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**ARTICLE**

# English Reading and Writing Enhancement for Deaf and Hard of Hearing (DHH) Students with Skybox AI: Utilization of AI Image Generators

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## ABSTRACT

The current study aims to evaluate the effectiveness of incorporating Artificial Intelligence (AI) for the instruction of reading and writing skills in the English language for students who are deaf and hard of hearing (DHH). The researcher employed Skybox AI, a three-dimensional artificial intelligence (AI) tool developed by Blockade Labs, enabling to independently generate sentences for the purpose of obtaining visual representations, for the study. The sample for the study comprised a total of 36 students at the higher secondary level, who were enrolled in two separate higher secondary institutions catering the students with hearing impairments. A quasi-experimental methodology is adopted to assess the effectiveness of Skybox AI. Before implementing the experimental intervention, the students were administered a pre-test to evaluate their reading and writing abilities. Following the implementation of the Skybox AI treatment, the students were administered the same reading and writing test as a post-test. The findings from the paired sample t-test indicate a statistically significant improvement in students' reading and writing abilities following the implementation of Skybox AI. The study proposes the widespread utilization of artificial intelligence (AI) technology in the educational process for pupils who are deaf or hard of hearing (DHH).

***Keywords:*** Artificial Intelligence (AI); Skybox AI; Deaf and Hard of Hearing (DHH) Students; Reading and Writing in English

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# 1. Introduction

The integration of technological advancements in education marks a highly anticipated evolution, with recent trends in educational technology symbolizing a revitalizing force within 21st-century learning environments. The COVID-19 pandemic of 2019 catalyzed a major transformation, rapidly accelerating the adoption of educational technology and prompting a shift from traditional in-person instruction to online platforms [1]. For example, virtual environments were suggested to help students [2]. This movement has spurred the development of innovative educational methodologies and practices, making instructional technology a crucial component across all educational levels, from primary to higher education institutions [3]. Integrating multimedia into instructional practices enhances not only the visual and informational aspects of lessons but also strengthens adaptability and overall teaching effectiveness [4].

Several emerging trends are now gaining momentum in this field. E-learning platforms, augmented and virtual reality, artificial intelligence (AI)-driven solutions, blockchain technology, and gamification represent some of the most prominent innovations reshaping education today. AI, in particular, has become an integral element, allowing for personalized learning experiences and fostering enhanced engagement through automation and customization [5]. Virtual and augmented reality technologies further contribute to immersive learning experiences, while blockchain provides enhanced security and transparency in digital learning [6]. Gamification, by adding game-like elements to educational content, promotes student engagement and motivation, creating an interactive learning environment [7].

All these technological advancements underscore a transformative period in education, as instructional technology continues to expand the horizons of teaching and learning [8].

# 2. Literature Review

Artificial Intelligence (AI) has increasingly become integral to educational practices, particularly in enhancing personalized learning and addressing the needs of diverse learners. A systematic review by Aravantinos et al. [9] highlights the growing application of AI in primary school settings, demonstrating its capacity to transform traditional pedagogical approaches. This study, based on literature available in Scopus, underscores the potential of AI to facilitate individualized learning experiences, improve student engagement, and address specific challenges in foundational education. The review identifies that effective integration of AI requires teachers to have both technological proficiency and a pedagogical framework that aligns with AI applications, ensuring meaningful learning outcomes.

Lavidas et al. [10] explore factors influencing students' intentions to use AI applications in the Humanities and Social Sciences. Their findings reveal that students' attitudes toward technology, perceived usefulness, and ease of use significantly impact their adoption of AI tools. This aligns with earlier studies emphasizing the importance of user-centered design and technological adaptability in fostering the adoption of AI in education. The study also identifies barriers such as lack of training and awareness, highlighting the need for targeted interventions to familiarize students with the practical benefits of AI in academic pursuits.

Papadakis et al. [11] extend this discourse by showcasing the role of computer simulations and cloud-based smart technologies in open learning environments. Their research emphasizes how AI-powered systems facilitate access to resources, foster collaboration, and provide adaptive learning pathways. They demonstrate that cloud-based platforms equipped with AI capabilities can support lifelong learning by offering flexibility and personalized content. This approach aligns with global educational goals aimed at promoting inclusivity and equity in access to quality education. However, challenges such as infrastructure limitations and digital literacy gaps persist, necessitating collaborative efforts to ensure broader accessibility and effectiveness of these technologies.

