A Symbiotic Approach: AI and Educators Shaping the Future of Education

Dr. Shikha Agarwal[1], Prof. Archana Singhal[2], Akansha Pundir[3], Anshika Chauhan[4], Shruti Singh[5]
University of Delhi, Delhi, India.

Abstract—**Due to the growing trend of integrating AI-based Adaptive Learning (AL) into education, and its role within the broader landscape of influence of Artificial Intelligence (AI) on education, study in this paper highlights its numerous advantages for students and educators both. However, concerns persist regarding the potential displacement of teachers by AI driven applications. Present work examines the impact of this scenario on academic performance of students, their mental well-being, along with the comparison of this scenario with unique qualities of human educators. To address these concerns, a survey was also conducted to understand students' perspectives on the integration of AI-based AL in education. This study also highlights the importance of addressing the challenges that come with introducing AL, as it could widen educational gaps. The goal is to advocate for a collaborative relationship of AI and teachers in education. Arguments are provided that while AI can enhance educational practices, it cannot completely replace the diverse roles and empathetic interactions provided by human teachers. Present work proposes a future for AI in education that embraces a collaborative approach, using technology to complement and enhance rather than replace the invaluable contributions of human educators. The proposed work has been given strong support based on the study and results given in this paper.**

Index Terms—**AI, Adaptive Learning, Education, Human Instructors,**

I. INTRODUCTION

In the changing world of education, the use of AI-based Adaptive Learning (AL) systems shows how technology can personalize learning experiences. These systems have the ability to adapt tasks according to each student's abilities, which is a big change in traditional teaching methods. Moreover, Artificial Intelligence (AI) is also significantly influencing classroom dynamics, facilitating the personalized teaching of each student. UNESCO has also recognized how AI can help solve problems in education, highlighting its significant impact on learning worldwide. As AI-based Adaptive Learning becomes more important, we wonder if it helps bridge the gap in learning or makes it worse. And a question arises: Can AI replace human teachers? AI excels at tasks but falls short in mirroring human thought processes and adaptability, highlighting a fundamental difference in cognitive abilities. This paper looks at AI-based AL in education, including its benefits, potential impact on widening the educational gaps, ethical concerns, and how AI and human teachers can work together to make learning better. Present work shows that using AI in collaboration with human teachers can improve education, instead of taking their place.

II. BACKGROUND

Adaptive Learning (AL) has a rich history and has evolved significantly in the realm of education. It began with early computer-based systems in the 1970s, focusing on personalized learning paths for students. Over time, advancements in data analytics, machine learning, and Artificial Intelligence (AI) have propelled AL to new heights. These technologies enable AL systems to analyze student performance data, understand learning patterns, and tailor content and activities accordingly. AL systems can tailor tasks based on students' proficiency levels.

III. LITERATURE REVIEW

The study provides a focused examination of the specific domain of Adaptive Learning (AL) and its implications within the broader context of Artificial

Intelligence's (AI) potential in education. While research works such as [16] and [6], which offer valuable theoretical insights, given study differentiates itself by its focused analysis of AL. Unlike previous studies that provide general insights into AI's role in education, this work centers on the specific challenges posed by AL implementation and its potential impact on educational equity. In contrast to the library research conducted in those papers, our research incorporates a survey targeted at students. This survey aims to understand perspectives on AI-based educational tools, exploring dimensions such as AI's impact on academic performance, concerns about job displacement, ethical considerations, and its transformative potential in education. Given study emphasizes the need to tackle the challenges linked to AL introduction, noting its potential impact on widening educational gaps. Through combining survey data with fact based analysis, an insightful perspective has been given on how ineffective AL implementation can worsen existing educational differences.

IV. STUDY AND FINDINGS

A survey was conducted to understand the awareness and opinions regarding the usage of AI in the field of education. This survey examines various dimensions, including the perceived impact of AI on academic performance, concerns surrounding potential job displacement of educators, ethical considerations, and the transformative potential of AI to revolutionize the education sector. By targeting students as respondents, the aim was to gather detailed perspectives on the integration of AI in education. A study on Artificial Intelligence in Education (AIEd) and Adaptive Learning (AL) was done to provide a comprehensive understanding of the subject matter.

