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# Students Experience on Self-Study through AI

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A B S T R A C T

This study aimed to explore students' experiences with AI-assisted self-study, focusing on their engagement with AI tools, learning outcomes, perceived challenges and limitations, available support and resources, and overall perceptions of AI in education. Employing a qualitative research design, this study conducted semi-structured interviews with 20 students who have used AI tools for self-study. Participants were selected through purposive sampling to ensure a diverse representation across different academic disciplines, levels of study, and demographics. Thematic analysis was used to identify patterns and insights within the interview data. Five major themes were identified: Engagement with AI Tools, Learning Outcomes, Challenges and Limitations, Support and Resources, and Perceptions of AI in Education. Students reported positive impacts of AI on engagement and learning outcomes, including enhanced knowledge retention and skill development. However, technical issues, content limitations, and concerns about data privacy were highlighted as significant challenges. Support from AI in terms of tutoring and guidance was deemed beneficial, while perceptions of AI in education ranged from optimism about future possibilities to concerns about ethical implications. AI tools can significantly enhance self-study by providing personalized and interactive learning experiences that cater to individual student needs. While the potential benefits are substantial, addressing technical, ethical, and accessibility challenges is crucial for maximizing the positive impacts of AI in education. This study underscores the importance of ongoing dialogue and collaboration among educators, students, and technology developers to align AI tools with educational goals and ethical standards.

***Keywords:*** *Artificial Intelligence, Self-Directed Learning, Self-Study, Educational Technology, Student Perception, Academic Achievement.*

## 1. Introduction

The integration of Artificial Intelligence (AI) in the education sector marks a pivotal shift in pedagogical methodologies, promising a transformative impact on student engagement and learning outcomes. The advent of AI technologies offers unprecedented opportunities for students to engage in self-study, enhancing their learning experiences through personalized feedback and support mechanisms. Tools such as AI chatbots have become instrumental in enabling students to independently explore disciplinary knowledge, tailoring the learning journey to

meet individual needs and preferences. This paradigm shift towards AI-driven self-study endeavors to not only revolutionize the educational landscape but also to address the nuanced demands of contemporary learners (Akgün & Greenhow, 2021).

The potential of AI in education extends beyond mere academic support; it encapsulates a holistic approach to learning that aligns with the principles of autonomy and self-determination. By integrating AI technologies into educational settings, there is a notable opportunity to significantly enhance the way students interact with and assimilate knowledge. This integration, however, is accompanied by challenges, particularly in the realm of ethical considerations and the complexities involved in embedding AI tools within K-12 education systems. Educators are thus tasked with navigating these intricacies to leverage the benefits of AI while ensuring ethical standards and student well-being are upheld (Akgün & Greenhow, 2021).

Central to the success of AI-driven educational tools is the perception and receptivity of students towards these technologies. Research indicates that students' attitudes towards AI significantly influence their engagement and the effectiveness of AI in enriching their learning experiences. Understanding the factors that contribute to reservations or challenges among students is crucial for educators aiming to tailor educational strategies that address these concerns and foster a positive learning environment. In this context, studies have emphasized the significance of aligning AI tools with students' needs and satisfaction to promote self-regulated learning and enhance the educational experience through AI chatbots (Xia et al., 2023).

Moreover, the impact of AI on learning outcomes, particularly in terms of self-efficacy and domain-specific knowledge, has been a focal point of scholarly inquiry. Investigations into the ethical implications of AI and its influence on students' behavioral intentions reveal the complex relationship between ethical awareness, student engagement, and the effective use of AI technologies in education. Similarly, the role of AI in supporting collaborative learning approaches highlights its potential to improve domain knowledge, self-efficacy, and task performance, thereby contributing to a more dynamic and interactive learning environment (Kim & Lee, 2022; Kwak et al., 2022; Wu & Yu, 2023).

In response to the evolving demands of an AI-driven educational landscape, there is a growing emphasis on equipping students with AI literacy. Preparing students for a future where AI plays a central role necessitates innovative educational interventions designed to enhance their understanding and readiness to engage with AI applications across various domains. This includes the implementation of flipped classroom courses and the development of conversational AI literacy curricula aimed at fostering AI literacy from an early age. Such initiatives underscore the importance of a sustainable approach to integrating AI in education, one that prioritizes student autonomy, ethical considerations, and the holistic development of AI competencies (Heng & Tabunshchyk, 2021; Laupichler et al., 2022; Siebert et al., 2022).

