P-ISSN: 2790-6795	Annals of Human and Social Sciences	Jul-Sep 2024,Vol. 5, No. 3
O-ISSN:2790-6809	http://doi.org/10.35484/ahss.2024(5-III)14	[137-150]

Annals of Human and Social Sciences
www.ahss.org.pk

RESEARCH PAPER

Effectiveness of Sign-Based Videos on English Comprehension of Students with Hearing Impairment

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ABSTRACT

This study investigates the efficacy of sign-based video interventions in improving English Comprehension among fifth-grade students with hearing impairments (SWHI). This study aims to develop and assess the effectiveness of a sign-based video intervention in improving the English reading skills of 5th-grade SWHI. The study employed a quasi-experimental approach, selecting 30 students from a private institute using a non-equivalent control group design. The English Reading Test (ERT) was given as a pretest and post-test to assess learning outcomes. To ensure a high level of dependability, pilot testing was conducted with an additional 30 students, resulting in a reliability coefficient of .845. The research findings indicate that using technology-enhanced teaching approaches, such as sign-based video Intervention, substantially positively impacts independent reading and concept clarification. These methods also promote motivation and improve long-term memory. It recommend to adapt other subjects for better comprehension of SWHI and integrate technology.

Keywords: English Comprehension, Sign Based Video, Students with Hearing Impairment, Technology-based Learning

Introduction

Technology-enhanced teaching methods can significantly benefit students with hearing impairments, enabling them to learn more broadly and have a long-lasting impact on their lives. American Sign Language experts developed the Learning Management System (LMS), including Greek Sign Language videos for text. Integrating technology through video can significantly improve understanding and learning for students with hearing impairments (Effendi et al., 2016). Feedback from deaf children and teachers can help develop criteria for online learning programs for deaf children aged seven to thirteen. Experimental tutorial lessons for SWHI e-learning modules have positively affected students' motivation. Additionally, studies have explored alternative theoretical perspectives on short-term memory mechanisms (Al-Osaimi et al., 2009).

Students with hearing impairment often struggle with language and speech development due to hearing loss. Reading and writing are crucial in their education, but less than half reach four-grade levels. Traditional teaching methods are ineffective, and technology can help (Niemi & Kurki, 2014). Education technology should be combined with educational ideas for better outcomes. In special schools, multimedia technologies can support learning for children with disabilities. Teacher-centred teaching has shifted to student-centred teaching, which is prevalent in today's educational paradigm (Derbissalova et al., 2024).).

Based on social learning theory, video-guided educational intervention can help students develop desired behaviour that promote academic engagement. Online videos, such as YouTube, can improve teacher and student involvement in higher education by providing accessible, adaptable, and current content. Collaboration and integrated learning can benefit children with hearing impairments. Automated sign language recognition is essential in computer vision, but regional differences make it difficult for hearing and deaf groups to communicate. Information and communication technologies can raise learning levels for these individuals (Baglama et al., 2018).

The current education system in Pakistan needs to be revised, efficient, and updated, failing to educate millions of illiterate people and produce critical thinkers. Twenty-five million children in Pakistan are still out of school, contributing to access and quality issues. Online learning can address these issues by offering faster, more engaging lessons. Instructional videos can also facilitate learning, especially for SWHI, who often struggle with spoken language development (Fernández Batanero et al., 2022).

Initiating innovation in any task improves it more efficiently. However, all of the data above suggest that using new technology to teach English to kids who are hard of hearing is a great idea. Since there is no prior research in Pakistan that shows how book content can be turned into a sign-based video to teach deaf children, deaf students in Pakistan are being taught using antiquated and traditional teaching methods that are not improving their academic performance in any meaningful way. The researcher was motivated to change the class 5 English book for deaf students to a sign-based video because it is evident from the research above that teaching textbook material to SWHI through videos significantly improves their learning ability. If these students are taught through these videos, their English can be significantly improved. However, after recognizing this requirement, the researcher created sign-based videos using the Class 5 English book content to help SWHI to perform better in English.

Literature Review

Learning materials should be tailored to each student's needs, talents, and traits to ensure accessibility to all learning styles, interests, abilities, and backgrounds. Research shows that SWHI learns better when courses are delivered across written, oral, and video formats (David et al., 2023). However, limited studies on hearing impairments use disparate criteria, making it difficult to compare outcomes and create effective intervention strategies (Krishnan et al., 2020).

Effects of Hearing Impairment on the Life of Individuals

Hearing loss can hinder effective communication and learning in infants and young children, affecting speech, intelligence, language, psychological development, and educational achievement. It can also impact a child's self-esteem and overall well-being. Children with hearing loss often have low reading skills, lower academic performance, and lower social development (Rajadell & Garriga, 2017). Early detection and treatment can help reduce these problems. Communication issues can also affect cognitive skills, social interactions, and physical and mental health. Dementia is more common in individuals with hearing loss, and it can lead to younger and more frequent deafness (Pierzycki et al., 2021).

