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A THEMATIC REVIEW ON GOOGLE NOTELM AS AN ASSISTIVE AI TOOL FOR ACADEMIC INDEPENDENCE AMONG STUDENTS WITH VISUAL IMPAIRMENT

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Abstract

Recent advances in artificial intelligence have significantly influenced the development of assistive technologies in education, particularly in supporting learners with disabilities. Studies on assistive technology consistently report that visually impaired students benefit from tools that promote autonomy, self-regulation, and independent engagement with academic content ***(Kelly & Smith, 2011).*** *However, challenges related to note-taking, information organisation, and independent comprehension remain prominent in higher education contexts* ***(Loveys & Butler, 2023****). Recent reviews on artificial intelligence in education highlight the growing role of AI-powered systems in enhancing learning autonomy through personalised interaction, summarisation, and content management* ***(Holmes et al., 2019; Zawacki-Richter et al., 2019).***

Research on AI-supported learning tools indicates that natural language processing–based applications can reduce cognitive load and support self-directed learning among students with diverse learning needs ***(Kasneci et al., 2023).*** *Emerging literature on AI note-analysis tools suggests their potential to support academic independence by enabling learners to engage actively with complex texts and manage learning materials more efficiently* ***(Dwivedi et al., 2023).*** *Google NoteLM represents an emerging AI-based tool designed for document interaction, summarisation, and content organisation, which may hold relevance as an assistive learning aid for visually impaired students.*

This thematic review synthesises existing literature on assistive technology, AI in education, and academic independence to explore the potential role of Google NoteLM as an assistive AI tool. The analysis identifies key themes related to accessibility, learning autonomy, and inclusive digital

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practices. The review also reveals a lack of focused research examining AI-based note-analysis tools specifically for visually impaired learners, indicating a significant research gap and the need for further empirical investigation.

Keywords: Artificial intelligence, Assistive Ai, Visual impairment, Google NoteLM.

Introduction

The rapid rise in the use of artificial intelligence (AI) in education has changed the picture for the delivery of learning support to students with disabilities. A recent paper points out that AI-based tools can eventually take support up the academic ladder by helping the students acquire skills like organisation of information, comprehension, and self-directed learning (Holmes et al., 2019; Zawacki-Richter et al., 2019). These projections are especially relevant for students with visual impairment as independence in learning is frequently the issue in higher education.

The traditional assistive technology, such as screen readers and Braille displays, have done quite a lot in making academic content accessible to visually impaired students, but still, they have not been able to take away the hold that non-visually impaired students have over them in terms of control over their learning (Loveys & Butler, 2023; Pogrund & Smith, 2012). One may wonder why, considering that these technologies provide the same access to learning materials they still depend on others for note-taking, summarizing, and even breaking down smaller parts of the whole academic process. Hence, very often visually impaired students need the help of their classmates or teachers for organizing and planning their revision.

AI and NLP techniques that are recently developed have been suggesting that learning tools powered by AI can become great partners in self-directed learning as they allow for an easy way to summarise, communicate with texts, and manage content efficiently (Kasneci et al., 2023). The mentioned features are very much important for learners with vision impairment, as they only have auditory and text-based interaction with educational materials. Google NoteLM, a budding AI-powered note-taking and document interaction tool, is providing capabilities that are in line with such learning needs.

This thematic review of the present study is set to investigate Google NoteLM's potential as a cutting-edge AI-assisted tool for visually impaired students in their journey toward academic independence. Through a literature review of assistive technologies, AI in education and independent learning, this review attempts to identify the main themes, point out the gaps in research, and suggest routes for future empirical studies.

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Need for the Study

Advancements in assistive technology have significantly improved access to educational content for students with visual impairment; however, access alone does not ensure academic independence. Existing literature indicates that visually impaired learners continue to face challenges in organising information, managing academic tasks, and engaging independently with complex learning materials, particularly in higher education contexts ***(Loveys & Butler, 2023).*** These challenges highlight the need for learning tools that extend beyond basic accessibility and actively support self-directed learning skills.

Although recent reviews acknowledge the growing role of artificial intelligence in education, much of the existing research focuses on general applications of AI or its use among the wider student population ***(Holmes et al., 2019; Zawacki-Richter et al., 2019).*** Limited attention has been given to examining how AI-powered academic support tools can function as assistive technologies for visually impaired students. Studies emphasise that without targeted technological interventions, visually impaired learners often remain dependent on peers or instructors for academic organisation and revision ***(Pogrund & Smith, 2012).***

Moreover, emerging AI-based note-analysis and summarisation tools have the potential to support independent learning by reducing cognitive load and enabling efficient interaction with academic texts ***(Kasneci et al., 2023)***. Despite this potential, there is a noticeable lack of consolidated research exploring such tools from an accessibility and academic independence perspective for visually impaired learners. Therefore, a thematic review is needed to synthesise existing evidence and examine the potential of Google NoteLM as an assistive AI tool that may promote academic independence among visually impaired students.

