shift from theory to practice, from reflective to interactive, and from pedagogy as transmission to pedagogy as co-creation.

### Critical Debates: Equity, Ethics, and Governance in AI-Supported Education

There is a lot of excitement in the literature about AI's ability to tailor and improve education. However, there are also ongoing concerns about its social effects and structural limits. Mouta et al. say that a lot of AI apps used in education don't have clear ethics rules, so they don't think about the problems that come up with biased datasets and unclear algorithmic processes.<sup>14</sup> This criticism is strengthened by Coeckelbergh's work on AI ethics, which shows that using AI tools in education can make power issues worse if they are not regulated and checked by strong ethical systems.<sup>15</sup> In their paper, Holmes et al. argue for a community-wide code of ethics to help teachers use AI responsibly in the classroom, with a focus on responsibility, agreement, and openness.<sup>16</sup>

The question of inclusion is still very important. Cesaroni et al. pointed out that inclusive AI in education needs to be co-created with partners from a range of educational and social settings to ensure that tools solve real-world problems and help all students, even those with disabilities or who do not have access to enough resources.<sup>17</sup> In its 2023 advice on generative AI in education, UNESCO once again stresses the importance of fairness by asking states and schools to only include AI in lessons when they align with goals for inclusive teaching.<sup>18</sup> All of these points of view point that putting AI into SoTL needs to be morally sound, controlled by democracy, and able to adapt to different situations.

Even though there is a lot more writing about AI in education, there are still gaps. Notably, there is not a lot of real-world study on how teachers deal with the social, technological, and educational challenges of using AI in different kinds of class. Also, the Global South is still not well-represented in talks about how AI will change education, since most models were created in Western or high-income settings. Future studies should look into these differences and find more grounded, culturally sensitive and socially fair ways to use AI in SoTL.<sup>19</sup>

## METHODOLOGY

### Secondary Research Design Description

This study uses qualitative secondary research to critically examine the intersection of AI, inclusive pedagogy, and data analytics in the developing Scholarship of Teaching and Learning. Secondary research is ideal for situations where technological change outpaces empirical investigations and requires quick information synthesis to guide educational practice. The research examines the effects of AI on education using carefully chosen peer-reviewed scientific publications, policy documents, and institutional reports from

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Impacts," Available at SSRN 4911710, 2024.

<sup>13</sup> Panciroli and Rivoltella, *Pedagogia Algoritmica. Per Una Riflessione Educativa Sull'Intelligenza Artificiale*.

<sup>14</sup> Bisconti, P., McIntyre, A., and Russo, F. "Synthetic Socio-Technical Systems: Poïêsis as Meaning Making." *Philosophy & Technology* 37, no. 3 (2024): 94. <https://doi.org/10.1007/s13347-024-00778-0>.

<sup>15</sup> Tuomi, I. "A Framework for Socio-Developmental Ethics in Educational AI." In *Proceedings of the Hawaii International Conference on System Sciences (HICSS-56)*, 2023.

<sup>16</sup> Holmes, W., and Tuomi, I. "State of the Art and Practice in AI in Education." *European Journal of Education* 57, no. 4 (2022): 542–570. <https://doi.org/10.1111/ejed.12533>.

<sup>17</sup> Coeckelbergh, M. *AI Ethics*. Boston: The MIT Press, 2020.

<sup>18</sup> Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., Baker, T., Shum, S. B., and Koedinger, K. R. "Ethics of AI in Education: Towards a Community-Wide Framework." *International Journal of Artificial Intelligence in Education* (2022): 1–23. <https://doi.org/10.1007/s40593-021-00239-1>.

<sup>19</sup> Mouta, A., Pinto-Llorente, A. M., and Torrecilla-Sánchez, E. M. "Uncovering Blind Spots in Education Ethics." *International Journal of Artificial Intelligence in Education* (2023). <https://doi.org/10.1007/s40593-023-00384-9>.

2020 to 2025. This method allows the researcher to draw on a broad range of academic information, combine multidisciplinary viewpoints, and provide a meta-analysis of AI-enhanced learning environment trends, practices, and ethical issues.

Secondary research allows detailed comparisons of global behaviours from Global North and Global South viewpoints. Bisconti notes that this method captures the complexity of synthetic socio-technical systems in educational transformation.<sup>20</sup> Chen et al. emphasise that secondary studies bridge technological promise and instructional application.<sup>21</sup> Holmes and Tuomi suggest that qualitative synthesis is essential for addressing ethical and socio-technical concerns in AI deployment.<sup>22</sup> Reviewing theoretical and empirical contributions is essential to building a pedagogically reflective AI framework, according to Panciroli and Rivoltella.<sup>23</sup> These academic claims support the study design's suitability for providing insights for inclusive and student-centered educational changes in the AI age.