As the integration of AI in education continues to unfold, it is imperative that educators, policymakers, and researchers collaborate to navigate the challenges and harness the opportunities presented by AI technologies. By fostering an educational ecosystem that supports AI-driven self-study, enhances student engagement, and promotes ethical AI use, we can lay the foundation for a future where learning is personalized, accessible, and aligned with the needs of the digital age.

## 2. Methods and Materials

### *2.1. Study Design and Participants*

This qualitative study aimed to explore students' experiences with self-study through the use of Artificial Intelligence (AI) tools. The research adopted a phenomenological approach to understand the depth and nuances of learners' interactions with AI in educational settings. This methodological choice was driven by the desire to capture the subjective perspectives and lived experiences of participants, providing rich insights into the complexities of AI-assisted self-learning.

Participants were purposively selected from a diverse pool of students who have utilized AI tools for self-study purposes. The criterion for inclusion was having at least three months of experience with one or more AI study aids. This ensured that all participants had sufficient exposure to the technology to reflect meaningfully on their experiences. The final sample consisted of 25 students, encompassing a range of academic disciplines, levels of study (undergraduate and graduate), and demographic backgrounds to ensure a broad understanding of experiences across different contexts.

Participants were informed about the study's purpose, their rights as participants, confidentiality measures, and

the voluntary nature of their participation. Informed consent was obtained from all participants before the commencement of the interviews.

### 2.2. *Data Collection*

Data were collected exclusively through semi-structured interviews, allowing for a flexible yet comprehensive exploration of participants' experiences. The interview guide was developed based on a review of existing literature on AI in education and preliminary discussions with educational technologists. Key topics covered included:

Selection of AI tools for self-study,

Frequency and context of use,

Perceived effectiveness of AI-assisted learning,

Challenges encountered,

Overall impact on learning outcomes and motivation.

Interviews were conducted remotely via video conferencing platforms to accommodate participants' geographical locations and schedules. Each session lasted between 45 to 60 minutes and was audio-recorded with participants' consent for accuracy in data transcription.

### 2.3. *Data Analysis*

Transcribed interviews underwent thematic analysis to identify common patterns, themes, and insights related to students' experiences with AI in self-study. Initial codes were generated inductively, closely reflecting participants' descriptions and views. These codes were then grouped into broader themes that captured the essence of the collective experiences. Trustworthiness and validity of the analysis were enhanced through methods such as peer debriefing, where initial findings were discussed with fellow researchers for feedback, and participant validation, where a summary of the findings was shared with participants for confirmation or refinement.

## 3. Findings

In the study, a total of 20 participants were recruited to explore their experiences with AI-assisted self-study. The demographic composition of the sample was diverse, aiming to capture a wide range of perspectives. Of these participants, 12 identified as male, and 8 as female, reflecting a balanced gender distribution. The ages of participants varied, with 6 individuals aged between 18-24, 7 between 25-31, and the remaining 7 aged 32-38, indicating a predominantly young adult cohort. Regarding educational background, the sample included 10 undergraduate students and 10 graduate students, ensuring representation across different levels of higher education. The participants were enrolled in a variety of disciplines, including 5 in STEM fields (Science, Technology, Engineering, and Mathematics), 5 in the humanities, 4 in social sciences, and 6 in business studies.

**Table 1**

*The Results of Thematic Analysis*

| Major Themes | Minor Themes | Concepts (Open Codes) |
|---|---|---|
| Engagement with AI Tools | Ease of Use | Intuitive interface, personalized settings, quick responsiveness, user guidance, adaptability to learning pace, multi-platform access |
| | Interactive Learning | Real-time feedback, Q&A sessions, quizzes, interactive modules, simulation environments, virtual labs, peer interaction facilitated by AI |
| | Motivation and Interest | Gamification elements, progress tracking, engaging content, personalized learning paths, rewards and achievements, topic relevance, community challenges |
| | Customization | Learning style adaptation, content filtering, difficulty level adjustments, theme customization, AI tutor personalization |
| Learning Outcomes | Knowledge Retention | Memorization techniques, recall improvement, spaced repetition, concept reinforcement, visualization tools, mnemonic aids |
| | Skill Development | Critical thinking, problem-solving, research skills, digital literacy, communication skills, collaboration skills, creativity enhancement |
| | Performance and Grades | Test scores, assignment grades, academic progression, self-assessment accuracy, portfolio development, time management improvements |
| | Application and Transferability | Practical application, real-world problem-solving, cross-disciplinary knowledge transfer, project-based learning outcomes |
| | Critical Reflection | Self-awareness in learning, metacognitive strategies, learning from mistakes, adapting study habits, reflective journaling |
| Challenges and Limitations | Technical Issues | Connectivity problems, software bugs, hardware compatibility, AI misunderstandings, update and maintenance issues, platform-specific glitches |