In education's ever-evolving landscape, Artificial Intelligence (AI) is revolutionizing traditional classrooms. With its ability to understand, solve problems, and learn from experiences, AI is reshaping teaching and learning paradigms, offering limitless possibilities. The rise in the use of AI for education was facilitated by online learning during the pandemic, leading to a greater number of students adopting this technology. [18]. The result of the survey in this context is shown in Fig[1].

Almost 88% of students began using AI for their studies during or after the pandemic
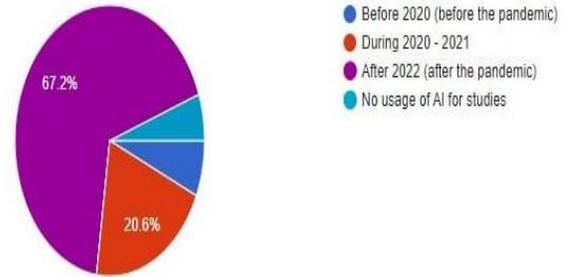

Figure 1

Approximately 56% of students use AI few times a week, with almost 18% using it daily for their education as given in Fig[2]
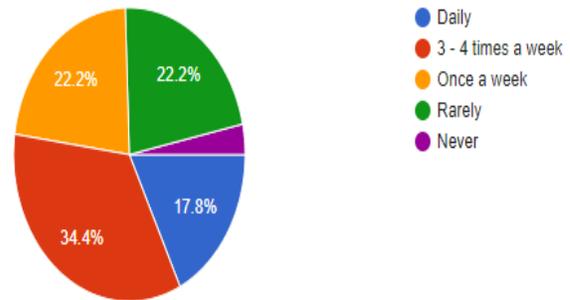

Figure 2

UNESCO report 'International forum on AI and education: steering AI to empower teachers and transform learning', underscores AI's potential to address education's greatest challenges and accelerate progress towards SDG 4. [17] The survey conducted provides evidence given in Fig[3] supporting the findings outlined in the UNESCO report. [17] Approximately 70% students agreed that AI has the potential to revolutionize the education sector, with 17% strongly agreeing to this notion and 25% students remaining neutral with their point of view. Fig[3]
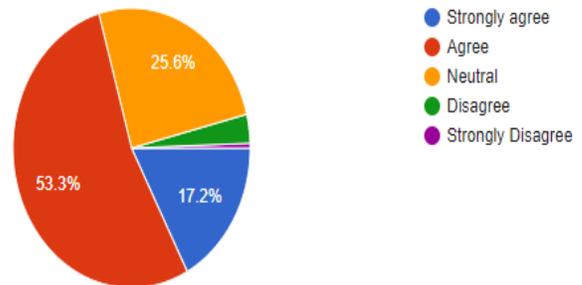

Figure 3

Every year, learning technology expert *Donald Taylor* surveys over 2,000 global industry leaders to unveil the trends revolutionizing workplace learning. Since 2017, one standout trend has consistently dominated: Adaptive Learning. [1]

AL's impact promises personalized learning experiences, relieving teachers of administrative tasks, and enabling data-driven decision-making. AL algorithms analyze students' learning patterns, providing tailored educational experiences. Automated grading systems and virtual assistants streamline administrative tasks, allowing educators to focus on meaningful interactions with students. Data-driven insights facilitate timely interventions, reducing dropout rates.

Immersive technologies like virtual reality enhance engagement, while natural language processing facilitates language learning. As AI advances, it holds the key to creating a more effective and inclusive learning environment, preparing students for the future.

46% of students agreed that using AI positively impacts their educational performance. Almost half of the students surveyed remained neutral with only a few students stating that using AI did not have any positive impact on their education. Fig[4]
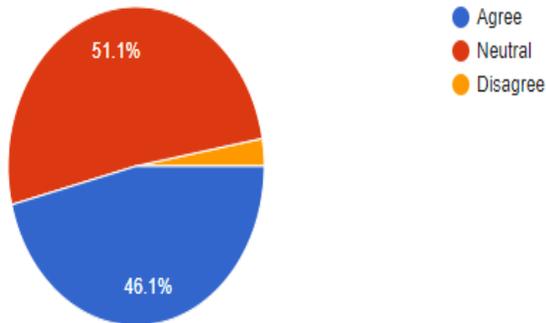

Figure 4

A majority of students (78%) chose 'loss of human interaction' as their biggest concern with the increased integration of AI in education. 'Dependence on technology' was the second biggest concern with 75% of students agreeing to this. 'Quality of education' and