Problems Faced by Students with Hearing Impairment

The greatest challenge for SWHI children is not the hearing impairment itself but the inability of parents, professionals, and the public to understand and accept them. The loss of selective hearing and difficulty blocking out background noise can make school difficult for children, leading to low self-esteem, immaturity in social situations, and feelings of rejection ((Curhan & Curhan, 2016). Deafness is a severe barrier to learning, preventing

language and thought development. However, most children with hearing loss can achieve academic success with the proper assistance. Early detection and treatment can help lessen problems, and communication and interaction problems can affect cognitive skills, social interactions, and physical and mental health (Martínez, 2022).

Academic Problems

Hearing impairment impacts children's speech, intelligence, language, psychological development, and educational achievement. Teaching deaf children English as a foreign language is challenging, as they have limited language abilities. Teachers should consider deaf children's unique models and provide appropriate classroom activities (Robert & Mkulu, 2023). Deaf children with special needs face speech and language barriers, leading to communication difficulties. They deserve equal treatment in social settings, especially in education, and special schools can provide guidance and exceptional services. Despite limitations, teachers should strive to help these children reach their educational goals (Farid et al., 2023).

Teaching English to Hearing-Impaired Students

English is crucial for social, economic, and intellectual development. It is taught in regular and special schools, with similar syllabi but more straightforward content and textbooks. Teaching English to children with special needs is a challenge that requires cooperation and participation from all parties. Teaching English to deaf students is different from other hearing students, as they face unique obstacles and require specific methods (Alkhawaldeh & Khasawneh, 2021). Deaf students often have delays in phoneme production, vocabulary, and syntax, affecting their reading ability. Teachers must know their characteristics, needs, and abilities to provide appropriate classroom activities. Deaf children with speech and language barriers face communication difficulties and need coaching. Despite limitations, they have the right to be treated equally in social settings, especially in education, through guidance and exceptional services in special schools (Krishnan et al., 2020).

Video-Based Teaching to Students with Hearing Impairment

Video-guided educational intervention is a promising approach to improve school engagement for deaf adolescent students. This innovative technology intervention involves group-based assessment and reflection on captioned video clips. Inclusive education addresses academic and psychosocial problems of people with disabilities (Wezzie et al., 2020). Video technologies can improve communication between deaf individuals using sign language. The selection of technically complex videos in e-learning systems is crucial. Video-based instruction fills gaps in classical methods, making education more comfortable for students with disabilities. The rapid development of information technologies fills gaps in traditional training methods, enhancing these students' education quality (Pierzycki et al., 2021).

Teaching Methods for Students with Hearing Impairment

Technology is being used to enhance connectivity for deaf individuals, particularly in Pakistan, where children with hearing loss often attend separate schools. It is a step towards a more inclusive education system. When teaching these children, teachers should consider their academic, linguistic, intellectual, personal, and social needs. Assistive devices like FM systems and hearing loops should be tailored to each student's needs. A combination of listening devices and computer-based software is essential to prevent anxiety and hinder participation in curricular and co-curricular activities (Ghafoor et al., 2022).).

Digital Learning Programs for Students with Hearing Impairment

Digital programs enhance the academic skills of children with disabilities in special education, promoting hand-eye coordination, fine motor skills, imitation, and language development (Alshawabkeh et al., 2021). These programs also teach problem-solving skills like literacy and mathematics, creating an individualized learning environment and enabling students with hearing impairments (Bashir et al., 2023).

Sign Language for Students with Hearing Impairment

Sign language is crucial for children with hearing impairments, facilitating linguistic, cognitive, and social growth. It allows them to express thoughts, emotions, and ideas, promoting effective communication from an early age. Sign language also promotes social inclusion by connecting children with peers and educators, reducing isolation (Alsharjabi et al., 2023). It is not a standalone teaching strategy but can supplement spoken language in non-hearing classrooms, enhancing communication and inclusivity. However, low self-esteem, prejudice, and stereotyping can hinder communication and demotivate children, affecting their interest in learning (Sugaya et al., 2019).

Facial expressions are crucial in sign language, conveying emotions and nonverbal cues. Learning sign language requires in-person instruction or subtitled video tutorials. However, video-based self-study is challenging due to the complexity of signs, including hand and arm movements. Sign language is not universal and requires specific knowledge in the community where communication is intended (Dawes et al., 2023).