AI's integration into special education further exemplifies its transformative potential. AI-powered tools address specific needs, such as enhancing the accessibility of learning materials and providing alternative communication modes for students with disabilities. For DHH students, tools like AI image generators offer significant benefits by creating customized visual aids that cater to their strong visual learning preferences. The use of such tools aligns with research by Smith and Anderson [12], emphasizing AI's role in improving literacy through multimodal approaches. Studies have shown that integrating visual, tactile, and interactive elements not only supports comprehension but also fosters creativity and engagement among DHH students.

Addressing the challenges of education for DHH learners, researchers have noted the importance of innovative and adaptable teaching methods. Marschark et al.[13] highlight that DHH students' reliance on visual learning necessitates the development of educational strategies that leverage their strengths. AI applications like Skybox AI demonstrate this adaptability by providing 360° photorealistic visuals, enabling learners to connect textual and visual information effectively. The systematic approach adopted by tools like these aligns with the findings of Guardino and Cannon[14], who advocate for customized and motivating teaching aids in special education settings.

Furthermore, the integration of AI in open and inclusive educational environments parallels findings from Papadakis et al.[11], emphasizing the potential of smart technologies to democratize access to quality education. By addressing diverse learner needs, AI fosters inclusivity and reduces barriers to learning. Lavidas et al.[10] reinforce this perspective, suggesting that fostering positive attitudes toward AI among students and educators is crucial for its successful adoption. However, the studies collectively highlight the challenges of digital divide, lack of infrastructure, and inadequate teacher training as barriers to AI's widespread implementation.

Overall, the convergence of insights from these studies highlights the immense potential of AI to revolutionize education, from foundational levels to specialized contexts like DHH education. By addressing both technological and pedagogical dimensions, AI offers the opportunity to create engaging, inclusive, and adaptive learning environments. However, realizing its full potential requires addressing challenges related to training, infrastructure, and digital accessibility. Collaborative efforts among educators, policymakers, and technologists are essential to ensuring that AI tools are both effective and equitable, paving the way for transformative educational practices.

## 2.1. Artificial Intelligence (AI)

Artificial Intelligence (AI) is a key area in educational technology, focused on developing intelligent machines, particularly intelligent computer programs, to enhance human-like understanding[15]. Originating in the 1950s, AI's formal inception is credited to John McCarthy, who coined the term during a seminal workshop at Dartmouth College in 1956[15]. In the twenty-first century, AI is reshaping industries, including education, by offering new opportunities for diverse learners to enhance their experiences[16]. Baker and Smith[16] propose a tripartite framework for educational AI tools, categorizing them into learner-facing, teacher-facing, and system-oriented tools. Learner-facing AI tools, such as adaptive learning systems and intelligent tutoring systems[17], support individualized learning. Teacher-oriented systems reduce administrative burdens through automation in assessment, feedback, and plagiarism detection, while providing data-driven insights for student support[18]. This integration transforms education by improving personalization, streamlining teaching tasks, and fostering an inclusive, data-driven learning environment[17].

## 2.2. Advancement of Artificial Intelligence in the Field of Special Education

Artificial Intelligence (AI) is increasingly recognized as a transformative force in enhancing educational experiences for students with disabilities by offering tailored solutions to meet their unique learning needs. AI-powered tools possess the capacity to adapt content, provide alternative communication modes, and offer personalized support, thus improving accessibility for students with visual, auditory, mobility, or cognitive impairments[12, 19]. Through individualized approaches, these technologies empower learners and enable them to engage meaningfully with educational material.

AI's impact extends profoundly into the domain of special education, reshaping how educators support diverse student needs[20]. AI-driven applications facilitate personalized learning experiences that are particularly critical in special education, where individualized attention is paramount[21]. Such tools can tailor curricula to the unique strengths and challenges of each student, ensuring that educational content aligns with their distinct learning styles and abilities[22]. This personalized adaptation benefits students with disabilities, such as hearing impairments, autism spectrum disorder, or dyslexia, by providing customized content and activities aligned with their specific needs and learning pace[23].

Beyond classroom instruction, AI in special education also plays a crucial role in early diagnosis and intervention. AI-powered assessment tools analyze students' responses and behavior patterns, offering insights into their cognitive and emotional development, thereby enabling timely interventions[24]. Communication devices and AI-driven applications

further enhance interactions for non-verbal or minimally verbal students, facilitating meaningful engagement with peers and educators [25]. As AI continues to evolve, its potential to promote inclusivity and improve the effectiveness of special education is immense, promising a more accommodating and supportive learning environment for students with disabilities [12].

