Evaluating the Impact of GenAI in High School Education
(A Critical Review)

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Abstract. GenAI has currently been widely integrated into learning in secondary schools, as it is considered to provide the potential to enhance the learning experience for students. However, using GenAI in secondary school settings remains controversial, as its benefits coexist with significant ethical, social, and educational challenges. This review critically examines the role of GenAI in secondary school education, assessing current applications, potential educational benefits, and unique challenges. Through the exploration of case studies and empirical research, the researcher highlights key areas where GenAI can enhance learning while presenting possible drawbacks and ethical dilemmas. The researcher concludes by suggesting guidelines for the responsible integration of GenAI in secondary school education, aiming to capitalize on its potential while addressing critical risks.

Keywords: GenAI, Learning, Student

1. BACKGROUND

The integration of Artificial Intelligence (AI) in education has sparked significant interest and debate, especially as Generative AI (GenAI) tools capable of generating text, images, and even coded solutions become more accessible to learners (Alier et al., 2024; Samala et al., 2024). With the rapid development of AI in various sectors, educational institutions, especially at the secondary school level, are at the forefront of considering the potential of GenAI as a transformative educational tool (Gupta, 2024; Rashid et al., 2024). GenAI's potential to personalize education, make learning more interactive and prepare students for a future increasingly shaped by AI is exciting (Borah et al., 2024). However, these opportunities have complexities that demand careful consideration.

As GenAI grows in popularity, educators and policymakers face pressing questions about its appropriate and ethical use in high school settings. Unlike college students, who often have more developed critical thinking and ethical reasoning skills, students in high school are in a unique developmental stage that can make them particularly vulnerable to over-reliance on AI (Lockey et al., 2021). There is growing concern that early and unsupervised exposure to GenAI may hinder the development of independent thinking, creativity, and problem-solving skills that are critical in the formative years (Cerioli & Laurenty, 2024). In addition, challenges around academic integrity, data privacy, and accessibility add layers of complexity to its implementation in secondary schools.

In addition, disparities in access to AI resources raise important questions about educational equity (Alasadi & Baiz, 2023). Schools with limited budgets and resources may find it difficult to provide GenAI tools, potentially widening the existing digital divide and putting certain student populations at a disadvantage. The increasing reliance on GenAI in education also raises ethical questions regarding data privacy and AI biases, as GenAI models are often trained with very large data sets that may contain embedded biases (Huang et al., 2024; Yan et al., 2024). These biases, if not addressed, can inadvertently perpetuate harmful stereotypes and influence young minds.

Given these challenges, it is imperative for educators, researchers, and policymakers to critically evaluate the risks and benefits of GenAI in secondary schools (Arantes, 2024). This article thoroughly examines these issues, offering insights into real-world applications of GenAI, ethical and developmental implications, and long-term effects on learning outcomes. By highlighting case studies, examining empirical evidence, and proposing practical guidelines, this review seeks to build an informed foundation for the responsible integration of GenAI in secondary school education.

This critical background underscores the importance of this article, which aims to guide educators, policymakers, and researchers in harnessing the potential of GenAI while safeguarding the educational and developmental needs of secondary school students.

2. METHOD

This article applies a structured scientific approach to critically assess the impact of Generative AI (GenAI) on secondary school education. The research begins by defining core issues, such as the potential for increased personalized learning, the risks of student dependence on AI, and challenges around academic integrity, privacy, and equity (Nguyen et al., 2023). Based on a comprehensive literature review, this research formulates a central hypothesis: that GenAI can enhance engagement and personalization of learning, but can also inhibit independent critical thinking and exacerbate the digital divide. Data from empirical studies, case analyses, surveys, and policy reviews support this hypothesis, with quantitative and qualitative methods used to assess the impact of GenAI on learning outcomes, ethical issues, and the accessibility gap among students.

Through a synthesis of findings, this article discusses the educational benefits and challenges of GenAI, providing evidence-based insights into how this technology affects the learning environment in secondary schools. The discussion highlights positive outcomes, such as increased engagement and skills preparation for future careers, while addressing risks,

including over-reliance on AI, ethical dilemmas, and equity concerns. The article concludes with practical recommendations for the responsible use of GenAI, suggesting policy guidelines to ensure fair access, privacy protection, and support for teachers in encouraging critical thinking. This concise yet rigorous approach offers a balanced view to guide educators and policymakers in responsibly integrating GenAI into secondary school education (Samala et al., 2024).

3. RESULTS AND DISCUSSION

Overview of GenAI Applications in High School Education

GenAI has been introduced into the high school curriculum in various forms (Chiu, 2023). GenAI tools such as ChatGPT and similar educational AI applications can act as virtual tutors, providing personalized learning experiences tailored to individual student needs (Karpouzis et al., 2024; Rashid et al., 2024). From writing assistance to generating creative ideas, GenAI helps students with content creation, supporting them in developing essays, reports, and creative projects (Lewis & Hart, 2024).

The GenAI app can simulate scientific experiments, assist in coding projects, and solve complex math problems, giving students valuable insight into scientific and technical fields (Y.-P. Cheng et al., 2024). GenAI can simulate conversation partners for language practice, support grammar checks, and improve vocabulary acquisition, aiding foreign language education (Law, 2024).