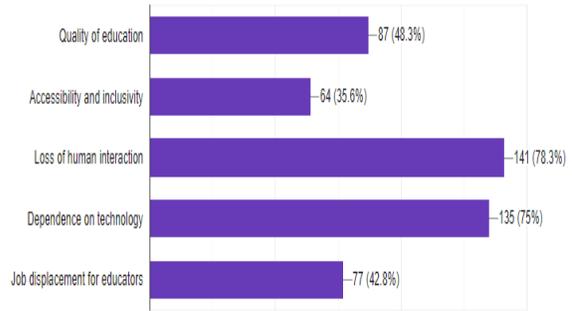'job displacement of educators' were some other prominent concerns. Fig[5]

Figure 5

Artificial Intelligence (AI) significantly automates education, yet the question persists: Can AI replace teachers?

Almost 50% students agreed that increased integration of AI in education can potentially lead to job displacement of educators, with 10% strongly agreeing to this. While 32% remained neutral, only 17% stated that there would be no job displacement of educators in this case. Fig[6]
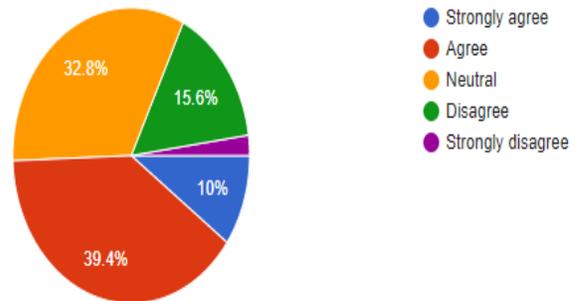

Figure 6

The current study contradicts the survey findings, emphasizing the reasons why AI cannot substitute for human educators.

Despite AL's strides, the complexity of the human mind remains unmatched, hindering attempts to fully replicate its functions.

Artificial Neural Networks (ANNs) serve as a vital connection between AI and human cognition. Inspired by the brain's structure, ANNs process data to recognize patterns and make decisions. Their versatility in machine learning and deep learning has fueled innovation across various sectors, facilitating the development of advanced, data-driven solutions.

However, it still does not change the fact that AL still needs humans to function. While AL has automated

many tasks, it still relies on human oversight and guidance for optimal function. Despite the progress, AL's complexity remains inferior to the multifaceted nature of human intelligence.

Human intelligence's uniqueness lies in creative thinking, adaptability, emotional intelligence, and contextual understanding—qualities ANNs struggle to replicate. ANNs lack the depth and adaptability of human cognition, often providing solutions without transparent reasoning. While ANNs can learn from data, their learning is confined to specific tasks, unlike human brains that can apply knowledge across various scenarios, showcasing broader learning capabilities. Moreover, ANNs heavily rely on training data quality and quantity, vulnerable to biased outcomes. Unlike human brains, which can navigate informational gaps through contextual understanding, ANNs require extensive retraining for new tasks. In contrast, human brains adapt to new situations, learn new skills and tackle novel problems without extensive reprogramming.

In a CNBC interview, dated November 15 2023, Narayan Murthy, co-founder of Infosys, discussed AI-powered chatbots like ChatGPT. He praised their usefulness in tasks like essay writing but stressed that they can't match human intelligence. Murthy suggested using them as tools to improve work quality rather than replacing human creativity. He also believes AI won't threaten jobs as long as people add their own ideas and skills. Despite heavy investments in AI by companies, Murthy emphasized the unique and irreplaceable role of human intelligence.

However, Murthy's opinion on ChatGPT and AI's impact on jobs offers a fresh perspective on a subject that has been debated for years.

Research indicates that each learner has unique characteristics and preferences, influencing how they use resources and experience learning. Students vary in goals, backgrounds, and preferences, emphasizing the need for a learning system to customize its approach for each individual.

AL technology tailors instruction and practice to students' abilities, enabling them to learn at their own pace. It adjusts to individual skills and provides immediate feedback, enhancing strengths and addressing areas for improvement.

Not just students, but AL also empowers teachers by providing adaptive feedback on students' existing knowledge, creating adaptive pathways that determine how content is delivered, and enhancing teachers' adaptability by enabling them to adjust their teaching methods based on data analysis. [2]

Adaptive Learning technology has become increasingly popular, yet achieving broad-scale adoption remains a significant hurdle.