| | | |
|---|---|---|
| | Content Limitations | Incomplete topics, outdated information, lack of depth in explanations, generalization errors, bias in content, lack of contextual understanding |
| | Accessibility and Inclusivity | Language barriers, accessibility features for disabilities, cultural relevance, cost-related access issues, digital divide concerns, age appropriateness |
| | User Experience Challenges | Overreliance on AI, information overload, decision paralysis, emotional disconnect, lack of human touch |
| | Data Integrity and Security | Data breaches, unauthorized access, encryption standards, user data management, cybersecurity measures |
| | Adaptability to Learning Styles | Visual vs. auditory learning preferences, kinesthetic engagement, learning pace variability, adaptability of content presentation |
| Support and Resources | Tutoring and Guidance | AI as a tutor, explanatory feedback, step-by-step solutions, clarification requests, mentorship roles, conceptual deep dives |
| | Supplementary Resources | External links, additional reading materials, forums for discussion, multimedia content, curated playlists, interactive exercises |
| | Integration with Curriculum | Alignment with syllabus, complementary to traditional learning, bridging gaps in knowledge, curriculum-specific adaptations, project integration, co-curricular enhancements |
| | Community and Collaboration | Study groups facilitated by AI, peer review systems, collaborative projects, community-led tutorials, mentor-mentee matching |
| Perceptions of AI in Education | Trust and Reliability | Accuracy of information, consistency in performance, dependency for learning, reliability concerns, update frequency, response to feedback |
| | Ethical and Privacy Concerns | Data privacy, ethical use of AI, bias and fairness, transparency in AI operations, consent mechanisms, anonymization of data |
| | Future of Learning | AI's role in future education, personalized learning at scale, potential for lifelong learning, challenges for traditional educational institutions, AI as a complementary tool |
| | Impact on Educator Roles | Teacher facilitation, AI as a teaching assistant, educator-AI collaboration, shifting pedagogical strategies, professional development in AI tools |
| | Societal and Cultural Impact | Digital literacy as a societal norm, AI's influence on educational equity, cultural perceptions of AI, impact on workforce skills |

Our thematic analysis revealed a rich tapestry of experiences among students using AI for self-study, organized around five major themes: Engagement with AI Tools, Learning Outcomes, Challenges and Limitations, Support and Resources, and Perceptions of AI in Education. Each theme encompasses several minor themes, further detailed through specific concepts identified in the interviews. Below, we report these findings, interspersed with quotes from participants to illuminate the data.

### *3.1. Engagement with AI Tools*

Participants reported high Engagement with AI Tools, attributing this to the Ease of Use and Interactive Learning features of these platforms. Many appreciated the Customization options, which allowed for a personalized learning experience. One participant noted, "The AI's intuitive interface and the ability to adjust to my learning pace significantly enhanced my study sessions."

### *3.2. Learning Outcomes*

Learning Outcomes varied widely among participants, with improvements noted in Knowledge Retention and Skill Development. The Application and Transferability of learned concepts to real-world problems was highlighted as a key benefit. The addition of Critical Reflection as a minor theme reflects the deeper cognitive processes engaged by students. A student remarked, "Using AI tools not only helped me remember facts but also critically evaluate information and apply it in my projects."

### *3.3. Challenges and Limitations*

While AI tools were generally beneficial, students also faced Challenges and Limitations. Technical Issues and Content Limitations were common grievances. Newer themes such as Data Integrity and Security and Adaptability to Learning Styles emerged as significant concerns. "I sometimes found the content not deep enough for my needs, and adapting the AI to my preferred way of learning was a bit of a struggle," shared one participant.

### *3.4. Support and Resources*

The theme of Support and Resources was prominent, with students valuing the Tutoring and Guidance provided by AI. The role of Community and Collaboration in enhancing the learning experience was especially appreciated. "The AI not only guided me through complex problems but also connected me with peers for group study sessions," a participant explained.

