International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 02 Issue: 11 November 2025
Page No: 4156-4163
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2025.0610

AI Democratization (LMS): Empowering the Future of Learning Management Systems

Satheesh Kumar G[1], Ashwini J K[2], Nayana Rao S[3], Gayathri N[4], Sagarika Patel[5]

[1,3,4]Assistant Professor, Computer Science and Engineering, City Engineering College, Bangalore, Karnataka, India 560062.

[2]Assistant Professor, AI&ML, Bangalore Institute of Technology, K.R. Road, V. V. Pura, Bangalore, Karnataka, India 560004.

[5]Assistant Professor, AI&ML, City Engineering College, Bangalore, Karnataka, India 560062.

Emails: *satheesh.kumar@cityengineeringcollege.ac.in[1], jk.ashwini88@gmail.com[2], nayana_rao@cityengineeringcollege.ac.in[3], gayathrin@cityengineeringcollege.ac.in[4], sagarikapatel1791@gmail.com[5]*

Abstract

The module "Artificial Intelligence-Powered Learning Management Systems (LMS)" is designed to explore the transformative role of Artificial Intelligence (AI) in enhancing traditional Learning Management Systems (LMS). The aim of this module is to equip learners with the knowledge and skills to effectively utilize AI-powered Learning Management Systems (LMS) to enhance virtual learning environments. Learners will understand how AI can be applied to automate administrative tasks, personalize content delivery, and improve assessment methods, ensuring a more efficient and customized learning experience for Gen Z learners.

Keywords: LMS, AI-driven platform, Cloud-based architecture, EdTech systems, FERPA

1. Introduction

The 2023 AI Index Report from the Stanford Institute for Human-Centered AI has documented a notable acceleration of investment in AI as well as an increase in research on ethics, including issues of fairness and transparency. Research on topics such as ethics is increasing because problems are observed. Ethical problems can also occur in education. The report identified significant interest in legislative initiatives that explicitly address artificial intelligence across 25 countries. Figure 1 Research on AI is growing rapidly. Additional metrics, such as investment amounts and workforce size, reflect comparable patterns. AI is advancing rapidly and heralding societal changes that require a national policy response. While broad policies across various sectors are important, education-focused regulations that respond to emerging opportunities and challenges are needed. These should align with existing legal frameworks, including federal student privacy protections, such as the Family Educational Rights and Privacy Act (FERPA), and comparable state-level laws. [1]

- Understanding the concept of AI and its growing role in education.
- Overview of Learning Management Systems (LMS) and their traditional functionalities.

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 02 Issue: 11 November 2025
Page No: 4156-4163
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2025.0610

- The Intersection of AI and LMS: How AI is Transforming Learning Experiences.

Key benefits of integrating AI into LMS for both educators and students. Figure 1 shows AI Publications