Objectives of the Study

The primary objective of this article is to explore the potential of Google NoteLM as an assistive artificial intelligence tool for promoting academic independence among visually impaired students.
In addition, the article aims to:

1. Examine existing literature on the application of artificial intelligence and assistive technologies in education for students with visual impairment.
2. Analyse research findings related to academic independence and self-directed learning among visually impaired learners;
3. Identify key thematic patterns concerning AI-powered note-taking, content organisation, and accessibility in educational contexts;

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4. Synthesise scholarly perspectives on the role of AI-based learning support tools in enhancing autonomous academic engagement; and
5. Highlight research gaps and future directions related to the use of AI-driven note-analysis tools for inclusive learning.

Methodology

The present research employed a thematic review approach for the purpose of an extracting existing literature concerning the role of artificial intelligence, assistive technology, and academic freedom among blind students, and more specifically the possible connection with Google NoteLM.

Literature Search Strategy

Relevant literature was discovered by means of systematic searches in certain reputable academic databases like Google Scholar, ERIC and Scopus. The keywords that were used in the search process included assistive technology, artificial intelligence in education, visual impairment, academic independence, AI note-taking tools and Google NoteLM. Only the published peer-reviewed journal articles, review papers, and relevant conference proceedings mainly from the period 2019-2025 were included, to ensure that the latest developments in AI and assistive technologies are captured.

Inclusion and Exclusion Criteria

If the studies were as follows, they would be included:

- Dealt with the areas of assistive technology or AI applications in education.
- Learners with visual impairment or inclusive learning contexts were considered.
- Academic independence, self-directed learning or content organisation were examined.

Studies were eliminated if they:

- We're not in any way related to school situations,
- Were only about AI technologies that were still in the labs and had no educational implications,
- Had no connection with accessibility or learner independence.

Finally, it turned out that 20 pertinent research and review articles, which adhered to the above-mentioned criteria, were chosen for the purpose of the analysis.

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Data Analysis and Theme Formation

Through the methodology of thematic analysis, the research studies that were selected were processed. The key findings, concepts, and patterns were extracted and coded. Thematic categories were developed by grouping the recurring ideas through a process of comparison and synthesis. These themes were reviewed repeatedly to ensure that they were coherent and relevant to the study objectives.

The final themes are indicative of the most critical patterns found in the literature on the subjects of assistive technology, AI-supported learning, accessibility, and academic independence, and were subsequently interpreted as potential roles of Google NoteLM as an assistive AI tool.

Findings

The thematic analysis of the selected literature revealed several recurring themes related to the use of artificial intelligence–based assistive tools and academic independence among visually impaired students. The major findings are organised under the following thematic areas.

Theme 1: Role of Assistive Technology in Promoting Academic Independence

Studies consistently highlight that assistive technologies play a crucial role in enabling visually impaired students to access academic content independently. Research indicates that tools supporting information access, organisation, and comprehension contribute significantly to learners' academic autonomy (Kelly & Smith, 2011; Loveys & Butler, 2023). However, the literature also reveals that access-focused technologies alone are insufficient to fully support independent learning, particularly at higher education levels.

Theme 2: Artificial Intelligence and Self-Directed Learning

Reviews on artificial intelligence in education report that AI-powered systems can support self-directed learning by facilitating personalised interaction with academic content, adaptive feedback, and efficient information management (Holmes et al., 2019; Zawacki-Richter et al., 2019). These capabilities are found to be especially relevant for learners with visual impairment, who depend on non-visual modes of interaction for academic engagement.

Theme 3: AI-Based Note-Taking and Content Organisation

The literature suggests that AI-supported note-taking and content organisation tools help reduce cognitive load and improve learners' ability to synthesise information from multiple sources (Kasneci et al., 2023). Such tools are reported to support independent study practices by enabling summarisation, clarification of complex concepts, and structured learning material management.

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Theme 4: Accessibility and Auditory Interaction in AI Tools

Findings from assistive technology studies emphasise the importance of auditory and text-based interaction in supporting visually impaired learners (Kelly & Smith, 2011). AI tools that provide conversational interaction, audio-based summaries, and structured outputs are viewed as more accessible and supportive of independent academic engagement.

Theme 5: Research Gap in AI Note-Analysis Tools for Visual Impairment

While the reviewed studies acknowledge the potential of AI-based learning tools, there is limited research specifically examining AI-powered note-analysis tools, such as Google NoteLM, in the context of visual impairment. The findings indicate a clear gap in empirical and review-based research addressing how such tools may function as assistive technologies for enhancing academic independence among visually impaired students.