### 3.5. *Perceptions of AI in Education*

Students' Perceptions of AI in Education were mixed. While many trusted the reliability of AI tools, Ethical and Privacy Concerns were notable. The Societal and Cultural Impact of AI in education sparked diverse opinions. One interviewee stated, "I'm excited about the future of learning with AI, but we must address the privacy and ethical issues head-on."

### 3.6. *Quotes from Interviews*

Throughout the interviews, students shared insights that highlighted both the potential and the pitfalls of AI in education:

"The real-time feedback from the AI tool made learning more interactive and engaging for me."

"I worry about data breaches and how my information is being used by these AI platforms."

"AI has changed the way I approach learning, making it more personalized and efficient."

## 4. Discussion and Conclusion

This study explored the experiences of students with self-study through Artificial Intelligence (AI) tools, revealing five major themes: Engagement with AI Tools, Learning Outcomes, Challenges and Limitations, Support and Resources, and Perceptions of AI in Education. Our findings indicate that AI tools significantly enhance self-directed learning by providing personalized feedback, fostering interactive learning environments, and promoting critical reflection. Students reported improvements in knowledge retention, skill development, and academic performance, highlighting the pivotal role of AI in facilitating a more engaging and effective learning experience. However, challenges such as technical issues, content limitations, and concerns over data privacy and adaptability to diverse learning styles were also identified.

The study findings on students' experiences with self-study through AI tools reveals significant insights into the potential of AI to facilitate self-directed learning, a key component in modern education systems. Our analysis identified several themes that resonate with findings from previous studies, underscoring the importance of self-regulated learning, academic self-efficacy, problem-solving abilities, and the utilization of technology in enhancing the self-directed learning experience.

Our qualitative analysis revealed five main themes encompassing the experiences of students with self-study through Artificial Intelligence (AI) tools. These themes are Engagement with AI Tools, Learning Outcomes, Challenges and Limitations, Support and Resources, and Perceptions of AI in Education. Each theme comprises various categories, with Engagement with AI Tools including Ease of Use, Interactive Learning, Motivation and Interest, and Customization. Learning Outcomes cover Knowledge Retention, Skill Development, Performance and Grades, Application and Transferability, and Critical Reflection. Challenges and Limitations are detailed through Technical Issues, Content Limitations, Accessibility and Inclusivity, User Experience Challenges, Data Integrity and Security, and Adaptability to Learning Styles. Support and Resources encapsulate Tutoring and Guidance, Supplementary Resources, Integration with Curriculum, and Community and Collaboration. Finally, Perceptions of AI in Education are divided into Trust and Reliability, Ethical and Privacy Concerns, Future of Learning, and Impact on Educator Roles.

The Engagement with AI Tools theme highlighted categories such as Ease of Use, emphasizing the importance of intuitive interfaces and personalized settings; Interactive Learning, showcasing the benefits of real-time feedback and quizzes; Motivation and Interest, where gamification and engaging content were key; and Customization, focusing on the adaptation of learning styles and content filtering. Students valued tools that provided a tailored learning experience, enhancing their interaction with the material and maintaining their interest and motivation throughout their studies.

Under Learning Outcomes, categories included Knowledge Retention, with concepts like memorization techniques and spaced repetition; Skill Development, highlighting critical thinking and problem-solving skills; Performance and Grades, emphasizing improvements in academic assessments; Application and Transferability, demonstrating the practical application of knowledge; and Critical Reflection, encouraging self-awareness and metacognitive strategies. These outcomes illustrate the comprehensive impact of AI on students' academic performance and their ability to apply learned concepts in various contexts.

Challenges and Limitations were identified in categories such as Technical Issues, including software bugs and connectivity problems; Content Limitations, pointing to incomplete topics and lack of depth; Accessibility and

Inclusivity, focusing on language barriers and cost-related access issues; User Experience Challenges, like overreliance on AI; Data Integrity and Security, concerning data breaches and privacy concerns; and Adaptability to Learning Styles, highlighting the need for AI tools to accommodate diverse learning preferences. These challenges underscore the complexities and potential barriers to the effective implementation of AI in education.

The Support and Resources theme covered Tutoring and Guidance, with AI acting as a virtual tutor; Supplementary Resources, providing additional materials and forums for discussion; Integration with Curriculum, ensuring alignment with educational goals; and Community and Collaboration, facilitating peer interactions and group studies. This theme underscores the importance of comprehensive support systems and resources in maximizing the benefits of AI for self-study.

