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A Comparative Study on the Impact of Cognitive Strategy Instruction in Teaching Students with Hearing and Visual Impairment in Special Education Centre in Bauchi State

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Abstract **Original Research Article**

This study investigated the impact of cognitive strategy instruction on the academic performance of students with hearing impairment and students with visual impairment in a Special Education Center in Bauchi State, Nigeria. Using a quasi-experimental comparative design, forty (40) students were purposively selected as participants, comprising twenty (20) students with hearing impairment and twenty (20) students with visual impairment. Data were collected through a Cognitive Strategy Learning Achievement Test (CSLAT) administered as pre-test and post-test. Cognitive strategy instruction was implemented over a four-week period, focusing on strategies such as summarization, self-questioning, concept mapping, rehearsal, and monitoring of comprehension. Data analysis employed descriptive statistics (mean and standard deviation) and inferential statistics (independent samples t-test) at a 0.05 level of significance. The findings revealed that cognitive strategy instruction significantly improved the academic performance of both groups, with mean post-test scores of 67.85 for hearing-impaired students and 63.40 for visually impaired students. The t-test indicated a statistically significant difference between the groups ($t = 2.11$, $p = 0.041$), suggesting differential effects of the intervention depending on sensory modality. The study concluded that cognitive strategy instruction is an effective approach for enhancing learning outcomes among students with sensory disabilities, particularly when instructional strategies are adapted to learners' modalities. Recommendations include systematic integration of cognitive strategies into special education curricula, teacher training, adaptation of instructional materials, and use of assistive technologies to optimize learning for diverse disability groups.

Keywords: Cognitive strategy instruction, hearing impairment, visual impairment, academic performance, special education, inclusive learning, Nigeria.

Introduction

Education is universally recognized as a fundamental human right and a critical instrument for social, economic, and technological development. Over the past few decades, global educational reforms have increasingly emphasized equitable access to quality education for all learners, including those with disabilities. This emphasis has been reinforced by international educational frameworks such as the United Nations Educational, Scientific and Cultural Organization Education for All initiative and the

United Nations Sustainable Development Goal 4, which advocates inclusive and equitable quality education for all learners regardless of their physical, sensory, or cognitive conditions. Within this global movement, the educational needs of learners with sensory impairments, particularly those with hearing and visual impairments, have gained increasing scholarly and policy attention.

Students with sensory impairments face unique educational challenges that can significantly influence their academic achievement and participation in classroom activities. Hearing impairment affects the ability of learners to access auditory information, which is a primary channel through which instruction is delivered in most classroom environments. As a result, learners with hearing impairment often encounter difficulties in language acquisition, communication, vocabulary development, and comprehension of academic content (Marschark & Spencer, 2016). These challenges may consequently influence their academic performance if appropriate instructional strategies are not implemented.

Similarly, students with visual impairment experience barriers in accessing instructional materials that rely heavily on visual input such as textbooks, diagrams, charts, and visual demonstrations. Although these challenges can affect academic progress, research indicates that visually impaired learners possess the capacity to achieve high levels of academic success when teaching strategies are adapted to accommodate their learning needs through auditory, tactile, and cognitive learning approaches (Ferrell, Bruce, & Luckner, 2014). Effective instruction for students with visual impairment therefore requires the integration of specialized strategies that facilitate conceptual understanding and information processing through alternative sensory channels.

In contemporary educational research, there is increasing recognition that the effectiveness of instruction depends not only on the content being taught but also on the cognitive processes that learners employ to acquire, organize, and retain knowledge. This perspective has led to the growing adoption of cognitive strategy instruction, an instructional approach that focuses on teaching learners how to actively process information and regulate their own learning. Cognitive strategies include techniques such as summarization, concept mapping, mnemonic devices, rehearsal, self-questioning, and problem-solving activities that enhance learners' ability to organize information and construct meaning from instructional materials (Pressley & Harris, 2006).

The theoretical foundation for cognitive strategy instruction is rooted in cognitive learning theory, which emphasizes the active role of learners in constructing knowledge through mental processing and interaction with learning materials. Early cognitive theorists such as Jerome Bruner proposed that learning occurs when learners actively organize and interpret information rather than passively receive knowledge from teachers. According to this perspective, effective instruction should engage learners in meaningful cognitive activities that enable them to connect new information with their prior knowledge and experiences.

For learners with disabilities, particularly those with sensory impairments, cognitive strategy instruction has been identified as an effective approach for improving academic achievement and promoting independent learning. Research has shown that explicit instruction in cognitive strategies helps students develop metacognitive skills that enable them to plan, monitor, and evaluate their learning processes (Swanson, Harris, & Graham, 2013). These metacognitive skills are especially important for learners with disabilities because they support self-regulation and enhance learners' ability to overcome learning difficulties.