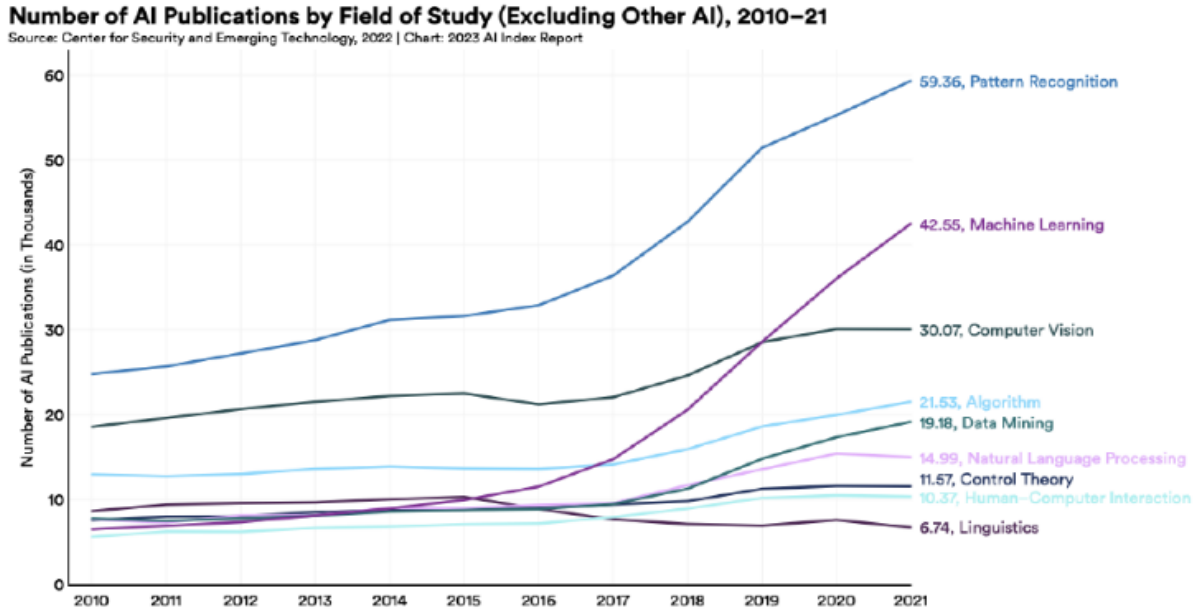

Figure 1 AI Publications

2. Related Work

2.1. Components of AI

- Educators will find that these different perspectives arise in the marketing of AI functionality and are important to understand when evaluating EdTech systems that incorporate AI. [2]
- AI tools are increasingly capable of performing automated tasks in various fields. Today's personalization technologies can modify the order, speed, support, or pathways of learning activities without human intervention.
- Actions in the future might look like an AI system or tool that helps a student with homework or a teaching assistant that reduces a teacher's workload by recommending lesson plans that fit a teacher's needs and are similar to lesson plans that a teacher previously liked.
- Furthermore, an AI-enabled assistant may appear as an additional "partner" in a small group of students working together on a collaborative assignment. AI-powered tools can also assist educators in managing intricate classroom tasks and routines. [3]
- For example, a tool may help teachers orchestrate the movement of students from a full-class discussion into small groups and ensure that each group has the materials needed to start their work. Figure 2 shows Artificial Intelligence

Figure 2 Artificial Intelligence

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 02 Issue: 11 November 2025
Page No: 4156-4163
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2025.0610

Table 1 Differences That Teachers and Students May Experience in Future Technologies

	Familiar Technology Capabilities	Future Technology Capabilities
Input	• Typing	• Speaking
	• Clicking and dragging	• Drawing
	• Touching and gesturing	• Analyzing images and video
Processing	• Displaying information and tasks	• Assisting students and teachers
	• Sequencing learning activities	• Planning and adapting activities
	• Checking student work	• Revealing patterns in student work
Output	• Text	• Conversations
	• Graphics	• Annotating and highlighting
	• Multimedia	• Suggesting and recommending
	• Dashboards	• Organizing and guiding

2.2. AI Enables Adaptivity in Learning

Adaptivity is widely regarded as a crucial feature through which technology enhances the learning process. Artificial intelligence offers a powerful set of tools to boost the adaptive capabilities of educational technologies. By leveraging AI, these systems can better respond to individual student needs, tailor instruction based on strengths, and support knowledge and skill development. One of AI's notable advantages of AI is its ability to process natural language and other intuitive forms of input, which, combined with the strengths of modern AI models, makes it particularly effective at enhancing adaptivity in learning environments. Recent advancements in "large language models" or "foundational models" have significantly improved AI's performance of AI. These models can, for instance, generate essays on a range of topics or create realistic images from simple text prompts. However, despite these advancements, there are still some limitations. Experts consulted during the listening sessions cautioned that AI systems still fall short of replicating the depth and breadth of human learning. It is critical to design educational tools with these constraints in mind. Moreover, foundational models often lack flexibility and struggle to adapt to new or changing contexts. They also lack human-like common sense, occasionally producing illogical or inaccurate responses. Therefore, it remains essential to involve humans in the decision-making process to mitigate the shortcomings of AI. [4]

3. Methodology

3.1. Research Designing, Selecting and Evaluating AI Tools

The most important decision-making loop teachers should be involved in is the one that defines what classroom technologies are developed and which are made accessible to them. Currently, educators contribute to the design and selection of educational tools. They provide input on usability, assess feasibility, evaluate effectiveness, and often share their insights with administrators and peers. Teachers also help identify what is necessary for successful technology integration. Although these responsibilities will persist, AI introduces additional challenges. For instance, the upcoming section on Formative Assessment highlights issues related to bias and fairness that could lead to discriminatory outcomes through algorithms. These concerns extend beyond data privacy and security, highlighting the risk of technology unjustly influencing or restricting students' access to learning opportunities.