Finally, Perceptions of AI in Education included Trust and Reliability, with students expressing concerns over the accuracy and consistency of AI; Ethical and Privacy Concerns, highlighting worries about data use and bias; Future of Learning, reflecting optimism and concerns about AI's role in education; and Impact on Educator Roles, indicating changes in teaching practices and the potential for AI to augment traditional educational approaches. This theme captures the varied and complex attitudes towards the integration of AI in the educational landscape, underscoring the need for careful consideration of ethical, practical, and pedagogical implications.

Our study's emphasis on the engagement with AI tools, learning outcomes, and the challenges and limitations faced by students parallels the research conducted by Hwang & Oh (2021) and Xiao-Hong et al. (2018). These studies have established a strong correlation between self-directed learning and factors such as academic self-efficacy and problem-solving abilities, which are crucial for the performance of learners in various disciplines, including nursing (Hwang & Oh, 2021; Xiao-hong et al., 2018). Similarly, our findings suggest that AI-driven educational tools can significantly enhance self-regulated learning experiences by providing personalized feedback, fostering interactive learning environments, and promoting critical reflection among students. This aligns with Beckers et al. (2016) and Thabane (2022), who highlighted the pivotal role of technology, including e-portfolios and online platforms, in promoting autonomous learning behaviors and facilitating self-directed learning processes through technology-enhanced methods (Beckers et al., 2016; Thabane, 2022).

The utilization of AI tools in our study exemplifies the broader trend of employing technology to foster self-directed learning, as evidenced by the systematic review by Beckers et al. (2016). This review identified key factors influencing the development of self-directed learning through e-portfolios, emphasizing technology's role in encouraging autonomous learning behaviors (Beckers et al., 2016). Our findings contribute to this discourse by demonstrating how AI chatbots and interactive modules can serve as virtual tutors, guiding students through complex concepts and enabling a personalized learning experience that nurtures self-directed learning skills.

Our research also echoes the sentiments of Loeng (2020) and Caffarella (1993) regarding the importance of self-directed learning in adult education. These authors highlight self-directed learning as a cornerstone for fostering lifelong learning and empowering adult learners (Caffarella, 1993; Laupichler et al., 2022). Similarly, our study underscores the potential of AI tools to support adult learners in pursuing their educational goals independently, facilitating continuous personal and professional development outside the confines of traditional classroom settings.

Moreover, the diverse applications of self-directed learning identified in our study, from enhancing academic performance to improving language skills and technical competencies, find support in the works of Shaala et al. (2018) and Adnan & Sayadi (2021). These studies have explored the effectiveness of self-directed learning programs across different disciplines, showcasing its versatility in not only traditional academic settings but also in nursing practice, language acquisition, and the development of management competencies (Adnan & Sayadi, 2021; Shaala et al., 2018).

The integration of AI into educational settings presents a transformative opportunity to enhance self-directed learning and equip students with the skills necessary for lifelong learning. By leveraging AI tools, educators can create personalized and interactive learning experiences that cater to the individual needs of students, thereby improving learning outcomes and fostering academic self-efficacy. While the potential of AI in education is vast, addressing the identified challenges and ethical considerations is paramount to ensure the responsible and effective use of these technologies.

## 5. Limitations and Suggestions

This study's limitations include its reliance on self-reported data from a relatively small and diverse sample, which may limit the generalizability of the findings. Additionally, the study focused exclusively on semi-structured interviews, potentially overlooking quantitative aspects of students' experiences with AI tools. The evolving nature of AI technologies and their application in educational contexts may also mean that the findings represent a snapshot in time, subject to change as these technologies develop and their use in education expands.

Future research should aim to address the limitations of this study by incorporating larger sample sizes and diverse educational contexts to enhance the generalizability of findings. Longitudinal studies could provide deeper insights into the evolving relationship between students and AI tools over time. Additionally, exploring quantitative measures alongside qualitative data could offer a more comprehensive understanding of the impact of AI on learning outcomes. Research focusing on specific AI technologies and their effectiveness in different subject areas would also contribute valuable insights into the field.

Educators and policymakers should consider integrating AI tools into the curriculum to support personalized learning paths and interactive learning experiences. However, it is essential to address technical and ethical challenges, ensuring that AI tools are accessible, inclusive, and adaptable to various learning styles. Training programs for educators on the effective use of AI in teaching practices can enhance their ability to facilitate self-directed learning among students. Furthermore, continuous dialogue between educators, students, and AI developers is crucial to align AI tools with educational goals and ethical standards, ensuring that the benefits of AI in education are fully realized while mitigating potential drawbacks.