The concern that the Paradox of Adaptive Learning Technologies: Bridging or Widening the Achievement Gap is answered.

Modern AI relies heavily on learning algorithms and high-quality data. The effectiveness of AI-based AL depends on the Quality and Quantity of the data it receives. *Garbage In, Garbage Out* principle applies - if the data is corrupt or scarce, AI's performance is compromised.

Adaptive learning uses AI algorithms to tailor learning experiences based on individual student interactions. AL can be effective for motivated, persistent students but may fail for easily distracted ones, leading to a potential widening of the achievement gap.

The effectiveness of the Adaptive Learning (AL) system is highly dependent on the Quality and Quantity of student interactions:-

Various parameters of 'quality of student interactions' are Engagement and Effort, Critical Thinking and Problem-Solving, Feedback and Correction.

When students actively participate, understand the content, and make genuine efforts to answer questions or complete tasks, they provide valuable data to the system. This data helps the AL algorithms understand the student's learning style, areas of strength, and areas that require improvement.

When students engage deeply with the material, they not only answer questions but also think critically, analyze concepts, and apply their knowledge. These interactions contribute to a rich dataset, allowing the AL system to provide targeted, challenging tasks that promote learning and growth.

Quality interactions also include how students respond to feedback. If a student receives feedback on incorrect answers, engages with the feedback, understands the mistakes, and corrects them, it indicates a high-quality interaction. The AL system can then adapt the learning path based on this interaction, guiding the student toward a better understanding of the topic.

Parameters of 'quantity of student interactions' are Consistent Participation and Diversity in Interactions.

AL systems require a consistent flow of data to function optimally. Regular participation ensures a continuous stream of information for the system to analyze and respond to. Students who consistently interact with the system provide a wealth of data points over time, enabling the AL algorithms to create a detailed learning profile for each student.

Quantity also refers to the diversity of interactions. Students engaging in various types of activities, from reading materials to answering questions and watching educational videos, provide a comprehensive dataset. Diverse interactions help the AL system tailor the learning experience across multiple dimensions, accommodating different learning preferences and styles.

Consequences of Inadequate or Poor Interactions include Ineffective Adaptation and Lack of Support.

When interactions are subpar—such as randomly clicking answers or skipping tasks—the AL system receives incomplete or misleading data. This hampers the system's ability to accurately assess the student's knowledge and learning needs. As a result, the adaptations made by the AL system may not align with the student's actual requirements, leading to less effective learning experiences.

If struggling students do not actively engage or provide meaningful interactions, the AL system cannot offer the necessary support, such as additional resources or targeted exercises. This lack of support further disadvantages these students, hindering their academic progress and potentially widening the achievement gap.

In essence, AL tools might help those who need it the least and hinder those who need it the most. The paradox lies in the fact that AL, which could potentially bridge the achievement gap, can unintentionally widen it. When AL tools are unable to engage distracted or unmotivated students effectively, these students fall further behind. *As a result, the achievement gap between motivated and unmotivated students increases.*

Further research and development efforts are needed to create AL technologies that engage all students effectively, ensuring that personalized learning truly becomes a tool for bridging, rather than widening, the achievement gap.

While AL has made significant advancements, particularly in personalized learning, it currently cannot replicate the depth of human interactions and adaptability that skilled educators bring to the classroom. Therefore, the human touch in education remains indispensable for creating a comprehensive and supportive learning environment.

As we navigate this dynamic landscape, it becomes evident that the future of education lies in the collaboration between these two forces. This partnership not only bridges the gap between traditional teaching methods and technological advancements but also opens doors to new possibilities in creating a holistic and adaptive learning environment.

A comparison has been made between Characteristics of human educators and AI based on various qualities [15]. Few Qualities which were found missing in the previous work are also included in the Table 1. The comparison resulted into limitations of AI.

