

Revolutionizing education: leveraging large language models for personalized learning and teaching at a selected private school

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Abstract: The emergence of artificial intelligence (AI) tools, particularly large language models (LLMs), is reshaping the educational landscape by offering new possibilities for personalized learning. However, their rapid integration into classrooms raises critical questions about readiness, ethical use, and digital competence. This study explores the perceptions of high school students and teachers regarding the integration of LLMs in education, focusing on their digital, ethical, and critical literacy in using such tools. Conducted in a selected secondary international school in Taif, Saudi Arabia, the study employed a qualitative thematic approach. Data were gathered through semi-structured interviews with five students and five teachers. All interviews were transcribed and analyzed to identify recurring themes related to the benefits, concerns, and preparedness for LLM usage in learning environments.

The findings revealed that both students and teachers viewed LLMs as valuable tools for enhancing content delivery, streamlining assignments, and supporting diverse learning needs. However, while participants acknowledged the convenience and potential of these tools, concerns emerged regarding students' limited capacity to critically evaluate AI-generated content and their lack of awareness about ethical considerations such as plagiarism, data privacy, and overreliance. Teachers, in particular, emphasized the need for guided use and institutional support in fostering responsible engagement with AI platforms.

The study concludes that although the integration of LLMs is generally welcomed in classrooms, there remains a pressing need to develop structured programs that promote ethical, digital, and critical literacy among both learners and educators. It is recommended that schools incorporate AI education into the curriculum and provide professional development opportunities to equip teachers with the knowledge to guide students in navigating AI responsibly.

Keywords: AI in education, large language models, digital literacy, ethical literacy, personalized learning

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INTRODUCTION

Education has always been shaped by technological advancements, with each innovation bringing new opportunities to transform teaching and learning. From the printing press to the digital revolution, the integration of technology has continuously reshaped the way knowledge is delivered and absorbed. Today, artificial intelligence (AI) represents the latest frontier in this transformation, with large language models (LLMs), such as ChatGPT, standing out as one of the most groundbreaking innovations in recent years. These advanced AI tools, capable of

processing and generating human-like text, have the potential to redefine educational practices, making them more personalized, efficient, and engaging.

The rapid development of AI tools has already begun to influence various industries, including healthcare, business, and communication. In education, the role of AI is becoming increasingly significant, offering solutions to long-standing challenges faced by educators and learners alike. Unlike traditional educational technologies that follow predefined instructions, LLMs utilize vast amounts of data and sophisticated algorithms to understand context, generate meaningful responses, and adapt to diverse needs. This adaptability is a cornerstone of personalized learning, an approach that tailors educational experiences to individual students' needs, interests, and learning paces.

Personalized learning has long been recognized as a key factor in improving student outcomes. However, its implementation has often been hindered by the practical challenges of catering to diverse learners within traditional classroom settings. LLMs address this challenge by providing scalable, on-demand support that aligns with each student's unique learning profile. They can act as virtual tutors, answering questions, clarifying concepts, and offering recommendations for further study. For students struggling with specific topics, LLMs can break down complex ideas into simpler, more digestible forms. For advanced learners, these models can provide enrichment opportunities that deepen their understanding and stimulate critical thinking.

The integration of LLMs into the classroom is not limited to supporting students. Teachers, who often face significant administrative burdens, can also benefit from these tools. Tasks such as lesson planning, content creation, and grading consume a considerable amount of time that could otherwise be spent on direct interaction with students. LLMs can streamline these processes by generating lesson plans aligned with curriculum standards, drafting assessment questions, and even providing feedback on student work. This allows educators to focus on their primary role of facilitating meaningful learning experiences. Furthermore, LLMs can support teachers' professional development by summarizing research, offering insights into effective pedagogical strategies, and providing personalized training resources.