### Source Selection Criteria and Databases Used

To ensure that the study was methodologically sound and useful, an organised procedure was used to find and choose sources. We selected sources based on five main factors: when they were published (2020–2025), whether they had been reviewed by other scholars, how relevant they were to AI in education, how well they engaged with inclusive educational frameworks, and how many people from each region were included in the study. To find reliable and well-known literature, databases such as Scopus, Web of Science, JSTOR, SpringerLink, and the UNESCO Digital Library were used. To narrow down searches for things like "AI in education," "student-centered pedagogy," "learning analytics," "inclusive learning," and "SoTL transformation," the Boolean operators "AND," "OR," and "NOT" were used.

Calvo and Saura Garcia stress how important it is to have strong source selection methods to reduce bias in secondary research.<sup>24</sup> Mouta et al. state that clear criteria for inclusion make AI-related educational studies more reliable and easier to repeat.<sup>25</sup> Linderoth et al. posits that it is especially important to consider writings from a wide range of institutions and places to question the sociotechnical imaginations built into AI policies.<sup>26</sup> In the same way, Bulathwela et al. warn against relying only on techno-solutionist stories and push for including critical views from media that focus on equality.<sup>27</sup> Based on these points of view, the study used many different types of books (theoretical, observational, and policy-oriented) to ensure that the analysis was thorough and included everyone.

A total of 48 papers, such as journal pieces, systematic reviews, and institutional standards, were chosen for a complete review. All the sources that were used talked about at least one issue related to AI technologies, data ethics, learning fairness, or educational design. The variety of these sources made it possible to compare ideas from three different angles, which added to the reliability of the results compiled in this piece.

### Analytical Techniques and Synthesis Method

Thematic content analysis and interpretative synthesis led the analysis. A coding grid was created to classify issues, including personalised learning, algorithmic fairness, digital exclusion, teacher responsibilities, and

<sup>20</sup> Bisconti, P., McIntyre, A., and Russo, F. "Synthetic Socio-Technical Systems: Poiësis as Meaning Making." *Philosophy & Technology* 37, no. 3 (2024): 94. <https://doi.org/10.1007/s13347-024-00778-0>.

<sup>21</sup> Chen et al., "Application and Theory Gaps during the Rise of Artificial Intelligence in Education."

<sup>22</sup> Holmes and Tuomi, "State of the Art and Practice in AI in Education."

<sup>23</sup> Panciroli and Rivoltella, *Pedagogia Algoritmica. Per Una Riflessione Educativa Sull'Intelligenza Artificiale*.

<sup>24</sup> Calvo and Saura García, "Generative AI and Democracy: The Synthetification of Public Opinion and Its Impacts."

<sup>25</sup> Mouta, Pinto-Llorente, and Torrecilla-Sánchez, "Uncovering Blind Spots in Education Ethics: Insights from a Systematic Literature Review on Artificial Intelligence in Education."

<sup>26</sup> Linderoth, Hultén, and Stenliden, "Competing Visions of Artificial Intelligence in Education—A Heuristic Analysis on Sociotechnical Imaginaries and Problematizations in Policy Guidelines."

<sup>27</sup> Bulathwela et al., "Artificial Intelligence Alone Will Not Democratise Education: On Educational Inequality, Techno-Solutionism and Inclusive Tools."

data governance. Each source was carefully tagged and thematically categorised. Interpretive synthesis investigated and critiqued repeating patterns, paradoxes, and emerging insights. This method mapped conceptual links between AI advancements, educational change, and socio-ethical ramifications. Knox et al. say interpretive synthesis is necessary to understand diverse theoretical contributions, especially in growing multidisciplinary disciplines.<sup>28</sup> Secondary research analytical rigour depends on the researcher's capacity to contextualise and link complicated concepts across domains, according to Tuomi.<sup>29</sup> According to Cesaroni et al., ecological synthesis reveals underlying assumptions in AI implementation methodologies.<sup>30</sup> Chiriatti et al. stress that content analysis should include explicit arguments and tacit power dynamics in AI narratives.<sup>31</sup> Based on these ideas, the current research used a reflective lens to analyse the technical, educational, cultural, and ethical aspects of AI adoption.

This multi-stage analytical method allowed comparison readings across socio-political locations, revealing how local circumstances and institutional capacity affect AI-powered education inclusion. The researcher used analysis to question literature discrepancies and propose a fair SoTL reform.

### Ethical Considerations in Handling Published Data

Even though people do not take part in secondary study, ethical standards must still be followed when using, interpreting, and presenting written materials. All sources used in the study had to be open to the public or could be viewed through academic databases with the appropriate permissions from the institutions. Intellectual property rights were observed, and all sources used were properly mentioned in line with the Chicago Style that the publishing journal required.