In the context of hearing impairment, cognitive strategy instruction often involves the use of visual aids, graphic organizers, structured note-taking, and concept mapping to enhance comprehension and retention of academic content. Such strategies compensate for the limited auditory access experienced by learners with hearing impairment by presenting information in visually structured formats (Luckner, Slike, & Johnson, 2020). These strategies also support the development of higher-order

thinking skills, including analysis, synthesis, and problem-solving.

Conversely, students with visual impairment tend to benefit more from cognitive strategies that rely on auditory processing, verbal interaction, and memory-based learning techniques. Instructional strategies such as mnemonic devices, auditory summarization, guided questioning, and verbal rehearsal have been shown to enhance information retention and conceptual understanding among visually impaired learners (Ajuwon, Meeks, & Griffin-Shirley, 2021). These approaches allow visually impaired learners to engage actively with learning materials despite the absence or limitation of visual input.

Although the importance of cognitive strategy instruction in special education has been widely acknowledged, many classrooms in developing countries still rely heavily on traditional teacher-centered instructional approaches that emphasize rote memorization and passive learning. These methods may not adequately support the cognitive engagement required for meaningful learning among students with sensory impairments. In Nigeria, for example, special education institutions often face challenges such as inadequate instructional resources, limited teacher training in specialized pedagogical strategies, and insufficient application of evidence-based teaching practices for learners with disabilities (Okeke & Nwosu, 2020).

Furthermore, while numerous studies have investigated the effectiveness of cognitive strategy instruction among students with learning disabilities, relatively few studies have conducted comparative investigations involving students with different types of sensory impairments. Understanding how cognitive strategy instruction influences learners with hearing impairment compared to those with visual impairment is important because these groups rely on different sensory channels for information processing and learning.

The need for empirical research in this area is particularly relevant in the context of inclusive and special education systems in developing countries, where educational resources and specialized instructional expertise may be limited. Comparative studies can provide valuable insights into the effectiveness of different instructional strategies and guide teachers in selecting appropriate approaches for diverse groups of learners.

Against this background, this study investigates the comparative impact of cognitive strategy instruction on the academic performance of students with hearing impairment and students with visual impairment in a Special Education Centre in Bauchi State, Nigeria. By examining the effectiveness of cognitive strategy instruction among these two groups of learners, the study seeks to contribute to the growing body of knowledge on evidence-based instructional strategies for students with sensory impairments.

The findings of this study are expected to provide important implications for teachers, curriculum developers, educational administrators, and policymakers involved in special and inclusive education. Specifically, the study will highlight the role of cognitive learning strategies in improving academic outcomes for learners with hearing and visual impairments and provide evidence-based recommendations for enhancing instructional practices in special education settings.

Literature Review

Cognitive Strategy Instruction (CSI) refers to a systematic instructional approach designed to help learners acquire, apply, and regulate cognitive processes required for learning and problem solving. It focuses on teaching students how to think, plan, monitor, and evaluate their own learning activities, rather than merely memorizing information (Pressley & Harris, 2006). Cognitive strategies typically include rehearsal, elaboration, organization, self-questioning, summarization, and metacognitive monitoring.

Within the field of Special Education, CSI has become an essential instructional framework for learners with disabilities because it promotes independent learning and academic self-regulation. According to Barry J. Zimmerman, cognitive and metacognitive strategies enable learners to become

self-regulated, allowing them to plan learning tasks, monitor comprehension, and adjust strategies when difficulties arise.

Research in special education suggests that learners with sensory impairments often face barriers in accessing instructional information. Therefore, structured strategy instruction can help compensate for these limitations by providing explicit guidance on how to process and retain academic information (Swanson, Harris, & Graham, 2013). CSI typically involves explicit modeling, guided practice, scaffolding, and gradual release of responsibility to learners.

In recent decades, scholars have linked CSI to the principles of the Zone of Proximal Development proposed by Lev Vygotsky. The theory emphasizes that learners achieve higher levels of understanding when guided by structured instructional support. Cognitive strategy instruction aligns with this principle by helping students internalize strategies that they can eventually apply independently.

Empirical evidence indicates that CSI improves comprehension, problem-solving ability, and academic performance among students with various disabilities (Graham & Harris, 2018). However, the extent of its effectiveness may vary across disability groups, particularly among learners with sensory impairments such as hearing and visual impairments.

Hearing Impairment refers to a partial or total inability to hear sounds, which may significantly affect language development, communication, and academic achievement. Students with hearing impairment often encounter challenges in classroom learning due to limited access to spoken instruction and auditory information (Marschark & Spencer, 2016).