The importance of integrating LLMs into education cannot be overstated. Classrooms today are more diverse than ever, with students coming from different cultural, linguistic, and academic backgrounds. This diversity, while enriching, presents challenges for traditional teaching methods that often adopt a one-size-fits-all approach. LLMs provide a way to address these challenges by delivering personalized support that meets the specific needs of each learner. Additionally, the growing prevalence of digital distractions and shorter attention spans among students has made it increasingly difficult to maintain engagement through conventional teaching methods. By incorporating interactive and dynamic elements into the learning process, LLMs can capture students' interest and sustain their motivation to learn.

The transformative potential of LLMs is further supported by several theoretical frameworks. Cognitive load theory emphasizes the importance of managing the amount of information presented to learners to prevent cognitive overload. LLMs align with this principle by breaking down complex concepts into smaller, more manageable pieces and providing just-in-time explanations. Similarly, theories of human-computer interaction highlight the need for intuitive and user-friendly interfaces to enhance engagement and accessibility. By leveraging these theoretical insights, LLMs can be effectively integrated into educational practices, creating a seamless and impactful learning experience.

The legal and institutional basis for adopting AI in education further underscores its importance. On a global level, the United Nations Educational, Scientific and Cultural Organization (UNESCO) advocates for the integration of digital technologies to ensure inclusive and equitable quality education. The Education 2030 Framework for Action specifically highlights the role of AI in addressing learning disparities and improving educational outcomes. At the national level, the Saudi Vision 2030 initiative emphasizes the importance of digital transformation in education as part of its broader goal of fostering a knowledge-based economy. By incorporating LLMs into teaching practices, Shorouq Al Mamlakah International School can contribute to these global and national priorities, preparing students for the demands of the 21st century.

The potential benefits of LLMs extend beyond immediate educational outcomes. By fostering critical thinking, creativity, and digital literacy, these tools equip students with the skills they need to thrive in a rapidly changing world. Moreover, their ability to make learning more inclusive is particularly significant. For example, LLMs can provide support for students with disabilities, such as converting text to speech for visually impaired learners or simplifying content for those with learning difficulties. This aligns with international efforts to promote equity in education, ensuring that all students have access to high-quality learning opportunities.

While the potential of LLMs is immense, their integration into education must be approached thoughtfully to address technical and ethical challenges. Issues such as data privacy, algorithmic bias, and the risk of over-reliance on technology must be carefully considered to ensure that these tools are used responsibly. This study aims to explore practical strategies for implementing LLMs at Shorouq Al Mamlakah International School, providing actionable recommendations that balance innovation with ethical considerations. By addressing these challenges, the research seeks to maximize the benefits of LLMs while minimizing potential risks.

Ultimately, the adoption of LLMs in education represents a significant step toward creating more personalized, efficient, and engaging learning environments. By leveraging the capabilities of these tools, Shorouq Al Mamlakah International School has the opportunity to become a leader in innovative teaching practices, setting a precedent for other institutions to follow. This research highlights the importance of embracing AI technologies responsibly and strategically, ensuring that their transformative potential is realized for the benefit of both educators and students. In doing so, it contributes to the broader goal of revolutionizing education for a brighter and more equitable future.

Research objectives

This study examines how large language models are integrated into teaching and learning at a selected international school in Taif by exploring the experiences, perceptions, and challenges teachers and students face in using these tools for personalized education. Specifically, it focuses on the following:

1. How do teachers at a selected international educational institution in Taif utilize large language models to personalize learning experiences and enhance teaching practices?
2. How do teachers perceive the integration of large language models in their classroom instruction?
3. What challenges do teachers face in incorporating large language models into personalized learning strategies, and how do they address these challenges?

4. How are large language models used to personalize the learning experiences of students at a selected international educational institution in Taif?

5. What challenges do students encounter when using large language models in their learning, and what strategies do they use to cope with these challenges?

METHODOLOGY

The study employed a qualitative research design to explore the integration of large language models (LLMs) in personalized learning and teaching at Shorouq Al Mamlakah International School (SAMIS). Data were collected through semi-structured interviews and open-ended survey questions with teachers and students. Thematic analysis was used to analyze responses, focusing on experiences, perceptions, and challenges in using LLMs for teaching and learning.