3.2. Important Directions for Expanding AI-Based Adaptivity

The term "adaptivity" is often used interchangeably with "personalization," although this label can be misleading. Many experts have pointed out that it lacks a clear definition. For some teachers, personalization involves empowering students with choices and input in their learning, while for others, it simply refers to systems that generate custom activity lists for each learner. This vagueness often masks the fact that most educational technologies personalize only in narrow ways. Typically, they adjust the level of difficulty or sequence of the content. However, experienced educators understand that truly supporting student learning involves much more than merely modifying content order or challenge level. [5]

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 02 Issue: 11 November 2025
Page No: 4156-4163
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2025.0610

3.2.1. Formative Assessment

Formative assessment has long been a central application of educational technology, as effective feedback loops are essential for enhancing instruction and student learning Throughout this report, we emphasized the importance of keeping humans actively involved and in control when using AI. This includes prioritizing the roles of those who participate in formative assessment processes—students, educators, administrators, families, and others who support the learners. As you review the following definition, notice the similarities between how AI and formative assessment are described: both involve identifying patterns and making informed decisions that respond to individual learner needs and abilities. [6]

3.2.2. Building on Best Practices

Several key areas show promise for advancing the future of formative assessments, many of which naturally extend to AI-driven systems and tools. For instance, the 2017 National Education Technology Plan (NETP) highlighted seven ways technology can enhance formative assessments, including the following:

- **Supporting Diverse Question Formats:** Offering students varied methods to demonstrate their knowledge and skills.
- **Evaluating Complex Skills:** Capturing growth in important abilities beyond traditional academic standards, such as teamwork, self-regulation, and job-related competencies, such as presenting or leading groups.
- **Delivering Immediate Feedback:** Keeping students engaged and aiding effective learning by providing prompt, personalized responses and recommendations.
- **Enhancing Accessibility:** Accommodating neurodiverse students and enabling learners to communicate using their strongest modes.
- **Tailoring to Individual Abilities and Knowledge:** Making assessments more accurate and efficient through adaptation.
- **Integrating Assessment into Learning:** Focusing on how assessments contribute to ongoing teaching and learning improvements (excluding accountability measures).
- **Supporting Continuous Learning:** Tracking student progress over time rather than just at fixed milestones. [7]

4. Discussion and Analysis

4.1. Research Policies

Effective AI policies focused on education will be necessary at the federal, state, and district levels to guide and support local and individual choices regarding the adoption and use of technology in schools and classrooms. In everyday life, many people use AI-powered products because they are often more efficient and convenient that their non-AI counterparts. For instance, paper maps are rarely used anymore, as digital tools help us find the fastest routes more easily. However, most users are unaware of the extent to which they compromise their privacy when using AI systems. AI introduces privacy concerns and other risks that cannot be managed solely through personal decision-making; therefore, so stronger protections must be established.

Urgent policy actions should include the following:

- Utilizing automation to improve learning outcomes while safeguarding human judgment and decision-making
- Evaluating the quality of data underpinning AI models to guarantee fair and unbiased recognition and decision-making processes within educational contexts, ensuring that the data align with pedagogical needs.
- Investigating how specific AI technologies, as components of broader educational systems, may enhance or hinder equity for students
- Implementing measures to protect and promote equity, such as human oversight and restricting AI tools that negatively affect fairness. Figure 3 shows The Long Tail of Learner Variability

This discussion covers three key themes.

- **Opportunities and Risks:** Policies should aim to maximize educational benefits while minimizing potential risks.

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 02 Issue: 11 November 2025
Page No: 4156-4163
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2025.0610

- **Trust and Reliability:** Building trust and ensuring protection are crucial in education, given the responsibility to keep students safe and preserve the integrity of their learning experiences. [8]
- **AI Model Quality:** The development and implementation of AI models are central to any AI system. Policies must encourage the thorough evaluation of these models to ensure that they align with educational objectives during their adoption and use.