Within educational settings, learners with hearing impairment may rely heavily on visual channels of information, including sign language, lip reading, written materials, and visual aids. As a result, their cognitive processing patterns may differ from those of hearing students. Research has shown that hearing-impaired students may experience delays in vocabulary development, reading comprehension, and abstract reasoning when instructional support is insufficient (Luckner & Bowen, 2010).

However, when appropriate instructional strategies are used, students with hearing impairment can achieve academic outcomes comparable to their hearing peers. Cognitive strategy instruction plays a significant role in facilitating this process by teaching students how to organize information visually, summarize content, and monitor their comprehension.

Studies have demonstrated that CSI improves reading comprehension and problem-solving skills among hearing-impaired learners. For instance, Marschark, Shaver, Nagle, and Newman (2015) found that explicit strategy instruction significantly enhanced academic performance among deaf students in inclusive and special education settings. Similarly, Luckner and Handley (2008) reported that cognitive and metacognitive strategies improved reading comprehension among secondary school students with hearing impairment.

These findings suggest that CSI can serve as a powerful instructional tool for learners with hearing impairment by compensating for limitations in auditory information processing and strengthening cognitive engagement in academic tasks.

Visual Impairment refers to a condition in which an individual experiences partial or complete loss of vision that cannot be corrected fully with medical treatment or corrective lenses. Students with visual impairment often depend on tactile and auditory learning modalities, including Braille, audio materials, and assistive technologies (Hatlen, 2015).

Educational challenges faced by visually impaired learners include difficulties in accessing printed materials, visual diagrams, graphs, and other visually presented information. These challenges can affect academic performance if appropriate instructional strategies are not provided (Ferrell, Bruce, & Luckner, 2014).

Cognitive strategy instruction has been widely recommended for learners with visual impairment because it promotes active information processing and strategic learning behaviors. For example,

strategies such as verbal rehearsal, mental imagery, structured note-taking, and self-questioning can help visually impaired students process and retain academic content effectively.

Research indicates that CSI improves reading comprehension, memory retention, and conceptual understanding among visually impaired learners. According to Wong and Butler (2012), explicit instruction in cognitive strategies enables visually impaired students to organize information logically and apply problem-solving techniques during academic tasks.

Furthermore, Hatlen (2015) emphasizes that visually impaired learners benefit from structured teaching approaches that encourage independent learning. CSI supports this goal by helping students develop metacognitive awareness and strategic thinking skills.

Despite these benefits, there is still limited empirical research comparing the effectiveness of CSI between learners with hearing impairment and those with visual impairment, particularly within African educational contexts.

Students with sensory impairments share certain educational challenges, yet their learning needs differ due to the nature of their disabilities. Hearing-impaired learners depend primarily on visual learning channels, while visually impaired learners rely heavily on auditory and tactile information processing.

According to Swanson et al. (2013), instructional strategies must be adapted to align with the sensory strengths of learners. Cognitive strategy instruction is particularly effective when teachers modify strategies to suit the specific needs of each disability group.

Comparative studies suggest that while CSI benefits both groups, the degree and form of effectiveness may vary depending on how strategies are delivered. For instance, Marschark and Spencer (2016) note that deaf learners often demonstrate strong visual-spatial processing abilities, which can enhance the effectiveness of visually structured cognitive strategies.

Conversely, Ferrell et al. (2014) report that visually impaired students may exhibit strong auditory memory skills, which can support strategy-based learning through verbal instruction and audio-based materials.

However, empirical comparative research between these two groups remains scarce, especially in developing countries such as Nigeria. This gap highlights the importance of conducting studies that examine how CSI affects different categories of learners with sensory impairments within specific educational contexts.

Several empirical studies have explored the impact of cognitive strategy instruction on learners with disabilities. Graham and Harris (2018) found that CSI significantly improved writing performance and self-regulation among students with learning disabilities. Similarly, Swanson et al. (2013) reported positive effects of strategy instruction on reading comprehension and problem-solving skills.

In the context of hearing impairment, Luckner and Bowen (2010) examined the use of cognitive and metacognitive strategies among deaf students and found significant improvements in comprehension and retention. Marschark et al. (2015) also reported that structured cognitive strategy instruction enhanced academic performance among deaf learners.

For visually impaired learners, Ferrell et al. (2014) found that explicit strategy instruction improved academic engagement and comprehension. Hatlen (2015) further emphasized that visually impaired students benefit greatly from structured instructional approaches that promote independent learning strategies.

Despite these findings, most existing studies focus on single disability groups rather than comparing different categories of sensory impairments. Comparative studies are necessary to determine whether the effectiveness of CSI differs between hearing-impaired and visually impaired learners.

The literature reviewed indicates that cognitive strategy instruction is an effective instructional approach for improving academic outcomes among

learners with disabilities. Studies have demonstrated that CSI enhances comprehension, memory retention, and problem-solving abilities among both hearing-impaired and visually impaired students.

