Exceptional Minds Meet Artificial Intelligence: Perspectives and Possibilities in Gifted Education

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***Abstract*— This paper examines the role of artificial intelligence (AI) in gifted education through research analysis and qualitative interviews. Findings reveal that while AI offers promising capabilities for personalization and intellectual stimulation valued by gifted learners, significant limitations exist in social-emotional support and spontaneous "Teachable Moments." Gifted students demonstrate heightened awareness of AI biases, emphasizing the need for improved data training. We conclude that optimal outcomes require balanced integration combining AI tools with human guidance while addressing ethical, emotional, and equity concerns. Recommendations include developing complementary human-AI partnerships, specialized tools for gifted education, comprehensive teacher training, and mechanisms incorporating gifted learners' feedback into system development.**

Keywords—Gifted Learners, Educational Technology, Artificial Intelligence, Pedagogy

I. INTRODUCTION (*HEADING 1*)

As AI rewrites the rules of industries, its fingerprints become more visible in today's educational institutions. AI has transformed both teaching and learning experiences. Academic institutions increasingly implement AI as adaptations to evolving curricula that are heavily assisted by educational technology (EdTech). While AI offers new possibilities, it also disrupts student learning in ways that literature describes as both promising and problematic. The U.S. Department of Education's Office of Educational Technology has responded with a detailed report outlining AI's applications, challenges, and the urgent need for ethical oversight [1]. A key concern is the use of AI in "personalizing" data—hailed as powerful but still limited in addressing learner diversity, especially for neurodivergent students.

Neurodivergence refers to individuals who differ from neurocognitive norms, including "gifted learners"—those with exceptional intellectual abilities. Despite their strengths, gifted students are often neglected due to assumptions of self-sufficiency, frequently facing stigma, peer misunderstanding, and insufficient intellectual challenge in mainstream classrooms [2].

AI becomes a contender for enhancing gifted education. Large Language Models (LLMs), which rely on deep learning to process vast amounts of text, enable advanced natural language tasks such as text generation, summarization, translation, and question answering [3][4]. With billions to trillions of parameters, LLMs excel at interpreting complex linguistic structures and contextual meaning [5]. As interest in AI grows, educational researchers have begun to explore its relevance for special needs education. AI capabilities offer potential to reduce understimulation and improve learning personalization for gifted students; however, this potential remains underexamined.

This article investigates how gifted adolescents perceive and interact with LLMs, aiming to uncover both opportunities and challenges in integrating these tools into classroom discourse. By analyzing their experiences, the study identifies key areas for thoughtful AI integration that enhance intellectual stimulation without compromising human interaction or exacerbating educational inequities.

Finally, the paper aims to answer the following research questions:

1. What perspectives do gifted learners hold regarding the use of LLMs for academic discussions?

2. What precautions should educators consider when incorporating AI in classrooms for gifted learners?

II. LITERATURE REVIEW

A. Gifted Learners

Intellectually gifted learners demonstrate excellence beyond high IQ scores, exhibiting advanced reasoning abilities, complex interests, strong memory, quick learning, and heightened sensitivity [6][7][8]. Despite advanced capabilities, they remain underserved in mainstream education, facing misidentification, inadequate curriculum differentiation, and inappropriate learning pacing that affects engagement and socio-emotional development.

AI offers promising interventions through personalized learning experiences tailored to individual abilities and interests. Adaptive systems can monitor performance in real-time, adjusting difficulty levels and providing enrichment opportunities that maintain intellectual stimulation and prevent the stagnation resulting from a one-size-fits-all instruction.

B. Identification

Accurate identification remains a critical barrier, as traditional methods often fail to capture giftedness across diverse populations. Without proper identification, gifted learners may never receive the specialized support they require, leading to underachievement and disengagement. Machine Learning can enhance identification accuracy by analyzing diverse datasets to recognize patterns signaling giftedness beyond conventional metrics, potentially uncovering students overlooked by traditional screening methods. Hodges & Mohan (2019) demonstrate that ML algorithms can analyze large datasets—including student behavior, performance trends, and socio-demographic indicators—to identify patterns that may signal giftedness. These models have the potential to uncover gifted students who might otherwise be overlooked by conventional screening methods, thereby broadening access to gifted education.