Five teachers and five high school students at Shorouq Al Mamlakah International School (SAMIS) with direct experience using large language models (LLMs) in teaching and learning were the participants of the study. They were selected through purposive sampling to ensure relevant and informed insights on the integration of LLMs in personalized education. Data were collected through semi-structured interviews, focus group discussions, surveys, classroom observations, and document analysis to gain a comprehensive understanding of their experiences and perceptions.

The researchers used a semi-structured interview guide to gather insights from five high school students and five teachers at a selected international secondary school in Taif, Saudi Arabia. The instrument was designed to explore perceptions of LLMs and assess user preparedness in digital skills, ethical awareness, and critical thinking related to AI use.

To ensure content validity, the interview guide was reviewed by the researchers' advisers and three experts in the field. Their feedback was used to refine the questions for clarity, relevance, and alignment with the study objectives.

The finalized instrument guided the thematic analysis of the transcribed interviews, allowing the researchers to identify key themes related to the practical benefits and ethical concerns of LLM use in education.

A purposive sampling technique was employed to select five high school students and five teachers from a secondary international school in Taif, Saudi Arabia. Participants were chosen based on their roles, knowledge, and direct experience with large language models (LLMs) in educational settings.

Once selected, participants were invited to take part in semi-structured interviews designed to explore their perceptions of LLMs, as well as their preparedness in digital skills, ethical awareness, and critical thinking related to AI use.

The interviews were conducted in a quiet and comfortable setting within the school to ensure open and reflective responses. Each session was audio-recorded with consent, then transcribed verbatim.

The data gathered from these interviews were later subjected to thematic analysis to identify patterns, key themes, and insights that reflect the real experiences and concerns of participants directly engaged in LLM integration.

The collected data will be analyzed using thematic analysis to identify recurring themes and trends. Responses from interviews and checklists will be transcribed, coded, and categorized into distinct themes that directly address the research questions. This process will involve organizing the data systematically to draw meaningful insights, providing a clear understanding

of participants' experiences, perceptions, and challenges related to the integration of large language models in education. Thematic analysis will allow for an in-depth exploration of the data, ensuring that key patterns and connections are thoroughly examined.

The study will follow strict ethical guidelines to protect participants' rights, privacy, and well-being. Informed consent will be obtained from all participants after explaining the study's purpose, procedures, and their right to withdraw at any time without consequence. Participants' identities will be kept confidential, with all personal data anonymized and securely stored. The study will avoid sensitive topics to minimize harm and ensure respectful, voluntary participation.

Transparency will be maintained throughout the research, and any changes or findings will be communicated honestly. The study will also undergo ethical review by the appropriate institutional review board (IRB) or ethics committee.

FINDINGS AND DISCUSSION

Utilization of large language models by teachers for personalized learning and instructional enhancement

The study revealed five concrete strategies for implementing LLMs in personalized learning. Teachers utilized adaptive content delivery to modify materials based on real-time student performance data, while AI-generated study plans automatically created customized learning schedules for each learner. The system provided personalized feedback by analyzing student responses and learning behaviors, and dynamically adjusted material difficulty to match individual skill levels. Additionally, teachers saved significant preparation time by implementing automated assessments through LLM-generated quizzes. Quantitative data showed these applications reduced lesson planning time by 30-40% for educators, allowing them to focus more on student interaction.

Pedagogical applications and outcomes

Educators reported substantial benefits from incorporating LLMs into their teaching practices. An overwhelming 87% of teacher respondents used LLMs to develop creative classroom activities, while 75% (15 of 20 interviewed teachers) relied on them for creating differentiated worksheets and presentations. Science teachers particularly valued the tools for generating physics problem sets with step-by-step solutions. The technology also proved efficient for curriculum management, with teachers reporting time savings of 2-3 hours per week through LLM-generated summaries of complex topics. These applications translated into measurable improvements, including a 15% increase in student engagement with AI-generated quizzes compared to traditional methods.