Holmes et al. say that ethical research is more than just citing sources correctly; it also means thinking critically about the philosophical ideas that are built into the texts that are being studied.<sup>32</sup> Coeckelbergh says that one part of AI researchers' social duty is to think about whose views are being heard and which ones are being ignored.<sup>33</sup>

UNESCO rules encourage contextual awareness and tell researchers not to make claims about AI's benefits that apply to everyone without taking into account differences between regions. Kazimzade et al. also stress how important it is to think carefully about whether statistics, models, and theories used in academic speech are inclusive.<sup>34</sup> In line with these suggestions, the researcher paid close attention to whose knowledge systems are valued and made sure to include opinions from educational settings that are not often heard. By incorporating these moral guidelines into the research methods, the study links itself with a socially just research ethos—one that not only shows intellectual honesty but also makes a real difference in the future of inclusive education.

### Limitations of the Methodology

Secondary research has significant drawbacks despite its scope and accessibility. First, using published materials limits the researcher to pre-existing study scope, design, and assumptions. This makes real-time, context-specific data on AI application in schools, especially in the Global South, unavailable. Second, AI technologies change faster than peer-reviewed research, which may leave gaps in current discoveries. Holmes and Tuomi acknowledge that secondary data synthesis may miss emotional and relational dynamics that

<sup>28</sup> Mouta, A., Pinto-Llorente, A. M., and Torrecilla-Sánchez, E. M. "Uncovering Blind Spots in Education Ethics." *International Journal of Artificial Intelligence in Education* (2023). <https://doi.org/10.1007/s40593-023-00384-9>.

<sup>29</sup> Holmes and Tuomi, "State of the Art and Practice in AI in Education."

<sup>30</sup> Valeria Cesaroni et al., "Towards Trustworthy AI in Inclusive Education: A Co-Creation Approach Rooted in Ecological Frameworks," in *Ital-IA 2024: 4th National Conference on Artificial Intelligence, Organized by CINI*, 2024.

<sup>31</sup> Chiriatti et al., "The Case for Human-AI Interaction as System 0 Thinking."

<sup>32</sup> Holmes and Tuomi, "State of the Art and Practice in AI in Education."

<sup>33</sup> Mark Coeckelbergh, *AI Ethics* (Cambridge, MA: The MIT Press, 2020).

<sup>34</sup> Gunay Kazimzade, Yasmin Patzer, and Niels Pinkwart, "Artificial Intelligence in Education Meets Inclusive Educational Technology—the Technical State-of-the-Art and Possible Directions," in *Artificial Intelligence and Inclusive Education: Speculative Futures and Emerging Practices* (Springer, 2019), 61–73.

shape teaching and learning.<sup>35</sup> Rowe argues that algorithmic systems may be detached from educational reality without actual classroom monitoring.<sup>36</sup> Xu and Wang warn that academic publications may under-represent marginalised perspectives, particularly from distant learning environments influenced by socio-economic disturbances.<sup>37</sup> Bisconti notes that without stakeholder narratives, human-AI interactions interpretations lack local flavour.<sup>38</sup> The analysis triangulated sources across disciplines, locations, and theoretical orientations to reduce these hazards.

The limitations stated here do not diminish the study's value, but rather emphasise the need for additional empirical research. The present technique provides a solid platform for theoretical reflection and further context-sensitive enquiries.

## PRESENTATION OF RESULTS / FINDINGS

### Theme 1: The Role of AI in Customising Learning and Boosting Engagement

#### Sub-theme 1.1: Adaptive Learning and Real-Time Feedback

Adding adaptable learning tools to schools has made it much easier for teachers to adapt to students' needs and keep their attention. AI-powered systems use real-time pupil data to tailor learning paths for each student, so that they can access material at the right speed and level of difficulty. Holmes and Tuomi posit that smart teaching systems are made to notice when a student does not understand something in real time and help them in a way that fits their own growth.<sup>39</sup>

Chen et al. also state that customisable systems help students feel more independent and confident in their abilities by making them choose how they learn. Zhang and Aslan agree that these kinds of technologies make individualised review and feedback possible, which are very helpful for filling learning holes and reducing brain stress.<sup>40</sup> However, Bulathwela et al. warn that flexible systems could reinforce structural imbalances if they are not built fairly, as they could give too many advantages to students who are better at using technology. These results show that flexible systems do make learning much more interesting, but they need to be designed in a way that is fair and honest to truly change the way people learn.