Table 1: Human Educator Vs AI

Qualities	Characteristics of Human Educators'	AI
Dedication to Teaching	Deep commitment and responsibility towards students' education, going beyond task completion.	AI may lack emotional connection and investment in students' education.
Personal Connection	Genuine interest in understanding students' personal lives and families, fostering trust and support.	AI may lack empathy and understanding for forming personal connections.
Professionalism	Commitment, confidence, trustworthiness,	AI may lack nuanced understanding

	and respect in maintaining high ethical standards.	and application of ethical standards.
Critical Thinking	Ability to engage in analytical and conceptual thinking, adapting teaching methods to diverse learning needs.	AI may struggle with flexibility and creativity in critical thinking.
High Expectations	Setting and maintaining high standards, challenging students to reach their full potential.	AI may lack adaptability in setting motivating goals for students.
Classroom Management	Skilled in creating a conducive learning environment, managing dynamics, and facilitating engagement.	AI may struggle with handling classroom dynamics and providing personalized support.
Stakeholder Collaboration	Collaboration with students, parents, colleagues, and the community to support student development.	AI may lack interpersonal skills needed for effective collaboration.
Student Development Knowledge	Comprehensive understanding of student biological, social,	AI may lack understanding of human development for

	psychological, and cognitive development.	personalized instruction.
Lifelong Learning	Commitment to continuous professional growth, seeking opportunities for skill enhancement and innovation.	AI may lack intrinsic motivation for lifelong learning.
Teaching Essential Life Skills	Guidance in developing crucial life skills such as time management, goal setting, and decision-making.	AI systems can provide resources and tools, but lack the personal experiences shared by human teachers.
Experiential learning	Creation and supervision of hands-on learning opportunities like field trips and lab work	AI can assist in certain aspects but lacks the ability to plan, execute, and oversee these activities like human teachers do.

The gap due to limitation of AI can be bridged through collaboration.

In 2008, esteemed educational researcher Professor John Hattie found that teachers had the greatest impact on student learning within schools, a topic he explored in his book "Visible Learning" (Hattie, 2008). Fast forward fifteen years, and his latest publication "Visible Learning: The Sequel" (2023) confirms that teachers remain the predominant factor in determining student learning success.

Collaboration between AI and humans in the education sector is important so that both can complement each other's weaknesses.

Together, AI and teachers create a dynamic synergy that empowers students to excel, ensuring that education remains a deeply human and technologically advanced endeavor.

84% students stated human interaction to be important in their learning process as compared to AI, with 36% terming it as extremely important. While 16% remained neutral, none of the students termed human interaction in their learning process as 'not important'. Fig[7]
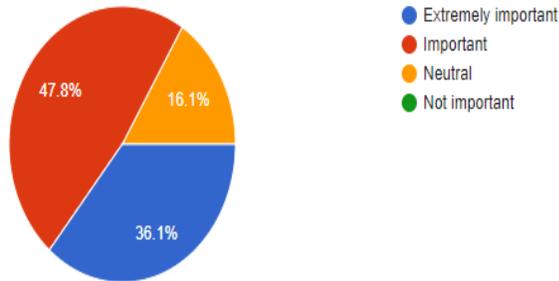

Figure 7

Approximately 86% students believe that AI should supplement and not replace teachers, with 55% strongly agreeing to this. While 10% remained neutral, roughly 3% disagreed with this. Fig[8]
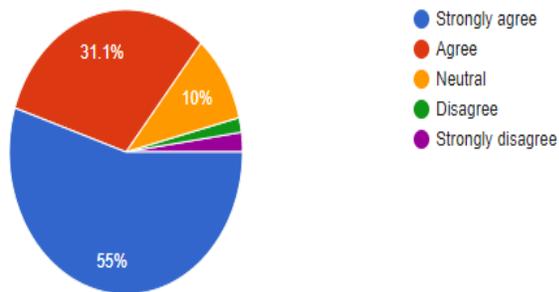

Figure 8

AI supports teachers by enhancing course planning through generative AI-based course recommendations and aiding students in research and writing skills using technologies like ChatGPT. Tools such as Grammarly provide real-time feedback on writing, turning the writing process into a valuable learning experience.

Almost 51% of a teachers' time is spent in administrative and other non-teaching activities. This leaves very little time for direct interaction with students. AI improves time efficiency for teachers and they will have more time to engage with students. [3]

However, for these benefits to be realized, educators must develop the skills to effectively integrate AI technologies into their teaching methods. This includes understanding how AI works, interpreting AI-generated data, and creatively using AI-powered tools to enhance the educational experience.