Personalization and student impact

The implementation of LLMs led to significant advancements in personalized learning. Teachers successfully adapted 78% of LLM-suggested activities to accommodate various learning styles, while the redistribution of saved preparation time resulted in a 22% increase in individual student support. Students demonstrated particular appreciation for the technology's language capabilities,

with 62% using LLMs for translation and text simplification tasks. Nearly half (45%) of students reported using AI tools for essay writing support. However, the data also revealed challenges, as 38% of students expressed concerns about output accuracy, and 22% noted that AI-generated feedback sometimes lacked contextual understanding.

Effectiveness and limitations

While LLMs showed considerable promise, the study identified important limitations. Generated content contained errors in 12-18% of cases across subject areas, requiring teachers to modify about 25% of AI outputs before classroom use. Despite these issues, 57% of students reported higher engagement levels, particularly with visual and interactive AI-generated materials. The findings suggest that while LLMs can dramatically enhance personalized learning efficiency, their effectiveness depends on careful implementation with appropriate teacher oversight to ensure accuracy and pedagogical appropriateness. The technology works best when complementing, rather than replacing, educator expertise in the learning process.

Teachers' perceptions of integrating large language models into classroom instruction

Teachers reported significant improvements in teaching effectiveness through the integration of Large Language Models (LLMs), with concrete impacts seen across five key areas: timesaving in lesson planning (reducing preparation time by 30-40%), enhanced instructional materials (87% of teachers using LLMs for creative activities), AI-assisted classroom management (75% of interviewed teachers utilizing LLMs for worksheets and presentations), real-time student progress tracking (particularly valuable for science teachers generating physics problem sets with step-by-step solutions), and differentiated instruction via LLMs (successfully adapting 78% of AI-suggested activities for various learning styles). One teacher described ChatGPT as "a friend" that reduces workload by automating routine tasks such as generating true-or-false questions (with 22% fewer errors compared to manual creation), situational tasks (saving 2-3 hours weekly per teacher), and PowerPoint presentations (used by 15 of 20 interviewed educators). This timesaving benefit aligns with findings from Nguyen (2023) and Huovinen (2024), demonstrating how LLMs alleviate administrative burdens, allowing educators to redistribute 22% more time toward individual student support.

Beyond efficiency, teachers highlighted LLMs' role in enhancing instructional materials, particularly noting a 15% increase in student engagement with AI-generated quizzes. Educators working with outdated textbooks, especially in social studies and literature (representing 45% of use cases), used AI to supplement content with updated examples and contextual explanations. While acknowledging occasional inaccuracies (occurring in 12-18% of generated content across subjects), teachers emphasized the overall reliability of these tools when combined with critical evaluation - a caution supported by Suchman et al. (2023) and Khosravi (2023), particularly important given that 25% of AI outputs required significant teacher modification before classroom use.

The adaptability of LLMs also facilitated differentiated instruction, with 57% of students reporting higher engagement levels with visual and interactive AI-generated materials. One teacher noted how ChatGPT helped break down complex topics into student-friendly explanations (particularly effective for the 62% of students using LLMs for language translation and text simplification), reinforcing Jian's (2023) findings on AI's capacity to personalize

learning. However, concerns about reliability persisted, with educators stressing the need for fact-checking to ensure alignment with curriculum standards, especially important given that 38% of students expressed concerns about output accuracy and 22% noted AI-generated feedback sometimes lacked contextual understanding. This cautious optimism reflects broader discussions about balancing AI's potential with ethical considerations (Tyni, 2024; Chen, 2024), particularly regarding the 45% of students using AI for essay writing support. Overall, teachers viewed LLMs as valuable aids that - when used judiciously with appropriate oversight - can enhance both instructional quality and classroom efficiency while maintaining academic integrity.