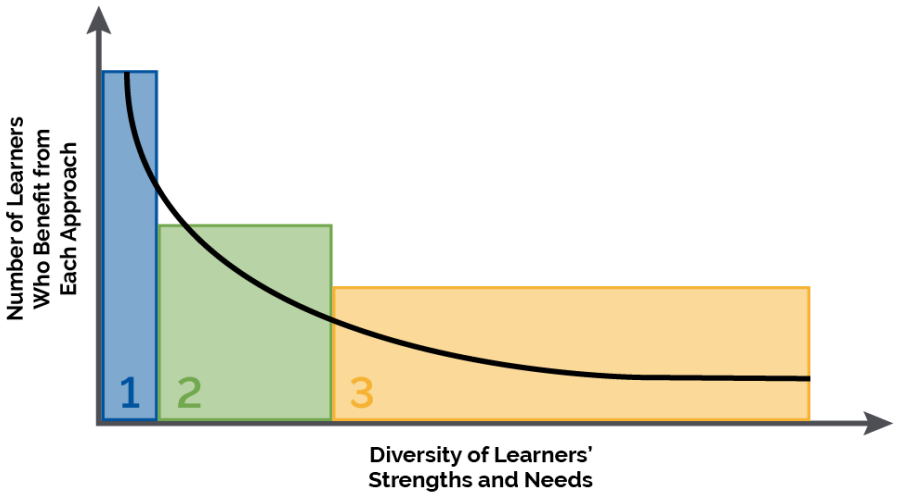

Figure 3 The Long Tail of Learner Variability

4.2. Challenge: Systems Thinking About AI in Education

As AI becomes more integrated into education, participants in our listening sessions cautioned that it would be introduced into areas of the system that are currently struggling or unstable. AI is not a solution for fundamentally flawed systems and should be applied with caution in uncertain or dysfunctional contexts. [9]

Always Prioritize Educators in Instructional Processes

To clarify how and where educators should be prioritized, we reaffirm the importance of keeping humans involved in AI decision-making and consider the specific "loops" where teachers should have a central role:

- The loop where teachers make immediate decisions during instruction.
- The loop involves teachers' preparation, planning, and reflection on their teaching practice, including ongoing professional learning.
- The loop in which teachers engage in the design, selection, and evaluation of AI-driven tools influences not only their own classrooms but also supports fellow educators. Figure 4 shows Three Ways to Centre Educators as We Conceptualize Human in The Loop AI

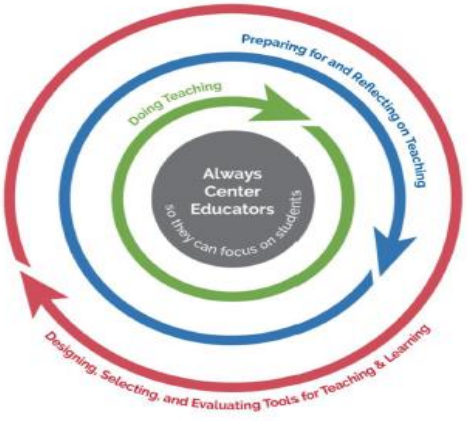

Figure 4 Three Ways to Centre Educators as We Conceptualize Human in The Loop AI

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 02 Issue: 11 November 2025
Page No: 4156-4163
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2025.0610

5. Proposed Taxonomy

Teaching is an inherently complex profession that requires educators to make countless decisions every day. Their roles extend beyond classroom instruction to include engaging with students outside the classroom, collaborating with colleagues, handling administrative tasks, and connecting with families and caregivers as active community members. Figure 5 shows Teachers Work Approximately 50 Hours A Week, Spending Less Than Half the Time in Direct Interaction with Students [10]