However, there remains a significant research gap regarding the comparative effectiveness of cognitive strategy instruction across different sensory disability groups. Most existing studies have examined either hearing impairment or visual impairment independently without conducting comparative analyses.

Methodology

This study adopted a quasi-experimental comparative research design to investigate the impact of cognitive strategy instruction on the academic performance of students with hearing impairment and students with visual impairment in a special education setting. The design was considered appropriate because it allowed the researcher to examine the effects of an instructional intervention on two naturally existing groups of learners without random assignment. Quasi-experimental designs are widely used in educational research, particularly when dealing with learners with disabilities, where ethical and practical considerations often prevent randomization (Creswell & Creswell, 2018). The study utilized a pre-test and post-test structure in order to determine the effectiveness of the instructional strategy. Both groups of students were tested before the intervention to determine their baseline academic performance and again after the intervention to measure the improvement that occurred as a result of the cognitive strategy instruction.

The study was conducted at a Special Education Center in Bauchi State, located in northeastern Nigeria. The center provides educational services to learners with different forms of disabilities, including hearing impairment and visual impairment. The institution was selected because it accommodates students with both categories of sensory disabilities and has trained teachers who specialize in the education of learners with special needs. The center provides an enabling learning environment through the use of specialized instructional materials and adaptive teaching approaches that align with the principles of Special Education.

The population of the study consisted of all students with sensory impairments enrolled in the selected Special Education Center during the period of the study. These students are categorized based on their disability types and receive specialized instruction that meets their educational needs. Students with Hearing Impairment are learners who experience partial or total loss of hearing and often depend on visual communication methods such as sign language, lip reading, and written instructions. On the other hand, students with Visual Impairment are those who have partial or total loss of vision and therefore rely more on auditory and tactile learning methods such as Braille and audio learning materials.

A sample of forty (40) students was used for the study. The sample consisted of twenty (20) students with hearing impairment and twenty (20) students with visual impairment. The participants were selected using purposive sampling technique. This sampling technique was appropriate because the researcher deliberately selected students who possessed the specific characteristics required for the study. Purposive sampling allows researchers to focus on participants who are most relevant to the objectives of the research (Patton, 2015). The students selected were those who had been formally identified by the school as having hearing impairment or visual impairment and were actively participating in classroom learning activities at the time of the study.

The primary instrument used for data collection in this study was the Cognitive Strategy Learning Achievement Test (CSLAT) developed by the researcher. The instrument was designed to measure students' academic performance and their ability to apply cognitive learning strategies. The test consisted of structured questions that assessed comprehension, information processing, retention, and problem-solving abilities related to the instructional content taught during the intervention period. To ensure accessibility for the participants,

the instrument was adapted to suit the needs of both groups. Students with hearing impairment received the test in written format supported with clear visual instructions, while students with visual impairment were provided the instrument in Braille and through audio-supported instructions to enable them to participate effectively.

The validity of the instrument was established through expert review. Specialists in special education, educational psychology, and measurement and evaluation examined the instrument to ensure that it accurately measured the intended constructs and aligned with the objectives of the study. Their comments and recommendations were incorporated in revising the instrument before it was used for the main study. This process helped to ensure content validity and appropriateness for students with sensory impairments.

The reliability of the instrument was determined using the test–retest method. The instrument was administered to a small group of students with similar characteristics who were not included in the main sample. After an interval of two weeks, the same instrument was administered again to the same group. The two sets of scores obtained were correlated using the Pearson Product Moment Correlation technique. A reliability coefficient of 0.82 was obtained, indicating a high level of consistency and stability in the instrument. According to Fraenkel, Wallen, and Hyun (2019), a reliability coefficient above 0.70 is considered adequate for educational research.

Data collection was conducted in several stages. First, permission was obtained from the management of the Special Education Center to carry out the research. The teachers and administrators were informed about the objectives and procedures of the study. The selected students were then administered a pre-test using the Cognitive Strategy Learning Achievement Test in order to determine their initial level of academic performance before the intervention.

Following the pre-test, the researcher introduced cognitive strategy instruction during classroom teaching over a period of four weeks. During this instructional period, students were guided in the use of various cognitive strategies such as summarization, rehearsal, self-questioning, concept mapping, and monitoring of comprehension. These strategies were taught explicitly and practiced during classroom activities under the guidance of the teachers. The goal of the intervention was to help the students develop effective ways of processing and retaining academic information.

After the completion of the instructional intervention, the post-test was administered to the students using the same instrument. The post-test results were used to determine the extent to which cognitive strategy instruction improved the academic performance of the students in both groups.