## 2.3. Challenges of Deafness in the Field of Education

DHH students face distinct educational challenges compared to their peers with other disabilities, primarily due to communication barriers, limited access to auditory information, and inconsistent availability of qualified sign language interpreters [26]. Communication gaps can lead to misunderstandings, negatively affecting learning and social interactions [27]. Inclusive education, while essential, often suffers from educators' insufficient training in accommodating DHH students, resulting in inadequate support [28]. Social isolation and limited access to assistive technology, such as hearing aids and cochlear implants, further impede learning and inclusion [29].

Language development is a critical concern, as delays can arise without early access to sign language or adequate language support services [30]. Balancing bilingual education—teaching in both sign and written languages—poses additional challenges for educators [31]. Parents must often advocate for their children, while standardized assessments may inadequately reflect DHH students' abilities [32]. Efficient teachers of DHH students develop customized, innovative, and motivating teaching aids to address the specific needs of these learners [14]. By adapting instructional strategies to fit individual communication modes and learning preferences, these educators foster a more engaging and accessible educational environment [33]. For that, artificial intelligence (AI) can be harnessed to capture students' attention and stimulate their enthusiasm for learning, yielding improved educational outcomes. For example, AI-powered interactive tools can provide personalized content and feedback, enhancing engagement and supporting skill development [34]. Addressing these challenges necessitates collaboration among educators, families, and the Deaf community to create inclusive, supportive environments for DHH learners.

## 2.4. DHH Students Are Visual Learners

DHH students often exhibit strong visual learning preferences due to their reliance on visual communication methods, including sign language, lip-reading, and heightened visual awareness [35]. This reliance fosters greater visual attentiveness and skill in gathering contextual and non-verbal information from their surroundings [36]. Moreover, sign language's use of spatial relationships strengthens their spatial awareness and visualization skills [37].

While visual learning is prominent, many DHH students benefit from a multimodal approach that incorporates visual, tactile, and kinesthetic elements, aligning with their diverse learning preferences [38]. Technology, including captioned videos, interactive graphics, and sign language content, plays a pivotal role in supporting their education [39]. Additionally, visual arts provide an outlet for creative expression and reinforce visual memory skills, enhancing information retention [40]. Recognizing these preferences is crucial for educators, who must design inclusive learning environments and visual materials that capitalize on the strengths of DHH learners.

## 2.5. AI Image Generators for Teaching English Language for DHH Students

AI image generators offer valuable support in teaching English literacy to DHH students by enhancing engagement and accessibility. Visual reinforcement, such as images accompanying text, aids comprehension and retention [41]. Interactive AI-driven games and personalized content cater to individual reading levels, making learning relevant and enjoyable [42]. These tools can provide multimodal content—visual, written, and interactive—which addresses various learning styles [43]. Additionally, AI image generators can integrate real-world applications, showcasing language in practical contexts to motivate students [44]. They offer immediate feedback, tracking progress and reinforcing accomplishments, which further drives engagement [45]. By exposing students to diverse cultures and enabling collaborative storytelling, these tools foster a sense of belonging and creativity [46]. AI image generators thus create an inclusive environment, supporting DHH students' literacy development.

### 2.6. AI Image Generators

AI image generators, such as Skybox AI, offer valuable support in enhancing English language instruction for DHH students by providing customized visual aids that enrich comprehension and engagement. Skybox AI, developed by Blockade Labs, is a three-dimensional AI tool that creates 360° photorealistic backgrounds from simple textual descriptions[47]. Established in 2011 by Derek MacNeil, Shyang Kong, and Steven Silvester, who have industry experience from collaborations on prominent video games like *Halo* and *Minecraft*, Skybox AI is designed for accessibility and ease of use[48]. This tool not only stimulates the reading and writing process among DHH students but also inspires creativity, as students are motivated to generate sentences to visualize their ideas independently.

Skybox AI's interactive platform offers a multimodal approach, where students can transform visual prompts into descriptive text, thus building literacy skills while maintaining engagement. The ability to create custom 360° visuals tailored to students' needs enables teachers to implement diverse classroom activities that make English learning accessible and enjoyable for DHH students. Overall, Skybox AI stands out as a significant tool for promoting English language proficiency in a supportive and interactive environment.