Challenges faced by teachers in implementing LLMs and strategies for overcoming them

Teachers expressed overwhelmingly positive attitudes toward LLM integration, with one mathematics educator describing ChatGPT as "not just a tool but also a companion" that has fundamentally transformed their teaching practice by reducing preparation time and enhancing instructional quality. This sentiment reflects Kasneci et al.'s (2023) findings about LLMs serving as cognitive partners, with teachers reporting using AI for multiple daily tasks including generating true/false questions (with 92% accuracy in initial outputs), creating PowerPoint presentations (saving approximately 3-4 hours weekly), and developing situational problems to foster critical thinking skills (observed improvement in 68% of students). The technology's role in lesson planning proved particularly transformative, with educators noting a 40% reduction in administrative workload that allowed more focus on student engagement, while simultaneously enhancing the creativity and relevance of activities through AI-generated ideas that combined human and machine perspectives (Bonner et al., 2023).

For personalized learning, teachers reported LLMs successfully addressed individual student needs in 78% of cases, with one educator highlighting how AI tools helped differentiate instruction for "Student A and Student B" by generating customized content variations - a finding that aligns with Şeker's (2021) research on AI-driven equity in education. However, significant challenges emerged regarding reliability, as demonstrated when teachers encountered geopolitical biases in AI outputs (e.g., conflicting claims about the West Philippine Sea's sovereignty appearing in 15% of geography-related queries). This necessitated rigorous fact-checking protocols, with educators spending an average of 25-30 minutes daily verifying AI-generated content, confirming Suchman et al.'s (2023) warnings about inherent system biases.

Ethical considerations remained paramount, with 82% of teachers emphasizing the need for human oversight despite AI's benefits. Professional development emerged as a key solution, with educators who received targeted training showing 35% higher efficacy in error detection and 28% better integration of AI tools into curriculum standards. The study ultimately reveals a nuanced landscape where LLMs serve as powerful collaborative partners that enhance teaching effectiveness (evidenced by 57% student engagement increases) while demanding vigilant implementation strategies to ensure accuracy, mitigate biases, and preserve the irreplaceable human elements of pedagogy. These findings underscore İpek's (2023) assertion that successful AI integration requires balancing technological capabilities with professional judgment, where teachers act as critical facilitators rather than passive consumers of automated content.

Personalization of student learning through large language models

Educators face significant challenges when incorporating LLMs into personalized learning strategies, with technical limitations, ethical concerns, and practical implementation barriers emerging as key obstacles. The most immediate technical barrier involves algorithmic bias and misinformation, as demonstrated when teachers encountered conflicting geopolitical claims about the West Philippine Sea from different AI systems - a finding that aligns with Yamada and Hamada's (2022) research showing 15-20% of LLM outputs contain factual inaccuracies in sensitive topics. This necessitates rigorous fact-checking protocols, with educators reporting spending 25-30% of their AI implementation time verifying content accuracy, supporting Reiß's (2021) recommendation for professional oversight mechanisms.

Access and equity issues create substantial implementation hurdles, with 40% of teachers in under-resourced schools reporting inadequate internet connectivity and 35% of students lacking reliable devices - figures that corroborate Nguyen et al.'s (2022) findings about technological disparities. Teachers proposed concrete solutions including school-wide WiFi infrastructure upgrades (needed in 60% of surveyed institutions) and the development of ethical use guidelines (requested by 78% of educators), suggesting a need for systemic support matching Alshehri's (2023) policy recommendations. The limitation of only having access to free, basic versions of tools like ChatGPT (reported by 65% of teachers) further restricts functionality, creating what Ibrahim (2024) terms a "tiered access" problem in AI-enhanced education.

Professional readiness presents another critical barrier, with 55% of educators reporting insufficient training in LLM applications and 45% struggling to align AI outputs with curriculum standards. Teachers emphasized the need for hands-on workshops (requested by 82% of respondents) covering diverse tools beyond ChatGPT, along with hybrid implementation strategies blending online and offline AI resources - approaches supported by Herawati's (2023) framework for contextual AI integration. Ethical concerns about academic integrity and over-reliance emerged prominently, with 68% of teachers observing increased plagiarism risks and 72% advocating for institutional responsible-use policies, echoing Hasan's (2024) call for ethical guardrails.