The data obtained from the pre-test and post-test were analyzed using both descriptive and inferential statistical methods. Descriptive statistics such as mean and standard deviation were used to summarize the academic performance of the students in each group. Inferential statistics, specifically the independent samples t-test, was used to test the research hypotheses and determine whether there was a statistically significant difference in the performance of students with hearing impairment and those with visual impairment after the intervention. All hypotheses were tested at a 0.05 level of significance.

Ethical considerations were also observed throughout the research process. Approval was obtained from the school authorities before the study was conducted. Participation of the students was voluntary, and the information collected from them was treated with strict confidentiality. The instructional intervention implemented during the study was designed to support the students' learning and did not interfere with their normal educational activities.

Results

This section presents the analysis of the data collected to determine the impact of cognitive strategy instruction on students with hearing impairment and those with visual impairment in the

selected Special Education Center in Bauchi State. The results were organized according to the research questions and hypotheses of the study. Descriptive statistics such as mean and standard deviation were used to describe the performance of the students, while inferential statistics were used to determine whether significant differences existed between the two groups after the instructional intervention.

The study involved a total of forty (40) students drawn from the Special Education Center. Twenty (20) of the participants were students with Hearing Impairment, while the remaining twenty (20) were students with Visual Impairment. All participants were exposed to cognitive strategy instruction for a period of four weeks. Their academic performance was assessed before and after the intervention using the Cognitive Strategy Learning Achievement Test.

Research Question 1

What is the level of academic performance of students with hearing impairment before and after exposure to cognitive strategy instruction?

Table 1: Pre-test and Post-test Performance of Students with Hearing Impairment

Test	N	Mean	Standard Deviation
Pre-test	20	41.30	6.25
Post-test	20	67.85	7.10

The results presented in Table 1 show the academic performance of students with hearing impairment before and after the introduction of cognitive strategy instruction. The pre-test mean score of the students was 41.30 with a standard deviation of 6.25. This indicates that prior to the intervention, the students demonstrated relatively low academic performance in the learning tasks measured by the Cognitive Strategy Learning Achievement Test.

However, after the implementation of the instructional intervention, the post-test mean score increased significantly to 67.85 with a standard deviation of 7.10. The increase in the mean score suggests that the students experienced considerable improvement in their academic performance after being exposed to cognitive strategy instruction.

The result indicates that cognitive strategy instruction contributed positively to improving the learning outcomes of students with hearing impairment. The improvement can be attributed to the explicit teaching of learning strategies such as summarization, rehearsal, and self-questioning, which helped the students to process and retain information more effectively.

Research Question 2

What is the level of academic performance of students with visual impairment before and after exposure to cognitive strategy instruction?

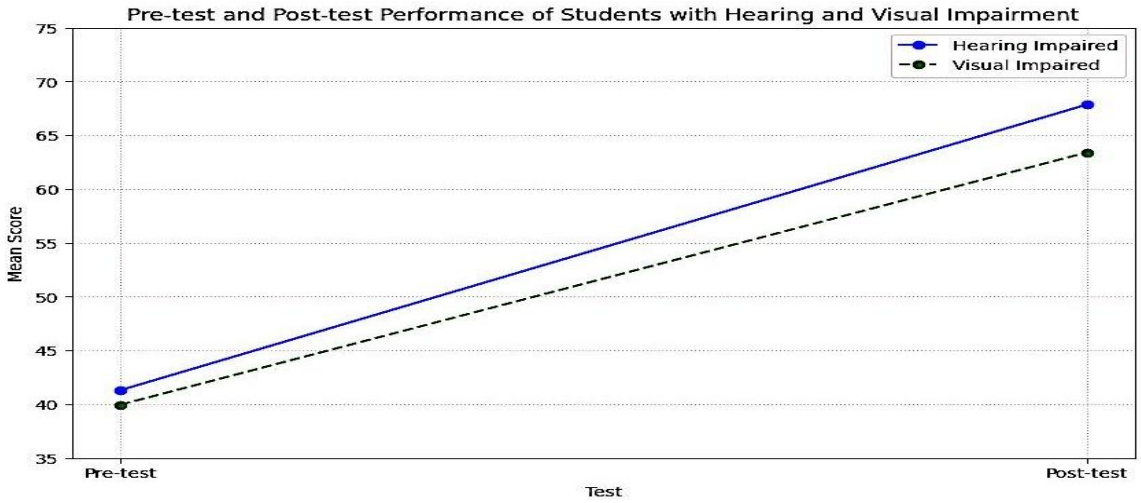
Table 2: Pre-test and Post-test Performance of Students with Visual Impairment

Test	N	Mean	Standard Deviation
Pre-test	20	39.95	5.80
Post-test	20	63.40	6.75

Table 2 presents the academic performance of students with visual impairment before and after exposure to cognitive strategy instruction. The pre-test mean score of the students with visual impairment was 39.95 with a standard deviation of 5.80. This result indicates that the students initially had a relatively low level of academic achievement before the introduction of the intervention.