The literature acknowledges the increasing importance of AI in education and the very possibility of AI-powered tools to help students learning gain independence but, it is conspicuously silent on research done specifically about Google NoteLM as a support AI tool for visually impaired students. The prevailing studies are merely talking about AI in general, generative tools or digital access while, one only finds in passing, reference to communication systems based on AI designed to foster independent academic engagement. Empirical and review-based studies, particularly, that scrutinize the accessibility features, usability, auditory interaction and academic independence outcomes of Google NoteLM for visually impaired learners are almost non-existent. This absence of targeted research, therefore, opens up a wide gap in our comprehension of how such up-and-coming AI tools might support technologies within inclusive education frameworks. Bridging this gap is not only necessary to provide evidence-based practice, tool design and future empirical investigations, but also to give researchers access to new frontier areas in the context of AI education.

Discussion

The results of this thematic review demonstrate an ever-changing relationship between artificial intelligence and academic independence of visually impaired students. The major theme in the literature was that the use of assistive technology enabled the students to access learning materials; still, the student engagement through such technologies was not very active as the learning process was directed to lower-order skills only. AI systems are being pointed out as the future of self-directed learning with the help of summarization, structuring content, and interaction with texts (Holmes et al., 2019; Kasneci et al., 2023).

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Visually impaired students would find those functions especially helpful since they are limited to non-visual communication and are often overloaded with thinking when dealing with complex subjects. The thematic analysis also indicates that AI-equipped note-taking and content analysis tools could solve a major problem that traditional assistive technologies have left unresolved. Such tools—through supporting information synthesis, revision, and personalized interaction with content—are seen as closely allied to the academic independence needs identified in the literature (Loveys & Butler, 2023).

In the same vein, the features of Google NoteLM like conversational querying, summarisation, and structured document interaction reflect various principles recognized as crucial for independent learning.

The discussion discloses a significant scarcity of empirical studies that look into AI-powered note-analysis applications for learners with disabilities. Having said that, studies that touch upon artificial intelligence in education in general are available, but direct research on such matters as accessibility, usability, and learning outcomes concerning tools like Google NoteLM has barely begun. This shortcoming restricts the application of evidence-based practices and emphasizes the demand for more empirical and design-based research in the future.

Implications

The findings of this thematic review have important implications for educational practice, technology development, and future research related to visually impaired students and inclusive learning. From an educational perspective, the review highlights the need to move beyond access-oriented assistive technologies toward AI-based tools that actively support academic independence. AI-powered systems that assist with organising information, summarising content, and facilitating self-directed learning may enable visually impaired students to engage more independently with academic tasks, particularly in higher education contexts.

For educators and institutions, the findings suggest that incorporating assistive AI tools such as Google NoteLM into teaching–learning processes could reduce learners' dependence on peers or instructors for academic support. Features of Google NoteLM, including AI-generated summaries, audio-based overviews, interactive question–answering, and quiz-style learning prompts, indicate strong potential for supporting visually impaired students by enhancing auditory access, structured revision, and independent engagement with learning materials. Teacher education and professional development programmes should therefore emphasise awareness and pedagogical integration of such emerging assistive AI tools.

From a technological perspective, the review underscores the importance of designing AI tools that prioritise accessibility, auditory interaction, and compatibility with existing assistive

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technologies such as screen readers. Developers should adopt inclusive and user-centred design approaches to ensure that AI-based learning tools effectively address the needs of visually impaired learners.

Finally, the review highlights important research implications. The limited focus on AI-based note-analysis tools in the context of visual impairment suggests the need for further empirical and design-based studies. Future research should explore the usability, accessibility, and educational impact of tools like Google NoteLM to strengthen evidence-based practices and advance academic independence through assistive artificial intelligence.

Conclusion

The present thematic review highlights that academic independence among visually impaired students remains a critical concern despite advancements in traditional assistive technologies. Studies emphasise that while tools such as screen readers and Braille displays improve access, they do not sufficiently support higher-order academic skills such as content organisation and self-directed learning ***(Kelly & Smith, 2011; Loveys & Butler, 2023).*** Reviews on artificial intelligence in education indicate that AI-powered systems can enhance learning autonomy through personalised interaction, summarisation, and efficient management of academic materials ***(Holmes et al., 2019; Zawacki-Richter et al., 2019).*** Furthermore, research on generative AI suggests that such tools may reduce cognitive load and promote active engagement with learning content, which is particularly beneficial for visually impaired learners ***(Kasneci et al., 2023).*** In this context, the features of Google NoteLM align with key principles identified in the literature for supporting independent learning. However, the limited availability of focused studies on AI-based note-analysis tools for visually impaired students highlights a clear research gap. The review concludes that Google NoteLM shows considerable potential as an assistive AI tool, and future empirical research is necessary to validate its effectiveness in fostering inclusive and independent academic learning.

The goals presented in this thematic review were met through a systematic synthesis of existing literature. The review dealt with past studies on AI and assistive technologies for visually impaired students, evaluated scholarly data regarding learning independence and self-directed learning, and uncovered the main topics like AI-based note-taking, accessibility and content sorting. Moreover, the perspectives on AI-assisted learning technologies were combined and the existing research gaps were pointed out, especially in regard to tools for AI-annotated notes such as Google NoteLM. Therefore, all the stated goals of the research were realized.

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