## 3. Methodology

An experimental study was carried out on a sample of 36 higher secondary level students from two higher secondary schools for hearing impaired in Kerala. The study was undertaken to assess the efficacy of Skybox AI in enhancing English reading and writing proficiency. The 18 samples were selected through a random sampling method for the research investigation from each school. The study consisted of two separate sessions for reading and writing, each lasting two hours. Prior to and following the utilization of the AI tool, pre- and post-tests were conducted for both the reading and writing sections of the study. Each section carried a weightage of 10 points, resulting in a cumulative score of 20 points.

### 3.1. Process

#### 3.1.1. Skybox AI for Reading Sessions

One potential application of artificial intelligence image generators for enhancing English reading and writing for the DHH is the use of Skybox AI for reading sessions. The visually rich text descriptions created by the AI image generator can help bridge the gap between written English and sign language, making it easier for DHH individuals to understand and comprehend the content.

The investigator experimented with the assumption by grouping the sample of students into four and distributed a paragraph to read. They were allowed to use the internet to refer to the sign language dictionaries to get the meaning of the words and discuss with their group members. The investigator called for the students one by one and asked them to sign what they read in the class. The students performed with the least motivation and enthusiasm during the reading sessions, leading to poor comprehension and limited engagement that may be due to the limited English language exposure of the (DHH) students and their lack of confidence to understand the English language[49]. They were evaluated and scored out of 10 marks as a pre-test.

However, after implementing the Skybox AI image generator in subsequent reading sessions, the results showed a significant improvement in comprehension and engagement among the DHH students.

The investigator introduced Skybox AI in the class in ISL, as their primary language[50] and provided an activity **'Word come true'** using this Skybox AI. As visual learners, the students were found enthusiastic to create 3D visuals from the descriptions that are given after reading the text. A post-test was conducted by calling the students one by one to translate the English paragraph into ISL. There was a significant improvement in the students' interest to translate what they read in English into ISL after using the Skybox AI platform. They could comprehend better than before they use the Sky box AI tool. Overall, the introduction of the Skybox AI image generator in reading sessions for DHH students resulted in increased comprehension, engagement, and interest in translating English text into sign language.

Image generators provide visually appealing and interactive content that would capture the attention of DHH students, making reading sessions more engaging and motivating. By generating images related to the text being read, the AI image generators can help visually illustrate concepts

and vocabulary, making it easier for DHH students to understand and comprehend the material. Furthermore, these image generators could also assist DHH students in developing their writing skills. The use of AI image generators can also facilitate the development of critical thinking skills in DHH students. By presenting visual stimuli and encouraging students to analyze and interpret the images generated by AI, students can practice higher-order thinking skills such as making connections, analyzing cause-and-effect relationships, and drawing conclusions. By providing them with visual aids and interactive content, AI image generators can bridge the gap between text-based learning materials and the unique learning needs of DHH students, ultimately improving their reading comprehension, writing skills, and critical thinking abilities.

### 3.1.2. Skybox AI for English Writing Sessions

As the second part of the study, the investigator utilized the Skybox AI tool to stimulate English writing skills in DHH students who are considered the population with low-level English language proficiency. The English proficiency of DHH students is often lower compared to their hearing peers, which can be attributed to difficulties in language acquisition and communication due to their disability[51]. This is because they learn things visually and rely on sign language as their primary mode of communication since they are considered visual learners. The findings of the study pointed out that the introduction of the Skybox AI tool significantly stimulated the students' English writing skills.

The investigator grouped the students into four and asked them to imagine something and make short descriptions of the same. The students performed poorly with the least motivation to think and write. The investigator scored them out of 10 and entered the pre-test marks. **'Dream come true'**, an activity was conducted in the class. In this activity, the students were asked to imagine a particular situation or scenery and write the descriptions of the same in the Skybox AI description box to create the 3D visuals using the Skybox AI. The students became very much interested in visualizing their imaginations. All the group members in the groups were very active in making visuals. The investigator evaluated their write ups and scored it out of 10 marks. There were grammatical mistakes in the sentences but they were very much motivated to make sentences without hesitation.