Following the four-week instructional period, the post-test mean score increased to 63.40 with a standard deviation of 6.75. This improvement indicates that cognitive strategy instruction also had a positive effect on the academic performance of students with visual impairment.

The increase in the post-test scores suggests that the instructional strategies implemented during the intervention helped the students to better organize, understand, and recall academic content. The use of adapted instructional materials such as Braille texts and audio explanations likely enhanced the effectiveness of the strategies for students with visual impairment.



Research Question 3

Is there a difference in the academic performance of students with hearing impairment and students with visual impairment after exposure to cognitive strategy instruction?

Table 3: Post-test Comparison between Students with Hearing Impairment and Visual Impairment

Group	N	Mean	Standard Deviation
Pre-test	20	67.85	7.10
Post-test	20	63.40	6.75

Table 3 presents the comparison of the post-test scores of students with hearing impairment and those with visual impairment after the instructional intervention. The mean score for students with hearing impairment was 67.85 with a standard deviation of 7.10, while the mean score for students with visual impairment was 63.40 with a standard deviation of 6.75.

The results indicate that both groups of students experienced improvement in their academic performance following the implementation of cognitive strategy instruction. However, the mean score of students with hearing impairment was slightly higher than that of students with visual impairment.

This difference suggests that while cognitive strategy instruction was beneficial to both groups, students with hearing impairment may have responded slightly more positively to the instructional strategies used in the study. One possible explanation is that many of the strategies implemented during the intervention relied heavily on visual aids and written instructions, which may have been more accessible to students with hearing impairment.

Nevertheless, the improvement observed in both groups demonstrates that cognitive strategy instruction is an effective instructional approach for learners with sensory disabilities within the field of Special Education.

Hypothesis

There is no significant difference in the academic performance of students with hearing impairment and students with visual impairment after exposure to cognitive strategy instruction.

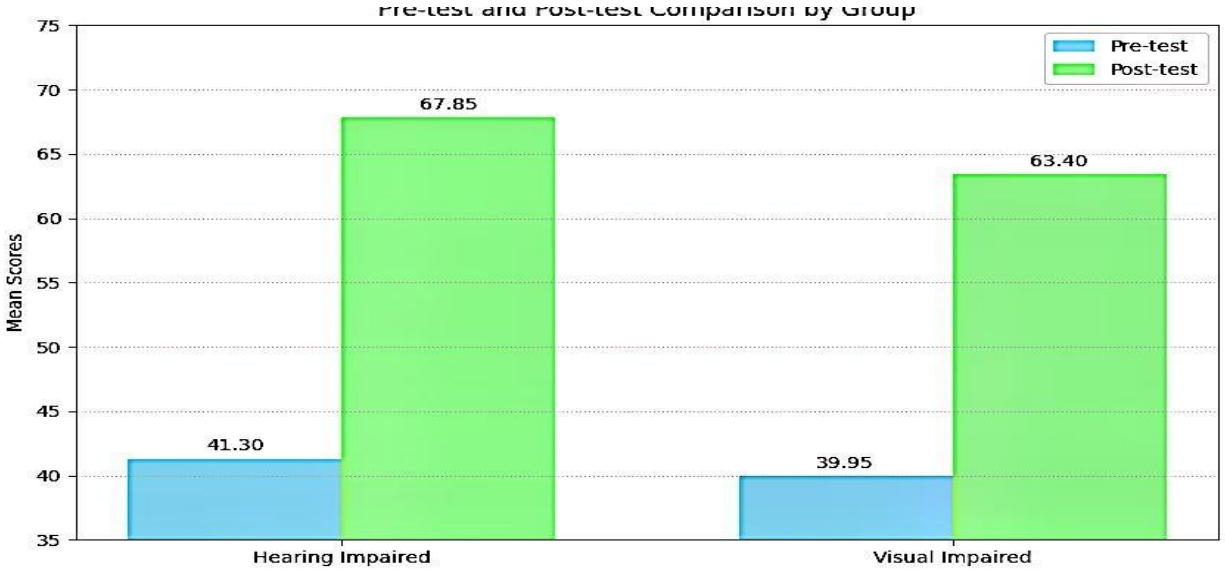
To test this hypothesis, an independent samples t-test was conducted to compare the post-test scores of the two groups.

Table 4: Independent t-test Comparison of Post-test Scores

Group	N	Mean	SD	t-value	p-value
Hearing Impairment	20	67.85	7.10	2.11	0.041
Visual Impairment	20	63.40	6.75		

The result in Table 4 shows that the calculated t-value was 2.11 with a probability value (p-value) of 0.041. Since the p-value is less than the significance level of 0.05, the null hypothesis was rejected.