V. CONCLUSION

The impact of AI-based AL on education is a complex and multifaceted one, with both positive and negative aspects. While AL has undoubtedly revolutionized many aspects of learning, from personalized instruction to efficient grading, it should be viewed as a valuable tool that complements the role of

teachers rather than a replacement for them. The essence of teaching lies in the human touch – empathy, creativity, mentorship and the power to ignite curiosity – all of which AL cannot replicate. Teachers are not just disseminators of knowledge but also nurturers of intellect and character. As we move forward, it is essential to harness the potential of AI to enhance and support teaching, while recognizing that the heart of education will always be the dedicated educators who guide and inspire the next generation. The future of education is not a world without teachers but a world where teachers are empowered by AI to create richer, more personalized, and more effective learning experiences. Thus, this study underscores the importance of maintaining a collaborative approach between AI and human educators in shaping the future of education

REFERENCES

[1] Capuano, N. and Caballé, S. (2020), Adaptive Learning Technologies. AI Magazine, 41: 96-98. Weber, N. (2019).

[2] Adaptive learning: Understanding its progress and potential. *Horizon Report: 2019 Higher Education Edition*, 3-41.

[3] Kelly, D., & Tangney, B. (2006). Adapting to intelligence profile in an adaptive educational system. *Interacting with computers*, *18*(3), 385-409.

[4] Verdu, E., Regueras, L. M., Verdu, M. J., De Castro, J. P., & Pérez, M. A. (2008, April). Is adaptive learning effective? A review of the research. In *WSEAS International Conference.*

Proceedings. Mathematics and Computers in Science and Engineering (Vol. 7, pp. 710-715). World Scientific and Engineering Academy and Society.

[5] L. Chen, P. Chen and Z. Lin, "Artificial Intelligence in Education: A Review," in *IEEE Access*, vol. 8, pp. 75264-75278, 2020, doi: 10.1109/ACCESS.2020.2988510.

[6] Chan, Cecilia Ka Yuk, and Louisa HY Tsi. "The AI Revolution in Education: Will AI Replace or Assist Teachers in Higher Education?." *arXiv preprint arXiv:2305.01185* (2023).

[7] Baidoo-Anu, D., Owusu Ansah, L. (2023). Education in the Era of Generative Artificial Intelligence (AI): Understanding the Potential Benefits of ChatGPT in Promoting Teaching and Learning. Journal of AI. 7(1), 52-62.

[8] U.S. Department of Education, Office of Educational Technology, Artificial Intelligence and Future of Teaching and Learning: Insights and Recommendations, Washington, DC, 2023.Miao F. (2022). *International Forum on AI and EducationEnsuring AI as a Common Good to Transform education 7-8 December 2021 Synthesis Report.* United Nations Educational, Scientific and Cultural Organization.

[9] Anderson J. (2023). *Educating in a World of Artificial Intelligence.* Harvard EdCast produced by the Harvard Graduate School of Education.

[10] P. -H. Lin, A. Wooders, J. T. -Y. Wang and W. M. Yuan, "Artificial Intelligence, the Missing Piece of Online Education?" in *IEEE Engineering Management Review*, vol. 46, no. 3, pp. 25-28, 1 thirdquarter,Sept. 2018

[11] Zawacki-Richter, O., Marín, V.I., Bond, M. *et al.* Systematic review of research on artificial intelligence applications in higher education – where are the educators? *Int J Educ Technol High Educ* 16, 39 (2019).

[12] Brusilovsky P, Peylo C (2003) Adaptive and intelligent web based educational systems. International Journal of Artificial Intelligence in Education (IJAIED), 13: 159-172.

[13] Kolchenko V. (2018). Can Modern AI replace teachers? Not so fast! Artificial Intelligence and Adaptive Learning: Personalized Education in the AI age. HAPS Educator 22 (3): 249-252. doi: 10.21692/haps.2018.032

[14] Liakopoulou, Maria. (2011). The professional competence of teachers: which qualities, attitudes, skills and knowledge contribute to a teacher's effectiveness? International Journal of Humanities and Social Science. 1. 66-78.

[15] Nur Fitria, Tira. (2023). The Use of Artificial Intelligence in Education (AIED): Can AI Replace the Teacher's Role? Epigram. 20. 165-187. 10.32722/epi. v20i2.5711.

[16] UNESCO (December 2022), International forum on AI and education: steering AI to empower teachers and transform teaching: Miao, Fengchun, Shiohira, Kelly, Vally, Zaahedah, Holmes, Wayne.

[17] Pantelimon F-V, Bologa R, Toma A, Posedaru B-S. The Evolution of AI-Driven Educational Systems during the COVID-19 Pandemic. *Sustainability*. 2021; 13(23):13501. https://doi.org/10.3390/su132313501