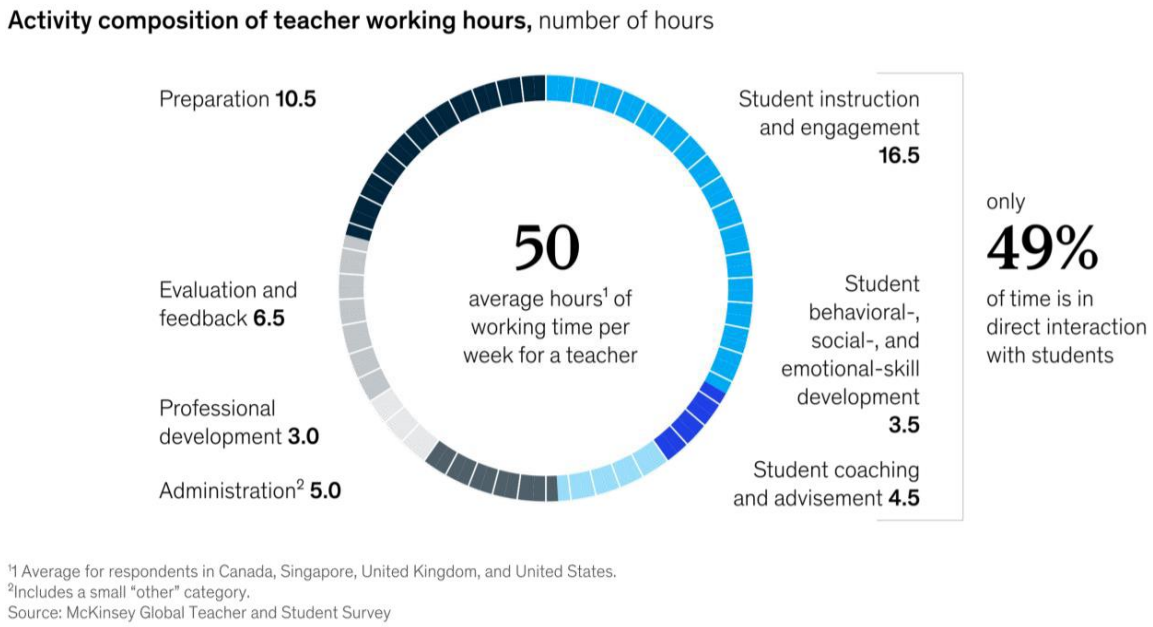

Figure 5 Teachers Work Approximately 50 Hours A Week, Spending Less Than Half the Time in Direct Interaction with Students

A McKinsey report first identified that AI's early advantages may lie in easing teachers' workloads by automating routine administrative and clerical tasks (Figure 4). The report also recommends that the time saved through AI-enabled tools be redirected toward enhancing instructional quality, such as reducing the average weekly preparation time from 11 hours to approximately six. Below, we outline this and two other key opportunities.

- **Reducing Routine Tasks:** Managing both minor and major details can be overwhelming for teachers. AI can help alleviate these low-level demands, allowing educators to concentrate more on student engagement and other higher-level tasks.
- **Extending Teacher Support Beyond Classroom Hours:** Teachers often want to provide more individualized support than time permits. For example, while a teacher may only be able to assist a student with a few practice problems during class, AI-powered systems can support additional practice outside of class, following the teacher's guidance on the type of feedback and help to offer. This approach ensures that students receive ongoing support without requiring teachers to be available around the clock.
- **Enhancing Professional Development:** New tools allow teachers to record classroom sessions, enabling AI algorithms to identify important moments in the discussion that can be reviewed later with professional development coaches, making training more effective.

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 02 Issue: 11 November 2025
Page No: 4156-4163
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2025.0610