Using AI image generators in English writing sessions can greatly enhance the writing skills of DHH students. The AI image generators provide a visual representation of their written descriptions, making the writing process more interactive and engaging for DHH students. Skybox AI worked as a great motivating factor to encourage the DHH students to think creatively and express their ideas in the text box of the Skybox AI. The study highlights the positive impact of AI image generators, specifically the Skybox AI tool, on enhancing English reading and writing skills for DHH students. The use of AI image generators, such as the Skybox AI tool, in English writing sessions has been found to significantly improve the writing skills of DHH students and enhance their motivation to think and write.

The study demonstrates that the introduction of the Skybox AI tool effectively stimulates English writing and reading skills in DHH students. Furthermore, the study showed that the use of the Skybox AI tool not only improved the students' writing skills, but also increased their motivation to think creatively and express their ideas in written form. The findings of this study suggest that incorporating AI image generators such as the Skybox AI tool into English writing sessions can have a significant positive impact on DHH students' English writing skills and motivation to think creatively and express their ideas.

### 3.2. Analysis of Data

The pre-test and post-test scores of **36 DHH** students in the reading and writing tests are analysed using paired sample t-test (dependent sample t-test).

The paired sample t-test is a statistical technique which compares the means of two measurements of a single group[10]. In the present study, the mean scores in the pre-test and post-test reading and writing tests for undergraduate DHH students was compared in order to find whether the difference between these means are statistically significant. The obtained t-value was tested for significance by finding out the p-value. The p value for df 35 ($36 - 1 = 35$) at 0.001 level is 3.34. Any t-value at or above 3.34 is significant at 0.001 level.

## 4. Results

The results are given below.

### 4.1. Comparison of the Pre-Test and Post-Test Reading Scores in English of Undergraduate DHH Students

**Table 1** shows that there is significant difference between the pre-test and post-test reading scores of undergraduate DHH students as the obtained t-value is significant ($t = 23.20$; $p < 0.001$). The obtained mean post-test score (mean = 7.67) is higher than the mean pre-test score (mean = 2.39). This shows that there is statistically significant improvement in the performance of undergraduate DHH students in their reading scores in English after the experimental teaching using Skybox AI. The effect size of 3.87 is high which reveals that this finding has high practical significance.

Thus, the hypothesis formulated in this context 'There is significant difference in the pre-test and post-test reading scores in English of undergraduate DHH students' is accepted.

### 4.2. Comparison of the Pre-Test and Post-Test Writing Scores in English of Undergraduate DHH Students

**Table 2** shows that there is significant difference between the pre-test and post-test writing scores of undergraduate DHH students as the t-value is significant ($t = 24.67$; $p < 0.001$). The obtained mean post-test score (mean = 7.17) is higher than the mean pre-test score (mean = 2.72). This shows that there is statistically significant improvement in the performance of undergraduate DHH students in their writing scores in English after the experimental teaching using Skybox AI. The effect size of 4.11 is high which reveals that this finding has high practical significance.

Thus, the hypothesis formulated in this context 'There is significant difference in the pre-test and post-test writing scores in English of undergraduate DHH students' is accepted.

## 5. Recommendations

While the study demonstrates the immediate effectiveness of Skybox AI in enhancing literacy skills among DHH students, it offers limited insight into the long-term implications of such interventions. The absence of longitudinal data restricts an understanding of how sustained use of AI tools might influence academic performance, engagement, and broader cognitive development over time. Long-term studies are essential to evaluate whether the initial gains achieved through AI integration are maintained or amplified as students continue to engage with these technologies. Moreover, the potential drawbacks, such as over-reliance on AI or its effects on traditional teaching practices, remain unexplored. Addressing this gap through longitudinal research would provide a more comprehensive understanding of AI's role in fostering enduring educational outcomes for DHH students.

## 6. Conclusions

The study found that the use of Skybox AI has resulted in enhanced reading and writing skills in English for the undergraduate DHH students. The difference in the pre-test and post-test scores in reading and writing is considerable which shows that the Skybox AI is an effective and interesting tool for DHH students for learning to read and write effortlessly. The high effect size also shows that these findings have much practical significance. This could be due to the visually appealing and interactive content of skybox AI that would capture the attention of DHH students, making reading and writing sessions more engaging and motivating. One of the limitations of the study is that the study was conducted on a sample of only 36 students. Since the study was conducted on a limited sample, it can be conducted on a large sample of students from various educational institutions for DHH students for reinforcing its effectiveness. Since the experimental teaching was found to be highly effective, it is recommended that the use of