Pre-test and Post-test Comparison by Group



This finding indicates that there is a statistically significant difference in the academic performance of students with hearing impairment and those with visual impairment after exposure to cognitive strategy instruction. The results suggest that the instructional approach had varying degrees of effectiveness across the two groups of learners.

The general findings of the study demonstrate that cognitive strategy instruction significantly improved the academic performance of both groups of students. However, the magnitude of improvement differed slightly between the groups, with students with hearing impairment showing a higher mean score than students with visual impairment.

The results highlight the importance of adapting instructional strategies to the unique learning needs of different categories of learners with disabilities.

Discussion of Findings

The findings of this study indicate that cognitive strategy instruction had a significant positive impact on the academic performance of students with hearing impairment and visual impairment in the selected Special Education Center in Bauchi State. Both groups demonstrated considerable improvement from pre-test to post-test, highlighting the effectiveness of explicit cognitive strategy teaching in enhancing learning outcomes for learners with sensory disabilities. This finding aligns with the broader literature on cognitive strategy instruction in special education, which emphasizes that structured strategies such as summarization, self-questioning, concept mapping, and rehearsal improve comprehension, memory retention, and problem-solving abilities among learners with disabilities (Pressley & Harris, 2006; Swanson, Harris, & Graham, 2013).

For students with hearing impairment, the post-test results revealed a significant increase in academic performance compared to the pre-test scores. The mean score increased from 41.30 to 67.85, demonstrating that cognitive strategy instruction effectively facilitated the processing and retention of academic information for these learners. This finding corroborates prior studies indicating that students with hearing impairment benefit from instructional strategies that leverage visual learning channels, such as graphic organizers, structured note-taking, and visual summaries (Marschark et al., 2015; Luckner, Slike, & Johnson, 2020). The visual orientation of these strategies likely enabled students to compensate for limited auditory input, supporting

comprehension and higher-order cognitive engagement.

Similarly, students with visual impairment showed substantial gains in academic performance, with mean scores rising from 39.95 to 63.40 after the intervention. This result aligns with existing research suggesting that visually impaired learners benefit from cognitive strategies that utilize auditory and tactile channels, including verbal rehearsal, guided questioning, and mnemonic devices (Hatlen, 2015; Ajuwon, Meeks, & Griffin-Shirley, 2021). By engaging students in metacognitive activities such as monitoring comprehension and verbal summarization, the intervention helped visually impaired learners internalize strategies that enhanced their ability to retain and apply knowledge. This finding reinforces the view that cognitive strategy instruction can foster independence in learning and facilitate meaningful engagement with instructional content, even when traditional visual information is inaccessible.

The comparative analysis between the two groups revealed that students with hearing impairment achieved slightly higher post-test scores than students with visual impairment. The independent samples t-test confirmed that the difference was statistically significant ($t = 2.11$, $p = 0.041$). This outcome suggests that while cognitive strategy instruction benefits both groups, its effectiveness may be influenced by the match between the instructional strategies and the learners' sensory modalities. The strategies employed in this study, which included significant visual components such as diagrams, charts, and written summaries, may have been more naturally aligned with the learning strengths of students with hearing impairment. Conversely, students with visual impairment, who rely predominantly on auditory and tactile modalities, may have experienced slightly less advantage, even with adapted instructional materials, due to the additional cognitive load required to process information through non-visual channels.

The findings of this study are consistent with the theoretical framework underpinning cognitive strategy instruction, which is grounded in cognitive learning theory and Vygotsky's Zone of Proximal Development (ZPD). According to Vygotsky (1978), learners achieve higher levels of understanding when provided with appropriate guidance and scaffolding. In the context of this study, cognitive strategy instruction served as a form of scaffolding, helping students internalize learning strategies and gradually develop independent cognitive skills. The intervention effectively positioned both groups within their respective ZPDs, enabling them to accomplish learning tasks they would not have been able to achieve independently.

Moreover, the results contribute to the growing body of evidence supporting the importance of strategy-based instruction in inclusive and special education settings. Previous studies have shown that explicit teaching of cognitive strategies improves academic outcomes for students with learning disabilities, hearing impairment, and visual impairment (Ferrell, Bruce, & Luckner, 2014; Luckner & Bowen, 2010; Graham & Harris, 2018). The current study extends this evidence by providing a comparative perspective, demonstrating that cognitive strategy instruction can be effectively applied to different sensory disability groups within the same educational context. This comparative insight is particularly relevant for Nigerian special education centers, where teaching resources may be limited and instructional practices need to be optimized for diverse learner populations (Okeke & Nwosu, 2020).