C. Content and Curriculum Development

Conventional curricula frequently lack depth and flexibility for gifted learners, who thrive with accelerated, inquiry-based, and interdisciplinary approaches [10]. Without tailored content, these students disengage when standard curriculum fails to challenge their advanced cognitive abilities.

AI can design customized curricula based on learners' prior knowledge, learning styles, and interests. This personalization creates meaningful learning pathways that resonate with gifted students, fostering deeper engagement and mastery [11].

D. Boredom and Amotivation

Gifted learners often experience boredom with repetitive or simplistic content, significantly hindering performance and leading to amotivation. Unchallenging environments suppress curiosity and foster disengagement [12][13].

AI-generated adaptive content can analyze performance in real-time, adjusting difficulty, format, and pacing accordingly. Intelligent Tutoring Systems offer adaptive challenge

interactive tasks, and instant feedback, maintaining interest while promoting autonomy [14]. These systems can simulate one-on-one tutoring, which solely aims to improve academic outcomes, particularly for students who require tailored scaffolding and accelerated pacing.

E. Socio-emotional challenges

Gifted learners face unique socio-emotional challenges including isolation, perfectionism, and emotional intensity [2]. These issues are compounded when giftedness coexists with other neurodevelopmental disorders (e.g., ADHD or ASD), creating complex emotional profiles requiring nuanced support rarely available in schools.

AI tools utilizing sentiment analysis, emotion recognition, and conversational agents can provide targeted support, offering immediate emotional assistance or alerting educators to distress signals for early intervention [15].

F. Are We There Yet?

Despite the fast-paced developments in AI and its ever-growing scope, debates persist regarding its suitability for educational applications. AI often poses limitations in creative thinking and innovation, which can disappoint users expecting out-of-the-box insights [16]. Furthermore, current AI models are criticized for several shortcomings: data bias, over-emphasis on deficit-based student assistance, lack of social adaptivity, inadequate support for neurodivergent learners, and insufficient capacity to challenge critical thinking [1].

III. Methodology

A. Research Design

This study used semi-structured interviews to examine gifted learners' perceptions of LLMs. This qualitative approach allowed for depth and flexibility in exploring emergent themes.

B. Participants

The sample consisted of 16 gifted learners (age range: 11-17 years; mean age: 14 years) who were formally identified as gifted through their respective schools' assessment procedures. Participants were recruited through purposive sampling from schools to ensure diversity in academic backgrounds and interests. Prior to participation, informed consent was obtained from both participants and their parents/guardians, and all research procedures were approved by the relevant institutional review board.

C. Procedure

AI Interaction Task

Each participant completed a structured task involving interaction with an AI LLM (primarily ChatGPT). Participants were instructed to engage with the LLM to discuss topics aligned with their specific academic interests or areas of giftedness. This task was designed to provide a concrete experience with AI technology that participants could reflect upon during the subsequent interview. The interaction sessions lasted approximately 30-45 minutes, during which participants were encouraged to explore the capabilities and limitations of the LLM within their chosen domain of interest.

Semi-Structured Interviews

Following the AI interaction task, semi-structured interviews were conducted with each participant. The interviews took place within two days of the interaction task to ensure fresh recollection of the experience. Each interview lasted approximately 20-45 minutes and was audio-recorded for subsequent transcription and analysis.

The interview protocol included the following core themes:

1) Initial impressions and experiences using the LLM
2) Perceived benefits and limitations for learning
3) Comparison with traditional learning
4) Potential applications in their education
5) Concerns regarding AI use in education
6) Suggestions for improvement or implementation

D. Data Collection and Ethical Considerations

This study followed strict data privacy and ethical guidelines for research with minors, including informed consent from both participants and their guardians, confidentiality and anonymity of data, clear communication of the study’s purpose and

procedures, safeguards for managing potential discomfort during interviews, and secure data handling in line with data protection regulations. Participants were assigned pseudonyms to maintain confidentiality, and all identifying information were excluded from the transcripts and analysis materials. No personal identity was stored during their interaction with AI systems. Interview transcripts, analyses, and other data collected are stored safely and accessible only to authorized research team members. The findings presented in this paper use only aggregated themes and anonymized quotes that cannot be attributed to specific individuals.