In arts education, GenAI allows students to experiment with creating digital art, music composition, and other creative projects, expanding the traditional arts curriculum to include digital media.

Educational Benefits of GenAI in a High School Environment

The integration of GenAI into high school education offers several potential benefits. GenAI-powered tools can adapt to each student's learning pace and style, creating a more personalized learning environment that can address individual challenges (Borah et al., 2024).

GenAI's interactive applications can increase student engagement by providing immersive learning experiences (Ivanashko et al., 2024). The novelty of GenAI-driven tasks can make learning more fun and engaging. Exposure to GenAI technology prepares students for the future career landscape, especially when AI becomes an integral part of various sectors. The experience also builds skills in digital literacy, critical thinking, and AI ethics (Ng et al., 2022).

GenAI can help teachers by grading assignments, tracking student progress, and even creating teaching materials, thus allowing teachers to focus more on interactions with students and less on administrative tasks (Giannakos et al., 2024).

Challenges and Risks Associated with the Use of GenAI in High School Education

Despite its benefits, the use of GenAI in high schools is fraught with challenges. One of the most pressing issues is the risk of students using GenAI for academic dishonesty (Akkaş et al., 2024). GenAI can generate essays, answer questions, and complete assignments, making it potentially misused for plagiarism and cheating (Giannakos et al., 2024).

Many GenAI tools require access to user data to function effectively. For high school students, this raises significant concerns about data privacy, given the sensitivity of minors' data and regulatory compliance.

There is a risk that students may become overly reliant on the GenAI tool, hindering their ability to develop critical thinking and problem-solving skills independently (Yan et al., 2024). The ease with which GenAI generates answers may inhibit deep learning and intellectual endeavor (Akbar et al., 2024; Law, 2024).

Not all students have equal access to GenAI devices. This gap may widen the digital divide, as students from less affluent backgrounds may not have the resources or infrastructure to benefit from GenAI-enhanced learning (Olojede, 2024).

The use of AI to generate personalized content for minors raises ethical questions, including the potential biasing influence generated by AI and the moral implications of exposing young minds to advanced AI technology without adequate safeguards (McStay & Risner, 2021).

Ethical and Psychological Implications of GenAI in Education

The ethical implications of using GenAI in education cannot be ignored, especially regarding its impact on impressionable young minds. GenAI models may inadvertently reproduce and propagate social biases present in their training data (Huang et al., 2024). For high school students, exposure to biased content can shape perceptions and reinforce stereotypes (Block et al., 2022).

Early and frequent exposure to AI tools can affect students' cognitive development and their sense of confidence. Reliance on GenAI can weaken intrinsic motivation to learn and reduce resilience in the face of challenging tasks (Hoernig et al., 2024).

Education is not just a transfer of information, but also a relational process. The use of GenAI as a substitute for human interaction may reduce opportunities for meaningful teacher-student relationships, which are crucial for social-emotional development. Several case studies

highlight the mixed results of using GenAI in education. Teachers noted an over-reliance on GenAI for brainstorming, suggesting a decline in students' original creativity (Rane et al., 2023; Wang et al., 2023).

Another study of GenAI-assisted STEM learning showed increased engagement in science experiments but also highlighted teacher concerns about students neglecting critical thinking processes (Yoon et al., 2024). These case studies underscore the double-edged nature of GenAI in education.

To maximize the benefits and minimize the risks associated with GenAI, educators and policymakers should adopt responsible guidelines (Arantes, 2024). Schools should establish policies on the acceptable use of GenAI, especially for assignments and exams, to prevent academic misconduct (Rasul et al., 2024).

High school curricula should include lessons on AI ethics, equipping students with an understanding of AI's capabilities, limitations, and moral considerations (George, 2023). Teachers should encourage students to use GenAI as a complement rather than a substitute for critical thinking, fostering resilience and intellectual curiosity (M. Cheng et al., 2022).

Schools and educational institutions should ensure that GenAI tools used in classrooms comply with relevant data protection laws, protecting student data (Hoernig et al., 2024). To prevent GenAI from exacerbating educational inequalities, schools should seek funding and partnerships that make GenAI tools accessible to all students.

Continuous assessment of the impact of GenAI on learning outcomes and student well-being will be critical for effective integration (Hauske & Bendel, 2024). Research should focus on longitudinal studies to understand the long-term effects of using GenAI in education.

4. CONCLUSIONS AND SUGGESTIONS

While Generative AI (GenAI) presents transformative opportunities to improve high school education through personalized learning, creative support, and skill development for future careers, it also presents significant challenges that demand careful consideration. The findings in this article underscore both the educational promise and potential pitfalls of GenAI, revealing that while GenAI can enhance student engagement and provide a valuable resource, its unchecked use can lead to over-reliance, privacy concerns, and ethical dilemmas, including bias and academic integrity issues.

To utilize GenAI responsibly, educators and policymakers should establish clear guidelines that promote equitable access, protect student data, and strengthen critical thinking skills, ensuring GenAI serves as a tool that supports rather than replaces human agency and

intellectual development. By taking a balanced and ethical approach to GenAI integration, schools can better prepare students not only for an AI-driven future, but also to become thoughtful, resilient, and ethically-minded individuals.

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