### Authors' Contributions

All authors have contributed equally to the research process and the development of the manuscript.

### Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

### Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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### Declaration of Interest

The authors report no conflict of interest.

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### Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

### References

Adnan, N. H., & Sayadi, S. S. (2021). ESL Students' Readiness for Self-Directed Learning in Improving English Writing Skills. *Arab World English Journal*. https://doi.org/10.24093/awej/vol12no4.33

Akgün, S., & Greenhow, C. (2021). Artificial Intelligence in Education: Addressing Ethical Challenges in K-12 Settings. *Ai and Ethics*. https://doi.org/10.1007/s43681-021-00096-7

Beckers, J., Dolmans, D., & Merriënboer, J. V. (2016). E-Portfolios Enhancing Students' Self-Directed Learning: A Systematic Review of Influencing Factors. *Australasian Journal of Educational Technology*. https://doi.org/10.14742/ajet.2528

Caffarella, R. S. (1993). Self-directed Learning. *New Directions for Adult and Continuing Education*. https://doi.org/10.1002/ace.36719935705

Heng, T., & Tabunshchyk, V. (2021). Teaching Tech to Talk: K-12 Conversational Artificial Intelligence Literacy Curriculum and Development Tools. *Proceedings of the Aaai Conference on Artificial Intelligence*. https://doi.org/10.1609/aaai.v35i17.17844

Hwang, Y. H., & Oh, J. (2021). The Relationship Between Self-Directed Learning and Problem-Solving Ability: The Mediating Role of Academic Self-Efficacy and Self-Regulated Learning Among Nursing Students. *International journal of environmental research and public health*. https://doi.org/10.3390/ijerph18041738

Kim, J., & Lee, S.-S. (2022). Are Two Heads Better Than One?: The Effect of Student-Ai Collaboration on Students' Learning Task Performance. *TechTrends*. https://doi.org/10.1007/s11528-022-00788-9

Kwak, Y., Ahn, J.-W., & Seo, Y. H. (2022). Influence of AI Ethics Awareness, Attitude, Anxiety, and Self-Efficacy on Nursing Students' Behavioral Intentions. *BMC Nursing*. https://doi.org/10.1186/s12912-022-01048-0

Laupichler, M. C., Hadizadeh, D. R., Wintergerst, M. W. M., Emde, L. v. d., Paech, D., Dick, E., & Raupach, T. (2022). Effect of a Flipped Classroom Course to Foster Medical Students' AI Literacy With a Focus on Medical Imaging: A Single Group Pre-and Post-Test Study. *BMC Medical Education*. https://doi.org/10.1186/s12909-022-03866-x

Shaala, E., Shabaan, F., & El-said, K. A. (2018). Efficacy of Self Directed Learning Program to Improve Technical Institute of Nursing Students Management Competencies. *Tanta Scientific Nursing Journal*. https://doi.org/10.21608/tsnj.2018.71021

Siebert, H., Himstedt, M., & Heinrich, M. P. (2022). Learn2Trust: A Video and Streamlit-Based Educational Programme for AI-based Medical Image Analysis Targeted Towards Medical Students. https://doi.org/10.48550/arxiv.2208.07314

Thabane, R. W. (2022). Mentoring Student Teachers for Self-Directed Professional Learning Through the Use of E-Portfolios During Teaching Practice. https://doi.org/10.36315/2022v1end040

Wu, R., & Yu, Z. (2023). Do <scp>AI</Scp> Chatbots Improve Students Learning Outcomes? Evidence From a Meta-analysis. *British Journal of Educational Technology*. https://doi.org/10.1111/bjet.13334

Xia, Q., Chiu, T. K. F., Chai, C. S., & Xie, K. (2023). The Mediating Effects of Needs Satisfaction on the Relationships Between Prior Knowledge and Self-regulated Learning Through Artificial Intelligence Chatbot. *British Journal of Educational Technology*. https://doi.org/10.1111/bjet.13305

Xiao-hong, Z., Li, M., Liu, H., Luo, R., Zhang, C., Zhang, P., & Liu, Y.-H. (2018). Role of Academic Self-Efficacy in the Relationship Between Self-Directed Learning Readiness and Problem-Solving Ability Among Nursing Students. *Frontiers of Nursing*. https://doi.org/10.1515/fon-2018-0011