IV. Results Analysis

Interview data were analyzed using Braun and Clarke's (2006) six-phase thematic analysis, which involved familiarizing with the data through repeated readings, systematically coding key features, grouping codes into potential themes, reviewing and refining these themes, clearly defining each one, and selecting illustrative extracts to support the final analysis in relation to the research questions.

To ensure methodological rigor, two independent researchers analyzed the interview transcripts. This dual-coding approach enhanced the trustworthiness of the findings and mitigated potential researcher bias.

Analysis of interview transcripts revealed three key themes addressing gifted learners' perspectives on using LLMs for academic discussions: content personalization, scaffolding, and interest compatibility.

Regarding personalization, gifted learners appreciated AI's ability to adapt to their specialized interests beyond standard curriculum, though they noted limitations in AI's capacity to accommodate their expansive thinking patterns. For scaffolding, participants valued LLMs' provision of challenging topics adjusted to their intellectual level and pace—critical for students requiring advanced content. However, they found the text-based format potentially limiting for their rapid thinking processes.

Participants demonstrated sophisticated awareness of LLM challenges: information overload requiring critical evaluation, response unpredictability depending on prompt effectiveness, and significant modality limitations in tactile, visual, and auditory learning experiences. They also recognized that AI communication lacks non-verbal elements that enrich traditional discussions.

Overall, while gifted learners see LLMs' potential to provide personalized, challenging content matching their cognitive abilities, they maintain a realistic view of current technological limitations. Their perspectives suggest they value AI as a supplement to, rather than replacement for, human-led academic discussions that support their unique educational needs.

TABLE I. THEMES EMERGING TO ANSWER THE QUESTION "WHAT PERSPECTIVES DO GIFTED LEARNERS HOLD REGARDING THE USE OF LLMS FOR ACADEMIC DISCUSSIONS?"

Theme	***Interview Response Summary (Support and Criticisms)***
Content Personalization	AI-mediated discussions adapt to the student's preferred topic and interests, which may personalize learning experiences
	AI-mediated discussions may be too narrow and rigid
Scaffolding and Compatibility	AI chatbots may provide novel and challenging topics adjusting to the student's pace and preference. Information and discussions will be at the level of the student's intellect
	Text-based modality of discussion is not always perceived as convenient and may limit the depth of immediate responding
Challenges	Information provided by an AI may be overwhelming and overloaded. Students will need to critically evaluate and sift through the information.
	Information and discussion may be unpredictable as AI responses solely depend on the effectiveness of prompts and keywords. Moreover, the AI responses will only be as good as its sources and databases.
	AI-mediated discussions may not be able to offer tactile learning or be limited in providing information in arts and music, or other domains which requires visual or auditory presentations.
	Communication is limited to written scripts

When identifying factors that must be considered for the incorporation of AI in classrooms, the gifted learners informed four major themes: content personalization, practical and learning accessibility, social factor and human facilitation, and content diversification.

Table II highlights key considerations for using AI with gifted learners, emphasizing the need to balance AI and traditional classroom discussions. While AI personalizes content and offers quick, deep access to information, it risks narrowing perspectives and lacks the exploratory richness of human-led dialogue.

AI supports flexible, in-depth learning—ideal for gifted students—but cannot replace the social, communicative, and hands-on benefits of classroom interactions. It may ease participation anxiety, yet falls short in fostering real-time social dynamics and nuanced feedback.

Though AI draws from vast data, it may miss culturally rich or authentically diverse perspectives that peer discussions naturally provide. Educators should use AI to enhance—not replace—human instruction, applying thoughtful strategies that support gifted learners' intellectual and social-emotional growth.