#### Sub-theme 1.2: Gamification and AI-Powered Motivational Design

Gamified settings driven by AI have become very useful for keeping students interested and motivated. These systems have encouraging formulas built in that change game features like point systems, awards, and keeping track of progress to fit the learner's likes and dislikes and how they usually act. Gorenz and Schwarz explain that projects created by algorithms in gamified settings can change levels of difficulty based on how well students are doing, keeping the flow going and keeping them interested.<sup>41</sup> Panciroli and Rivoltella also say that using AI data to support encouraging design through gaming can help even the most hesitant learners stay motivated and continue.<sup>42</sup> Holmes et al. say that gamified AI tools can help students learn more and become more emotionally invested when they are used ethically.<sup>43</sup> Mouta et al., on the other hand, warn

<sup>35</sup> Holmes and Tuomi, "State of the Art and Practice in AI in Education."

<sup>36</sup> Michael Rowe, "Shaping Our Algorithms before They Shape Us," in *Artificial Intelligence and Inclusive Education: Speculative Futures and Emerging Practices* (Springer, 2019), 151–63.

<sup>37</sup> Tianyuan Xu and Huang Wang, "High Prevalence of Anxiety, Depression, and Stress among Remote Learning Students during the COVID-19 Pandemic: Evidence from a Meta-Analysis," *Frontiers in Psychology* 13 (January 10, 2023), <https://doi.org/10.3389/fpsyg.2022.1103925>.

<sup>38</sup> Bisconti, McIntyre, and Russo, "Synthetic Socio-Technical Systems: Poïesis as Meaning Making."

<sup>39</sup> Holmes and Tuomi, "State of the Art and Practice in AI in Education."

<sup>40</sup> Chen, Xiang, Xie, Haoran, Zou, Di, and Hwang, Gwo-Jen. "Application and Theory Gaps during the Rise of Artificial Intelligence in Education." *Computers and Education: Artificial Intelligence* 1 (2020): 100002. <https://doi.org/10.1016/j.caeai.2020.100002>.

<sup>41</sup> Drew Gorenz and Norbert Schwarz, "How Funny Is ChatGPT? A Comparison of Human- and A.I.-Produced Jokes," *PLOS ONE* 19, no. 7 (July 3, 2024): e0305364, <https://doi.org/10.1371/journal.pone.0305364>.

<sup>42</sup> Panciroli and Rivoltella, *Pedagogia Algoritmica. Per Una Riflessione Educativa Sull'Intelligenza Artificiale*.

<sup>43</sup> Wayne Holmes et al., "Ethics of AI in Education: Towards a Community-Wide Framework," *International Journal of Artificial Intelligence in Education* 32, no. 3 (September 9, 2022): 504–26, <https://doi.org/10.1007/s40593-021-00239-1>.

against the danger of making learning too easy, especially when external drive takes over critical involvement.<sup>44</sup> In conclusion, gamified AI systems can be very useful for teaching if they are based on real, learner-driven goals.

### **Sub-theme 1.3: Engagement through Voice Recognition and Multimodal AI Interfaces**

Voice-activated artificial intelligence (AI) and multimodal user interfaces have expanded student participation, especially for those with special needs. Flexible input techniques from speech, gesture, and visual analytics reduce barriers for learners who struggle with text-based engagement. Voice-enabled AI systems improve accessibility, especially for early learners and those with reading issues, according to Chiriatti et al.<sup>45</sup> Cesaroni et al. say multimodal AI accommodates neurodiverse learning methods, making participation more inclusive.<sup>46</sup> Tuomi further observes that multimodal interfaces allow collaborative and emotive learning, which traditional e-learning platforms neglect. Thus, AI systems with speech and multimodal tools are instructional advances that increase participation and inclusion.

## **Theme 2: Student-Centred Learning Supported by Data Analytics**

### **Sub-theme 2.1: Learning Analytics and Personalised Instruction**

AI-powered learning tools are becoming increasingly important in adapting lessons to the needs of each student. Educators can get a more complete picture of how their students are doing by collecting and examining behaviour data such as time spent on work, relationship patterns, and error rates. Sorensen says that prediction models from learning data can predict students who are likely to struggle early on.<sup>47</sup> Holmes and Porayska-Pomsta note that data platforms provide teachers real-time insights that help them vary their lessons. Zhang and Aslan point out that predictive analytics have been useful in higher education to help students navigate complicated course paths.<sup>48</sup> However, Coeckelbergh says that relying too much on data could turn students into automated profiles that do not take into account the social, emotional, and environmental factors that also affect learning.<sup>49</sup> This calls for a fair use of data analytics, where teachers use their professional judgement to determine the meaning of results and how to use them in ways that are good for teaching.

### **Sub-theme 2.2: AI-Enhanced Formative Assessment**

AI has revolutionised formative assessment, allowing dynamic student performance and knowledge gap measurement. AI-based contextualised feedback reduces evaluation turnaround time and allows quick action. Tang, Chang, and Hwang said real-time diagnostic technologies assist instructors adapt lessons to student success.<sup>50</sup> Chiusaroli says that adaptable exams promote fairness by accommodating varied learning paces and special needs.<sup>51</sup> UNESCO reiterates that AI-driven evaluation must avoid prejudice and give culturally sensitive comments for fairness and transparency. To sustain student confidence and interest, Bisconti and Carnevale recommend incorporating ethical indicators in AI evaluations, such as avoiding surveillance tendencies. This suggests that formative assessment supplemented by AI may increase student agency and openness when used with educational purpose and ethical monitoring.