Role of Teachers in Educating Students with Hearing Impairment

Educators should be exposed to technology tools to help students succeed. Special education teachers should be trained in using technology, including word processors, spell checkers, and proofreaders. These technologies can help students with disabilities overcome difficulties, such as spelling and writing difficulties. Training programs should include technology applications in the classroom, allowing more special education programs to benefit from their expertise (Batanero et al., 2019).

Classroom Adaptation for Students with Hearing Impairment

It is essential to adjust classrooms for children with hearing impairments to promote an inclusive learning environment. Access to auditory information can be ensured through visual aids like captioned movies, written materials, and assistive technologies like cochlear implants and hearing aids (Haile et al., 2019). Teachers also frequently use techniques like FM systems to improve voice clarity, reduce background noise, and arrange chairs to maximize visual clues. Teachers are essential in implementing inclusive teaching strategies, utilizing sign language when necessary, and creating a safe environment where students feel at ease communicating their requirements(Dawes et al., 2023). These modifications help students with hearing impairment succeed academically and improve their general social and emotional health, creating a welcoming and stimulating learning environment (Sugaya et al., 2019).

Importance of Adaptations for Students with Hearing Impairment

Modifications for Students with hearing impairment are essential to guarantee equal access to education and promote an inclusive learning environment (Artemenko et al., 2021). Adjustments, including visual aids, sign language interpretation, and technology-assisted learning tools, close communication gaps and improve understanding. Methods to accommodate the specific requirements of students with hearing impairments enhance their academic achievements and foster their social and emotional well-being. These requirements allow educators to enable students with hearing

impairments to realize their maximum capabilities and engage actively in the classroom (Hua, 2023).

Technological Accommodation for Students with Hearing Impairment

The digital revolution is transforming education, particularly for students with hearing difficulties. Assistive technology refers to items or systems that can be customized or purchased to improve a person's capacity (Yarrow et al, 2023). Schools must adapt to this shift by equipping middle and high school special education teachers with technological resources. Teaching students how to use simple, inexpensive tools can increase independence, independence and self-sufficiency rather than just basic math concepts (Artemenko et al., 2021).

Material and Methods

The methodology for the study was a Non-equivalent design of control groups in quasi-experimental studies. Experimental research design is a scientific framework of guidelines and procedures for conducting experiments using two variables. In this instance, the first set of variables acts as a constant independent variable to evaluate the differences between the second set of independent variables (Koren et al., 2009). One kind of quantitative research is quasi-experimental research, which gathers data and uses numerical statistics for analysis. Quasi-experimental research compares groups under various situations or treatments. The researcher selects accessible groups that appear similar in view, but only one of these two groups is examined in a non-equivalent control group design. Selecting an experimental study design aims to carry out an extensive analysis of cause-and-effect correlations. It allows the researcher to modify the independent variable and take irrelevant variables into account in order to ensure high internal validity (Alvi et al., 2023).

The 30 fifth-grade SWHI who made up the study's sample were randomly chosen for the experiment. The study was limited to Lahore City because the city has both public and private institutions for SWHI. The sole private institute in Lahore granted the researcher permission to experiment despite the researcher's requests to all these organizations. As a result, the experiment for this study was carried out at the institute where a sufficient number of fifth-grade kids were present, and the setting was conducive to experimenting.

In order to assess the learning outcomes of SWHI regarding the English textbook for class five, the researcher created the English Reading Test (ERT), which was used as a pretest and post-test. The self-developed test comprised several item types (Q1: differentiated nouns and verbs, word/meaning in Urdu, fill in the blanks with prepositions according to pictures, sentence completion with appropriate words, word completion with missing letters, column matching, reading comprehension and multiple-choice questions, differentiation among parts of speech, e.g. adverb, adjective, conjunctions, picture descriptions).

Pilot Testing of English Literacy Test

A pilot version of the English Test about English comprehension was also given to fifth-grade deaf students. 30 deaf pupils who were not involved in this study's experiment participated in a pilot trial. This study was restricted to Lahore due to the necessary sample size, and 170 fifth-grade pupils with hearing impairments were enrolled in several public and private schools in Lahore. A researcher states that for pilot testing, a sample size of 10–20% of the full-scale survey sample size may be used (Cain & Allan, 2017). In this case, the researcher utilized 18% of the sample size. The following is the outcome of the instrument's reliability check for the pilot research method.

Table 1
Distribution of Data of Pilot Testing of English Test

Sr. No.	School Name	f	%
1	School A	4	13.3
2	School B	7	23.3
3	School C	6	20
4	School D	5	16.7
5	School E	5	16.7
6	School F	3	10
	Total	**30**	**100**

The pilot study of an English Literacy Test in Lahore involved students given clear verbal and non-verbal instructions to complete the test. The test had 100 items, equal marks, no cheating, and only one possible answer in MCQs. The researcher visited schools and considered students' readiness levels with hearing impairments. The test was handed over to teachers to improve students' English performance.