TABLE II. THEMES EMERGING TO ANSWER THE QUESTION *"WHAT PRECAUTIONS SHOULD EDUCATORS CONSIDER WHEN INCORPORATING AI IN CLASSROOMS FOR GIFTED LEARNERS?"*

Theme	***Interview Response Summary (Support and Criticisms)***
Content Personalization	AI-mediated discussions adapt to the student's preferred topic providing insights within the interests of the student. Opportunities to discuss specialized topics may be explored
	AI-mediated discussions may be limited by available online information, reinforcing confirmation bias, while classroom discussions foster exploration of new interests.AI-mediated discussions may become an echo-chamber.
Practical Learning and Accessibility	AI chatbots offer in-depth information, immediate response, flexible pacing, and convenient access to discussions.
	Classroom discussions enhance social and communication skills, whereas AI-mediated discussions may improve written communication skills. Classroom discussions may also involve practical learning and activities. Domains such as music and art require practical presentation of stimuli during discussions.
Social Factor and Human Facilitation	Comfort in participation with AI-mediated discussions will not be hampered by anxiety, fear of judgment, time constraints, and narrowed opinions.
	AI-mediated discussions can feel one-dimensional, lacking the social dynamics, tension, and real-time feedback that enrich classroom interactions. In contrast, classroom discussions foster idea exchange, persuasion skills, and nuanced human feedback that blends professional insight with subjective judgment—something AI cannot replicate.
Content Diversification	AI-mediated discussions pool information from global databases and various sources, which allows for diverse information.
	Classroom discussions will have diverse perspectives from the facilitator and peers. Discussions which values cultural contexts are more profound.

A. Discussion

The convergence of AI and gifted education offers exciting potential alongside notable challenges [16]. AI has the capacity to bridge gaps in curriculum differentiation, providing insights and support aligned with the unique needs of gifted learners.

AI can personalize learning by analyzing performance and preferences to adjust content, pace, and complexity—helping to keep gifted students engaged and appropriately challenged. This goes beyond adaptive testing, offering evolving learning pathways that support long-term talent development. AI also excels at curating interdisciplinary content, promoting systems thinking and satisfying intellectual curiosity. Its ability to connect students with global mentors and peer communities is especially valuable in under-resourced settings.

However, AI falls short in replicating the social depth essential for emotional and interpersonal growth [18]. While simulations may help develop resilience and communication, they cannot replace authentic relationships. Gifted learners, often highly sensitive and intuitive, need real-time emotional feedback and adaptive support that AI still struggles to provide.

Rigid AI frameworks can stifle creativity and reduce intrinsic motivation. Frequent assessments may heighten anxiety, and narrow AI systems often lack the complexity and flexibility gifted learners need [16]. Many tools default to standardized models, under-stimulating students and failing to address emotional intensity, perfectionism, or distress.

Gifted learners' heightened critical thinking enables them to detect algorithmic biases, making it vital to improve AI systems with transparent, inclusive training data. Their sensitivity to inconsistency demands AI that clearly communicates its limitations.

Despite these shortcomings, research shows generally positive attitudes toward AI in education, though concerns about unequal access and over-standardization remain. Social learning remains irreplaceable: spontaneous, emotionally attuned "Teachable Moments" [1] rely on human educators' instinct and real-time responsiveness—underscoring AI's role as a supplement, not a substitute.

V. RECOMMENDATION & CONCLUSION

Integrating AI into gifted education addresses challenges like identification, amotivation, and social-emotional issues faced by gifted learners. A balanced approach, combining AI with human guidance, leverages the strengths of both while compensating for their limitations. Ethical considerations, including privacy, transparency, and bias, must be prioritized, alongside safeguarding emotional development through human interaction and ensuring equitable access.

To effectively integrate AI, we recommend investing in teacher training, developing AI tools tailored to gifted learners, and fostering interdisciplinary collaboration. Long-term research and student feedback are essential for ethical, effective implementation. Ultimately, AI should enhance educators' ability to meet the complex needs of gifted learners, creating more responsive and effective learning environments through thoughtful design and continuous evaluation.

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