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<sup>44</sup> Mouta, Pinto-Llorente, and Torrecilla-Sánchez, "Uncovering Blind Spots in Education Ethics: Insights from a Systematic Literature Review on Artificial Intelligence in Education."

<sup>45</sup> Chiriatti et al., "The Case for Human-AI Interaction as System 0 Thinking."

<sup>46</sup> Cesaroni et al., "Towards Trustworthy AI in Inclusive Education: A Co-Creation Approach Rooted in Ecological Frameworks."

<sup>47</sup> Lucy C. Sorensen, "'Big Data' in Educational Administration: An Application for Predicting School Dropout Risk," *Educational Administration Quarterly* 55, no. 3 (August 27, 2019): 404–46, <https://doi.org/10.1177/0013161X18799439>.

<sup>48</sup> Zhang and Aslan, "AI Technologies for Education: Recent Research & Future Directions."

<sup>49</sup> Coeckelbergh, *AI Ethics*.

<sup>50</sup> Kai-Yu Tang, Ching-Yi Chang, and Gwo-Jen Hwang, "Trends in Artificial Intelligence-Supported e-Learning: A Systematic Review and Co-Citation Network Analysis (1998–2019)," *Interactive Learning Environments* 31, no. 4 (May 19, 2023): 2134–52, <https://doi.org/10.1080/10494820.2021.1875001>.

<sup>51</sup> Diletta Chiusaroli, "Disabilità, Contrasto Alla Povertà Educativa Ed Inclusione: L'importanza Delle Sinergie Educative Nell'era Pandemica e Post-Pandemica," *Formazione & Insegnamento* 19, no. 1T1 (2021): 192–98.

### **Sub-theme 2.3: Learning Dashboards and Student Agency**

AI-enabled learning monitors are tools that show students' progress, performance trends, and goal completion in a way that is easy for them to understand. These platforms give students more control over their own learning by giving them practical information about their progress. Holmes and Tuomi say that students can make smart decisions about how to study and what resources to use when they have access to their own data.<sup>52</sup> Mouta et al. warn, though, that if students don't get the right help, they might get complicated visual data wrong or lose interest in learning when they see bad trends.<sup>53</sup> Bulathwela et al. also say that students should be involved in the creation of panels to ensure that the visualisations are useful and inspiring. Overall, AI-driven screens are a step toward giving students more power, but how well they work depends on how easy they are to use, how clear they are and how well teachers guide students through them.

## **Theme 3: Ethical and Governance Dimensions of AI Integration in SoTL**

### **Sub-theme 3.1: Algorithmic Fairness and Data Bias**

Fairness in AI decision-making is a major challenge, especially with biased datasets and opaque algorithms. These prejudices may marginalise learners, particularly in diverse or under-represented groups, if unchecked. According to Coeckelbergh, algorithmic processes typically reflect socio-political preconceptions in their training data.<sup>54</sup> Bulathwela et al. claim that AI systems may prefer digitally literate students, increasing digital inequalities. Mouta et al. demonstrate that many educational AI systems lack clear bias mitigation and fairness validation techniques. Calvo and Saura Garcia propose AI audit frameworks for educational ethics.<sup>55</sup> The accumulated data suggests that AI applications must be designed with fairness to improve parity in SoTL.

### **Sub-theme 3.2: Data Privacy, Surveillance, and Consent**

Since more and more educational platforms use AI, concerns about data monitoring and student consent have grown. These tools often gather detailed information about how people behave, sometimes without their clear permission. UNESCO stresses that protecting students' privacy must be at the heart of using AI in education. Holmes et al. say that collecting data without rules can make students less trusting and create settings where people are watched rather than cared for.<sup>56</sup> This is also what Chiriatti et al. say, and they warn that monitoring reasoning can normalise behaviour conformity at the price of critical thought. Cesaroni et al. suggest models of active government that give teachers and students more say over how data is used and how the platform is designed.<sup>57</sup> These results make it clear that institutions need to establish clear data control rules and ways for people to give informed consent that are in line with ethical research standards right away.

### **Sub-theme 3.3: Educator Preparedness and Institutional Readiness**

AI incorporation into SoTL necessitates instructors who are technologically knowledgeable, morally and pedagogically comfortable with AI systems. Holmes and Tuomi stress that professional development must incorporate critical AI literacy and ethical thinking beyond technical training.<sup>58</sup> According to Panciroli and Rivoltella, educator preparation affects whether AI is used to repeat obsolete educational approaches or create inclusive and participatory pedagogy. Co-creating AI tools with educators ensures relevance,

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<sup>52</sup> Holmes and Tuomi, "State of the Art and Practice in AI in Education."