Importantly, the study highlights that adapting cognitive strategies to align with learners' sensory modalities enhances the effectiveness of instruction. For example, visually oriented strategies benefited students with hearing impairment, while auditory and tactile adaptations supported students with visual impairment. This finding reinforces the principle that inclusive teaching requires not only the adoption of evidence-based strategies but also the careful consideration of the unique needs of learners with different types of disabilities (Swanson et al., 2013; Marschark & Spencer, 2016). Teachers and curriculum developers in special education centers should therefore prioritize the integration of multimodal instructional strategies that accommodate the sensory strengths and limitations of all learners.

Overall, the study demonstrates that cognitive strategy instruction is a powerful tool for improving learning outcomes in special education. Both students with hearing impairment and those with visual impairment benefited from the intervention, confirming that structured cognitive strategies enhance academic performance, self-regulation, and engagement. The slight differential effectiveness between the groups underscores the need for ongoing adaptation and personalization of instructional strategies to maximize learning outcomes for all students with sensory disabilities.

Conclusion

This study confirms that cognitive strategy instruction is a powerful tool for enhancing academic performance and fostering self-regulated learning among learners with sensory impairments. By teaching students how to plan, monitor, and evaluate their learning processes, teachers can support independent learning, improve comprehension, and promote engagement in academic tasks.

Recommendations

Integration of Cognitive Strategies into Special Education Curriculum: Special education centers should systematically incorporate cognitive strategy instruction into teaching programs for students with sensory impairments.

Teachers should ensure that instructional materials are adapted to suit the sensory strengths of learners.

Educators in special education should receive ongoing professional development on the use of cognitive strategy instruction and its adaptation for different types of disabilities.

Schools should employ assistive technologies that complement cognitive strategies, such as text-to-speech devices for visually impaired learners and visual learning software for hearing-impaired learners. Such technologies can enhance engagement and support independent learning.

Additional studies should explore the long-term effects of cognitive strategy instruction on different disability groups, including larger sample sizes and diverse educational contexts. Research should also examine how multimodal strategies can be optimized for inclusive classrooms.

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References

Ajuwon, P., Meeks, M., & Griffin-Shirley, N. (2021). Inclusive education for students with visual impairments in developing countries. International Journal of Disability, Development and Education, 68(4), 453–468.

Ferrell, K., Bruce, S., & Luckner, J. (2014). Evidence-based practices for students with sensory impairments. American Annals of the Deaf, 159(4), 351–364.

Friend, M., & Bursuck, W. (2019). Including students with special needs: A practical guide for classroom teachers (8th ed.). Pearson.

Graham, S., & Harris, K. R. (2018). An examination of writing instruction in special education. Exceptional Children, 84(3), 265–283.

Hatlen, P. (2015). The expanded core curriculum for students with visual impairments. Journal of Visual Impairment & Blindness, 109(4), 297–301.

Luckner, J., & Bowen, S. (2010). Teachers' use and understanding of cognitive and metacognitive strategies. American Annals of the Deaf, 155(1), 29–39.

Luckner, J., & Handley, C. (2008). A summary of the reading comprehension research undertaken with students who are deaf or hard of hearing. American Annals of the Deaf, 153(1), 6–36.

Luckner, J., Slike, S., & Johnson, H. (2020). Supporting deaf learners through evidence-based instructional strategies. Journal of Deaf Studies and Deaf Education, 25(3), 245–257.

Marschark, M., & Spencer, P. (2016). The Oxford handbook of deaf studies in learning and cognition. Oxford University Press.

Marschark, M., Shaver, D., Nagle, K., & Newman, L. (2015). Predicting the academic achievement of deaf and hard-of-hearing students. Journal of Deaf Studies and Deaf Education, 20(3), 346–355.

Marschark, M., Shaver, D., Nagle, K., & Newman, L. (2015). Predicting the academic achievement of deaf and hard-of-hearing students. Journal of Deaf Studies and Deaf Education, 20(3), 346–355.

Okeke, B., & Nwosu, K. (2020). Inclusive education practices in Nigerian special schools. International Journal of Inclusive Education, 24(7), 732–746.

Pressley, M., & Harris, K. (2006). Cognitive strategies instruction. Handbook of Educational Psychology, 2, 265–286.

Pressley, M., & Harris, K. (2006). Cognitive strategy instruction: From basic research to classroom instruction. Educational Psychologist, 41(2), 89–103.

Swanson, H. L., Harris, K., & Graham, S. (2013). Handbook of learning disabilities. Guilford Press.

UNESCO. (2020). Global education monitoring report: Inclusion and education. UNESCO Publishing.

Vygotsky, L. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.

Vygotsky, L. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.

Wong, B. Y., & Butler, D. L. (2012). Learning strategies and self-regulated learning. Educational Psychologist, 47(1), 1–6.

World Health Organization. (2021). World report on hearing. WHO.

Zimmerman, B. J. (2002). Becoming a self-regulated learner. Theory Into Practice, 41(2), 64–70.

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