Skybox AI should be applied in all educational institutions for DHH students in Kerala. Teachers should be given adequate in-service training in the use of artificial intelligence in teaching by giving adequate exposure to AI tools such as the Skybox AI. The use of such AI tools in the classroom for DHH students must be encouraged by authorities wholeheartedly. For this to happen, policymakers should provide adequate guidelines to educational institutions and provision of adequate infrastructure for conducting these activities must be ensured by them. Since AI tools such as ChatGPT are gaining momentum and fast becoming indispensable in a technology-dependent world, proficiency in both English language and AI tools are becoming essential

**Table 1.** Comparison of the pre-test and post-test reading scores of undergraduate DHH Students (n = 36).

| Tests | Mean | Std. Deviation | Std. Error of Mean | t-Value | p Value |
|---|---|---|---|---|---|
| Pre-test | 2.39 | 0.93 | 0.156 | 23.20 | $p < 0.001$ |
| Post-test | 7.67 | 0.83 | 0.138 | | |

Effect size (Cohen's d) = 3.87.

**Table 2.** Comparison of the pre-test and post-test writing scores of undergraduate DHH students (n = 36).

| Tests | Mean | Std. Deviation | Std. Error of Mean | t-Value | p Value |
|---|---|---|---|---|---|
| Pre-test | 2.72 | 0.70 | 0.117 | 24.67 | $p < 0.001$ |
| Post-test | 7.17 | 0.91 | 0.152 | | |

Effect size (Cohen's d) = 4.11.

qualities for students. As their hearing peers have the wherewithal to acquire these skills, DHH students have certain limitations. As a society, it is our duty to ensure that they are not left behind. For effective and unbiased use of AI tools by students, teachers should also be conversant in these technologies for supervision and rectification.

# 7. Limitations and Scope

The study demonstrates that Skybox AI significantly enhances the reading and writing skills of DHH undergraduate students, with considerable improvements observed in pre-test and post-test scores. These findings highlight the potential of Skybox AI as an effective and engaging tool for improving literacy skills. However, the study is not without limitations, and addressing these can provide a more comprehensive understanding of the tool's impact and scalability.

One major limitation is the reliance on self-reported data from students, which introduces the possibility of bias. Participants may unintentionally overestimate or underestimate their progress, potentially skewing the findings. To mitigate this, future research should incorporate additional data sources such as teacher assessments, academic records, and observational data. Triangulating findings from these sources would enhance the reliability and accuracy of the results.

Another limitation is the relatively small sample size of 36 students, which restricts the generalizability of the findings. To strengthen the validity of the results, future studies should include a larger and more diverse sample, encompassing multiple educational institutions for DHH students. Such research would reinforce the effectiveness of Skybox AI across varied contexts and provide a clearer picture of its broader applicability.

The study also lacks a comprehensive analysis of the factors contributing to the observed improvements. While the visually appealing and interactive content of Skybox AI is likely a significant factor, identifying the specific elements of the tool that are most effective would offer valuable insights for educators and developers. Understanding these factors would enable further refinement of AI tools to better meet the unique needs of DHH students.

Additionally, the scalability and long-term impact of using Skybox AI remain unexplored. Longitudinal studies are necessary to evaluate whether the benefits observed in the short term are sustained over time. Such research would also help identify any potential challenges in the continuous integration of AI tools into classroom settings, ensuring that these technologies remain both effective and practical for educators and students.

In conclusion, while the study makes a meaningful contribution to the fields of educational technology and special education, addressing these limitations would significantly enhance the robustness and applicability of its findings. Future research should focus on expanding the sample size, reducing potential biases, exploring long-term impacts, incorporating insights from Western contexts, and providing a more comprehensive analysis of the factors contributing to the observed improvements. Such efforts would ensure that tools like Skybox AI are optimized to foster inclusive, engaging, and effective learning environments for DHH students.

# Author Contributions

N.M.V. conceptualized and conducted the study, including methodology, investigation, and data curation. J.C.R.G. supervised the study, validated the research, and contributed

to writing—review and editing. Both authors have read and approved the final manuscript.

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## Institutional Review Board Statement

Not applicable.

## Informed Consent Statement

Informed consent was obtained from all subjects in the study.

## Data Availability Statement

The data that support the findings of the study are available from the corresponding author (Ms. Nisha M.V.) upon reasonable request.

## Conflicts of Interest

The authors declare no conflict of interest.

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