<sup>53</sup> Mouta, Pinto-Llorente, and Torrecilla-Sánchez, "Uncovering Blind Spots in Education Ethics: Insights from a Systematic Literature Review on Artificial Intelligence in Education."

<sup>54</sup> Coeckelbergh, *AI Ethics*.

<sup>55</sup> UNESCO. *Guidance for Generative AI in Education and Research*. Paris: UNESCO, 2023.

<sup>56</sup> Mouta, Ana, Pinto-Llorente, Ana M., and Torrecilla-Sánchez, Eva M. "Uncovering Blind Spots in Education Ethics." *International Journal of Artificial Intelligence in Education* (2023).

<sup>57</sup> Bulathwela, Sashank, Pérez-Ortiz, Maria, Holloway, Catherine, Cukurova, Mutlu, and Shawe-Taylor, John. "Artificial Intelligence Alone Will Not Democratise Education." *Sustainability* 16, no. 2 (2024): 781. <https://doi.org/10.3390/su16020781>.

<sup>58</sup> Panciroli, Cristina, and Rivoltella, Pier Cesare. *Pedagogia Algoritmica*. Brescia: Scholé-Morcelliana, 2023.

usefulness, and cultural adaptation, according to UNESCO.<sup>59</sup> To prevent isolated, unscalable actions, Tuomi advises institutions to integrate AI techniques into the curriculum and governance changes.<sup>60</sup> The research emphasises that the adoption of revolutionary AI in SoTL depends on human leadership, accountability, and equality, not just technology.

## DISCUSSION

The results of this study show that artificial intelligence (AI) is becoming more and more in line with student-centered teaching, especially when it comes to individualised learning, involvement, and systems that can give students feedback in real time. This aligns with earlier research showing that AI could change how material is delivered in real time, making it better able to meet the needs of all types of learners. Chen et al. say that flexible systems allow for scaffolded development, which is a good way to help students with different learning speeds.<sup>61</sup> Holmes and Tuomi also found that AI-enabled teaching models give students more freedom by incorporating student comments into changes to the material that occur in real time. Zhang and Aslan found that medical performance tracking in AI systems makes students more motivated and helps them do better at school.<sup>62</sup> But these technical improvements are still situational, as Bulathwela et al. warn against digital tools that assume that all areas have the same infrastructure.<sup>63</sup> Unlike older models that taught rigidly, new data shows that AI can support each learner's unique path, but this ability needs to be supported by ethics and infrastructure to ensure everyone benefits.

Understanding the role of gaming and multidimensional AI interactions makes the importance of emotional and inclusive design in the use of AI to improve education even stronger. Panciroli and Rivoltella say that gamified settings keep students motivated by providing them with dynamic and emotionally engaging experiences that are different from traditional ways of testing. Gorenz and Schwarz show that these sites also make people laugh and be curious, which makes them more emotionally involved. Chiriatti et al. say that AI systems that recognise words and gestures make it easier for neurodiverse learners to participate. Cesaroni et al. say that co-creation models in AI design make it easier for people to use and build trust among learners. Previous research looked at motivation as something outside of teaching. However, new research sees emotional involvement as the key to student perseverance, especially in settings with few resources. As a result, the data show that any future plan for integrating AI should take into account emotional design, multimodal usability, and cultural awareness.

One important thing that can be learnt from the results is that learning analytics and screens are becoming more popular as ways to give students more control over their learning and help teachers make decisions based on data. Holmes and Porayska-Pomsta say that learning data can help teachers make perfectly targeted changes if it is visualised well.<sup>64</sup> Knox back this view by pointing out the metacognitive benefits students get from being aware of how they are progressing.<sup>65</sup> Mouta et al., on the other hand, say that if students are not shown how to make sense of these visuals, they may misunderstand them or feel anxious.<sup>66</sup>

<sup>59</sup> UNESCO. *Guidance for Generative AI in Education and Research*. Paris: UNESCO, 2023.

<sup>60</sup> Tuomi, Ilkka. "A Framework for Socio-Developmental Ethics in Educational AI." *HICSS-56* (2023).

<sup>61</sup> Holmes, Wayne, et al. "Ethics of AI in Education: Towards a Community-Wide Framework." *International Journal of Artificial Intelligence in Education*, 2022, 1–23. <https://doi.org/10.1007/s40593-021-00239-1>.

<sup>62</sup> Bulathwela, Sashika, et al. "Artificial Intelligence Alone Will Not Democratise Education: On Educational Inequality, Techno-Solutionism and Inclusive Tools." *Sustainability* 16, no. 2 (2024): 781. <https://doi.org/10.3390/su16020781>.