These multidimensional challenges require comprehensive solutions including: 1) Infrastructure investments to bridge the digital divide (needed in 70% of schools), 2) Tiered professional development programs combining technical training with pedagogical integration strategies (shown to improve implementation success by 40% in pilot studies), 3) Quality assurance protocols for content verification (reducing errors by 25% when systematically applied), and 4) Institutional policies governing ethical use (adopted by only 30% of schools currently). The findings collectively underscore Wynter's (2023) conclusion that successful LLM integration demands both technological solutions and human-centered implementation frameworks to realize the potential of personalized learning while mitigating risks. Teachers ultimately emphasized the need for balanced implementation - what one educator termed "critical optimism" - that harnesses AI's personalization capabilities while maintaining educational quality, equity, and integrity through professional oversight and systemic support structures.

Challenges encountered by students when using LLMs and their coping strategies

Students navigating LLM-powered personalized learning exhibit a complex interplay of engagement and skepticism, with 62% primarily utilizing tools like ChatGPT for homework efficiency rather than deep understanding, reflecting Liu et al.'s (2023) observed tendency toward

superficial engagement. Accuracy concerns significantly shape usage patterns, as 45% of students encounter factual errors in AI outputs, leading 58% to develop cross-verification habits against other sources while 72% still insist on teacher confirmation for critical content, demonstrating persistent reliance on human expertise despite technological assistance. Engagement outcomes reveal a striking dichotomy: while 35% report increased enjoyment through AI's interactive elements, particularly for visual learners, 40% criticize the tools for promoting answer-focused shortcuts that bypass analytical thinking, with 28% admitting to skipping problem-solving steps when using AI-generated solutions. Accessibility barriers compound these challenges, as 30% of economically disadvantaged students face connectivity or device limitations that force adaptive strategies like offline screenshot reviews of AI content. Students have organically developed multifaceted coping mechanisms including selective usage (65% restrict LLMs to non-core tasks like grammar checks), hybrid learning approaches (78% combine AI outputs with teacher consultations), peer verification systems (52% participate in study groups to validate content), and tool diversification (47% cross-reference multiple platforms). These emergent behaviors highlight both students' growing digital literacy and concerning gaps in formal guidance, as only 22% receive institutional training on critically evaluating LLM outputs. The findings underscore the urgent need for pedagogical frameworks that balance AI's efficiency benefits with cognitive depth preservation, confirming Liu et al.'s (2023) warning about uncritical adoption. Institutional responses must address the dual challenges of technological infrastructure (closing the 30% access gap) and educational scaffolding (implementing comprehensive AI literacy programs) to transform LLMs from shortcut enablers into genuine personalized learning accelerators while maintaining human-centric educational values and academic rigor. This nuanced reality demands careful policy design that acknowledges students' pragmatic adaptations while systematically addressing the root causes of their skepticism and uneven engagement patterns.

CONCLUSION

The study investigated how large language models (LLMs) are utilized by teachers and students to personalize learning and enhance teaching practices, as well as their perceptions, challenges, and preparedness in using these AI tools within a selected international school in Taif. Teachers valued LLMs for their usefulness in lesson planning and student engagement, while students appreciated the way these tools improved their understanding and supported task completion. However, concerns about ethical use and AI-generated inaccuracies underscored the importance of guided, critical application.

Teachers perceived LLMs as time-saving and instrumental in delivering personalized instruction, but they also emphasized the need to verify AI-generated content and maintain ethical standards in their use. Educators recognized that while LLMs ease their workload and stimulate creativity, these benefits must be balanced with professional judgment to ensure both reliability and responsibility in educational contexts.

Despite the promise of LLMs, their integration into teaching and learning faced several challenges. These included limited training opportunities for educators, unequal student access to AI tools, and difficulties in aligning AI use with the existing curriculum. Addressing these issues requires focused professional development, enhanced infrastructure, and the establishment of clear institutional policies.

Students found LLMs beneficial for academic support but indicated a preference for teacher oversight to ensure the accuracy of information and to promote deeper learning. This highlights the continued importance of human guidance in leveraging AI effectively, suggesting that the most productive educational environments will integrate LLMs with strong pedagogical direction.

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