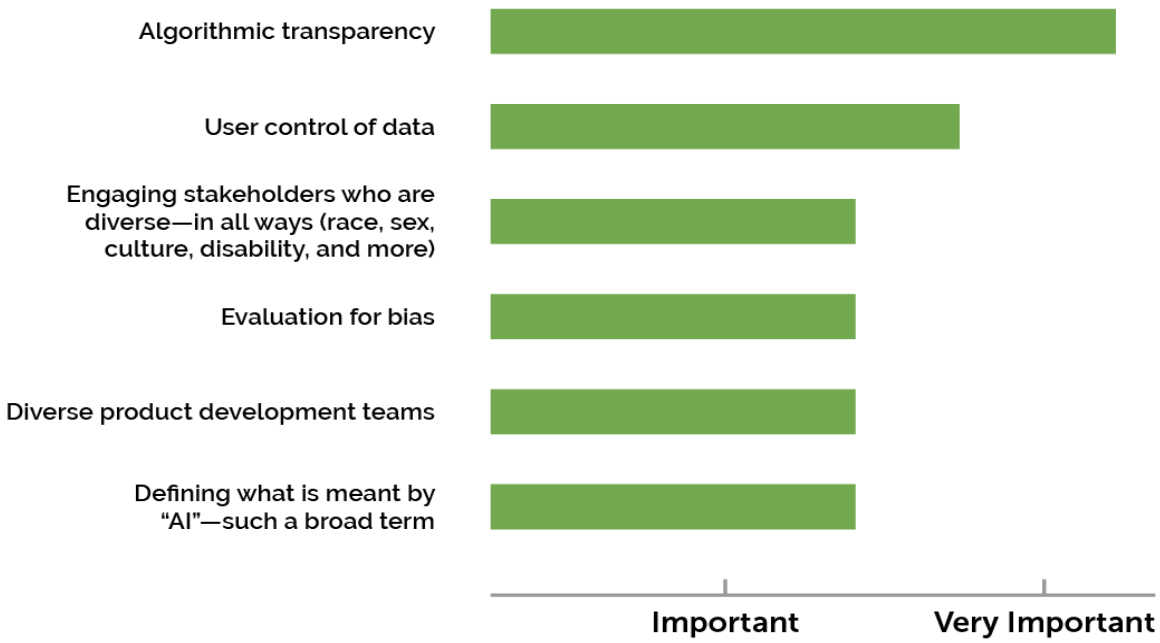

Figure 6 Concerns Raised During the Listening Session About Teaching with AI

Conclusion

The widespread adoption of AI is more than just a technological change; it represents a crucial societal objective. Incorporating AI into learning management systems (LMS) offers the opportunity to overcome obstacles that limit fair access to high-quality education. Entrepreneurs, educators, and technology experts share the responsibility of developing solutions that are inclusive, scalable, and affordable. Democratizing AI has the potential to transform education, making it more intelligent, equitable, and accessible to everyone. This is just the beginning of a journey whose effects will be felt for generations to come.

References

[1]. The White House (September 8, 2022). Readout of White House listening session on technology platform accountability.

[2]. U.S. Department of Education, Office of Educational Technology. (2022). Advancing digital equity for all: Community-based recommendations for developing effective digital equity plans to close the digital divide and enable technology-empowered learning. US Department of Education.

[3]. Zhang, H., Lee, I., Ali, S., DiPaola, D., Cheng, Y., & Breazeal, C. (2022). Integrating ethics and career futures with technical learning to promote AI literacy among middle school students: An exploratory study. International Journal of Artificial Intelligence in Education, 1–35. https:// doi.org/ 10.1007/ s40593-022-00293-3

[4]. A. P. Yadav, D. A. Sharma, M. P. Madhumitha, Jerome, U. Almas, and M. Das, "AI in Education: Adaptive Learning Systems," Nanotechnology Perceptions, pp. 607–621, 2024, doi: https:// doi.org/ 10.62441/nanontp.vi.2329.

[5]. "Enhancing Education with Text-toSpeech for Students," Vision Matters, May 14, 2024. https://visionmatters.net/enhancingeducation-with-text-to-speech-tools/.

[6]. R. Garcia, "Socrates As A LifeLong Learner In A Digital Age," eLearning Industry, Mar. 08, 2019. https://elearningindustry.com/lifelonglearner-in-a-digital-age-socrates.

[7]. UNESCO, "Mother tongue-based multilingual education: the key to unlocking SDG 4: quality education for all,"

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 02 Issue: 11 November 2025
Page No: 4156-4163
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2025.0610

Unesco.org, 2021. [Online] Available: https://unesdoc.unesco.org/ark:/48223/pf0000247333.

[8]. Sahrish Panjwani-Charania and X. Zhai, "AI for Students with Learning Disabilities," Oxford University Press eBooks, pp. 469–493, Oct. 2024, doi: https://doi.org/10.1093/oso/9780198882077.003.0021.

[9]. P. Vanichvasin, "Impact of Chatbots on Student Learning and Satisfaction in the Entrepreneurship Education Programme in Higher Education Context," International Education Studies, vol. 15, no. 6, p. 15, Nov. 2022, doi: https://doi.org/10.5539/ies.v15n6p15.

[10]. "Web Personalization using Amalgamation of Web Navigational Patterns & User Profiles", Sowbhagya M. P., Yogish H. K., G. T. Raju, published in INTELLIGENT SYSTEMS AND APPLICATIONS IN ENGINEERING, IJISAE, 2024, 12(1), 377–384.