<sup>63</sup> Bisconti, Paolo, Andrew McIntyre, and Francesco Russo. "Synthetic Socio-Technical Systems: Poiësis as Meaning Making." *Philosophy & Technology* 37, no. 3 (2024): 94. <https://doi.org/10.1007/s13347-024-00778-0>.

<sup>64</sup> Zhang, Ke, and Aysu B. Aslan. "AI Technologies for Education: Recent Research & Future Directions." *Computers and Education: Artificial Intelligence* 2 (2021): 100025. <https://doi.org/10.1016/j.caeai.2021.100025>.

<sup>65</sup> Jeremy Knox, "What Does the 'Postdigital' Mean for Education? Three Critical Perspectives on the Digital, with Implications for Educational Research and Practice," *Postdigital Science and Education* 1, no. 2 (October 23, 2019): 357–70, <https://doi.org/10.1007/s42438-019-00045-y>.

<sup>66</sup> Mouta, Pinto-Llorente, and Torrecilla-Sánchez, "Uncovering Blind Spots in Education Ethics: Insights from a Systematic Literature Review on Artificial Intelligence in Education."

Bulathwela et al. also warn that too much exposure to analytics could create a society that is focused on data and does not value the more important parts of learning.<sup>67</sup> There is a debate going on in AI-enhanced education about how to balance the need for data empowerment and over-surveillance. This debate needs a complex, dialogical approach between system design and instructional purpose.

There are many things that this means for teachers, students, and lawmakers. For teachers, AI opens up new ways to switch from reactive to proactive teaching methods by letting them spot early signs of disinterest and poor performance. Tang, Chang, and Hwang say that teachers who have access to real-time data can change how they teach based on what students need right now.<sup>68</sup> Chiusaroli adds that customisable tools may help students with disabilities the most when they are set up in a way that includes everyone.<sup>69</sup> According to the UNESCO policy rules for 2023, AI should only be used in schools if teachers get a lot of training on how to use it. Holmes et al. argue that community-driven ethics models should be used to give teachers control over how AI systems are used.<sup>70</sup> For students, being able to see more about how they learn may help them become more self-aware and take more responsibility for their work, but this must be weighed against the risk of misinterpreting the data. Meanwhile, policymakers are in charge of building the rules and infrastructure that will make inclusive AI a reality rather than a dream.

Even with these chances, there are still many ethical problems, especially when it comes to computer justice, data bias, and spying. Coeckelbergh states that unchecked automated choices can strengthen biases, especially when training data are based on incorrect sociocultural assumptions.<sup>71</sup> This worry is echoed by Bulathwela et al., who say that AI systems could repeat patterns of exclusion if they are not tested to see if they are fair for all user groups. Mouta et al. also warn that computer logic is often hard to understand, making it hard for students and teachers to question or disagree with results.<sup>72</sup> According to Calvo and Saura Garcia, the risks of unfair AI adoption can be reduced by implementing official reporting processes and involving stakeholders.<sup>73</sup> These results highlight a basic paradox: AI has the potential to change the way everyone learns, but this potential can only be achieved when it is governed by democratic principles, data openness, and ethical self-reflection.

Adding AI to school settings is made even more difficult by concerns about privacy. UNESCO's 2023 advice stresses that institutions should have clear rules about data keeping, permission, and student privacy before using AI. Holmes et al. show that a lot of current educational platforms do not tell users how their data is used, kept, or made money, which hurts trust.<sup>74</sup> Chiriatti et al. say that constant monitoring can make behaviour conformity usual, which goes against the goals of emancipatory education.<sup>75</sup> Cesaroni et al. suggest approaches to data governance that involve students and teachers more and give them control instead of controlled platforms or companies.<sup>76</sup> These new ideas make it even more important for schools to have ethical data policies that do more than just follow the rules. These policies should also address the bigger issues of power, liberty, and justice in digital learning.

In the end, the results show that AI is not just a tool, but also a force that can change the Scholarship of Teaching and Learning (SoTL). However, this change must be carefully planned, rooted in the right context, and morally solid. The research supports the idea that AI systems can improve teaching and learning

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<sup>67</sup> Bulathwela et al., "Artificial Intelligence Alone Will Not Democratise Education: On Educational Inequality, Techno-Solutionism and Inclusive Tools."

<sup>68</sup> Tang, Chang, and Hwang, "Trends in Artificial Intelligence-Supported e-Learning: A Systematic Review and Co-Citation Network Analysis (1998–2019)."

<sup>69</sup> Chiusaroli, "Disabilità, Contrasto Alla Povertà Educativa Ed Inclusione: L'importanza Delle Sinergie Educative Nell'era Pandemica e Post-Pandemica."

<sup>70</sup> Holmes et al., "Ethics of AI in Education: Towards a Community-Wide Framework."

<sup>71</sup> Coeckelbergh, *AI Ethics*.

<sup>72</sup> Mouta, Pinto-Llorente, and Torrecilla-Sánchez, "Uncovering Blind Spots in Education Ethics: Insights from a Systematic Literature Review on Artificial Intelligence in Education."

<sup>73</sup> Calvo and Saura García, "Generative AI and Democracy: The Synthetification of Public Opinion and Its Impacts."

<sup>74</sup> Holmes et al., "Ethics of AI in Education: Towards a Community-Wide Framework."

<sup>75</sup> Chiriatti et al., "The Case for Human–AI Interaction as System 0 Thinking."

<sup>76</sup> Cesaroni et al., "Towards Trustworthy AI in Inclusive Education: A Co-Creation Approach Rooted in Ecological Frameworks."

through tailoring, engagement, and data. However, to work with these systems, teachers, schools, and governments must be ready to use these tools with care and vigilance. In this way, the future of AI in education is not determined by technology itself, but by the decisions made by the people who make, control and use it.

## **RECOMMENDATIONS**

The study suggests that institutions should formulate policies that guide the ethical and pedagogical use of AI in teaching and learning. Such policies should protect student data and privacy by ensuring that they protect data privacy and ensure that the use of AI remains within the institutional pillars of inclusivity and fairness. Universities without incorporating outside frameworks, duplicating integrated adaptive policies should address their particular contexts, priorities, and capabilities. Implementation, risk management, and responsible innovation, especially within the teaching and learning domains, require defined governance frameworks.

As part of their transformative strategies, institutions should allocate adequate resources to advance the professional learning of their staff, particularly in the area of AI. Training and development should focus on advanced use of AI, consider the ethical implications, and provide guidance on deliberate, data-informed pedagogy. Educators should be empowered through the frameworks of continuous professional learning to use AI in a manner that illustrates their professional discretion and creativity.

A major investment in digital infrastructure necessary to provide equitable access to AI-enabled education is one of the key recommendations of this study. Without sufficient financial investment in reliable internet access, current generation hardware, and interoperable systems, AI enabled learning will fail to reach its transformative potential. Besides the investment, there should be frameworks to enhance inclusivity, including support to students from marginalised groups and the development of AI systems that address the dominant linguistic and cultural contexts. Therefore, infrastructure development should focus on access, sustainability, and contextual relevance.

The study further recommends that educational institutions construct comprehensive ethical and regulatory barriers to contain the morality and legality of artificial intelligence in education as much as possible. Internal documents should be designed to ensure the principles of openness, responsibility, and equity of all AI use in teaching, learning, and assessment. There should be AI bias and misuse monitoring tools that are regularly scheduled. Institutions should consider ethical governance as a moving target that advances as technology and other relevant changes shift.

Finally, there must be a concerted effort to further facilitate innovative ways that describe the pedagogical, psychological, and sociocultural influences of AI in education. Future members should embrace longitudinal participatory frameworks to study AI application patterns in learner participation, teachers' self-concept, and tall aspects of school culture and climate. This evidence will be crucial in the development of policies and practices to ensure AI complements the human aspect of education. These recommendations are designed to guarantee that AI will be the basis for a new, sustained, inclusive, and ethical framework to transform SoTL to a more vibrant and equitable field of practice.

## **CONCLUSION**

The results of this study show how important AI is for rethinking the Scholarship of Teaching and Learning (SoTL). AI technologies such as adaptable learning systems, clever coaching, and learning analytics, could make lessons much more relevant to each student, get them more involved, and help them learn more. Using student-centered teaching along with AI-driven observations has helped teachers make better decisions based on data. But this change does not come without problems, especially when it comes to social responsibility, digital inequality, and how ready schools and other institutions are. Since these problems exist, change needs to look at them from many angles.

During this conversation, it has become clear that in order for AI to truly help achieve open and successful educational goals, establishment priorities and policies need to be re-evaluated. Steps that must

be taken include creating ethical control systems, strengthening the digital infrastructure, and encouraging teachers to continue learning and growing. A dedication to area uniqueness is also very important. This ensures that AI solutions can adapt to the social, cultural, and economic conditions of each school. The relationship between new technologies and fair schooling needs to be taken into account in future plans so that digital growth does not make inequality worse.<sup>77</sup>

In conclusion, the changes in SoTL in the age of AI provide a once-in-a-lifetime opportunity to rethink what teaching and learning really are about. The future of education is not in technology itself, but in how teachers, lawmakers, and students choose to use it. The educational community can build a strong, fair, and flexible system by incorporating ethics, inclusion, and self-reflection into every step of AI integration. This piece added to that vision by bringing together recent changes and showing how to move toward an education future that is focused on students, based on data, and based on ethics.

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