Item Analysis of Pilot Test

Item analysis is used in educational research to evaluate and enhance the quality of assessment instruments like tests and exams. It systematically analyses individual test items to identify effective measures of learning objectives and differentiate between high and low-performing students. This process provides valuable insights into the reliability and validity of assessment tools, enabling educators to make informed decisions about refining or discarding specific items to improve assessments' overall effectiveness and fairness. Four components of test analysis are item difficulty, item discrimination, item distractor, and response frequency.

Item Difficulty Index: Item difficulty in educational research measures the challenge posed by a test item or question, typically measured by the percentage of correct answers. It helps educators and researchers identify items that are too easy or too difficult and helps refine tests. A well-balanced test should include easy, moderately complex, and challenging items to differentiate between students of different cognitive levels. Moderate-difficulty items are preferred, with an acceptable range of 0.25-0.75.

Item Discrimination: Item discrimination is a statistical measure that assesses how well a test item differentiates between high and low performers. It helps educators evaluate individual test items, refine assessments, and ensure they accurately reflect student abilities and learning levels. The Item Discrimination Index ranges from -1.00 to +1.00, with items with a d-index of 0.3 or higher acceptable.

Distractor Effect: An item distractor is an incorrect option provided with a correct answer in a multiple-choice question or assessment format. It aims to challenge and evaluate test-takers understanding, identify common errors, refine test items, and improve test reliability and validity by discriminating between students with different understanding levels.

Reliability of the English Literacy Test

Research describes Cronbach's Alpha as a method for measuring survey items' reliability and internal consistency (Yun et al., 2023). The instrument's Cronbach's alpha value was 0.85, indicating high agreement. The English Literacy Test, consisting of 171 items, had a reliability value of 0.851. However, 71 items were rejected due to unacceptable difficulty and discrimination index ranges, resulting in a final test of 100 items.

Development of Sign-based Video Intervention

This study developed a Sign-based Video Intervention (SBVI) to support students with hearing impairments in grade 5th. The content was taken from the Punjab Curriculum Textbook Board Lahore, and videos were recorded in sign language according to the English textbook syllabus. The videos were edited and updated based on suggestions and feedback from sign language experts. The researcher chose to teach the SWHI in English through sign-based video intervention, as it is a significant and compulsory subject for these students. The script was written for the videos, organized logically, age-appropriately, and easily understood.

The videos were recorded using common vocabulary words, specific vocabulary words, and whole sentences. The researcher played a vital role in converting the content into sign language, with help from sign language experts to ensure clarity and engagement. The videos were edited to make them visually appealing and improved in quality. The total 15 videos were formulated from three chapters of the English textbook of class 5th, each lasting 20-25 minutes.

Validity of SBVI: In order to assess the validity of the SBV intervention, the researcher deliberately assembled a panel of ten experts, comprising sign language interpreters, intervention specialists, teachers from SWHI, and members of the deaf community, who were experts in various domains related to this intervention. This panel was supplied with the final SBVI to ensure its legitimacy. A checklist for the SBVI evaluation criteria for fifth-class deaf pupils was also given to the expert panel. The primary areas the researcher wished to look into were listed on the checklist. It covered symptoms of accuracy, communication clarity, cultural appropriateness, and the efficacy of the education. Every expert on the panel saw every film in their specialized fields and assessed them using the researcher's checklist. Each subject-matter expert in the videos offered his or her assessment of the videos' accuracy. Most professionals encouraged the researcher and expressed appreciation for all the films. The researcher encouraged professionals to provide candid and open feedback on the videos.

Production of Final SBV Intervention

The researcher improved the SBV based on expert input for use as an intervention with fifth-grade pupils with hearing impairments. The researcher adhered to the guidelines the panel of experts provided and made all the required adjustments and enhancements to the SBV intervention. The investigator made certain that every video pertaining to the intervention satisfies all the necessary quality requirements and study objectives.

Pilot Testing of SBVI

Following completing the films' validation procedure by a panel of specialists from various fields, the researcher administered a pilot study on class five SWHI. The purpose of the pilot study was to determine the impact of sign-based video intervention on deaf pupils' English language acquisition at the Government Special Education Centre in Nishtar Town, Lahore, run by the Punjab government's Special Education Department. The relevant institute's principal was formally consulted before the pilot test. In order to prevent prejudice, discrimination, or any other element that could impact the study's final experiment's outcomes, the fifth-class students at this institute were excluded from the experiment.

Experimentation

The researcher conducted an experimental study at a private school in Lahore, ensuring confounding variables and risks were avoided. They administered an instrument

to establish baseline English literacy skills, controlling extraneous variables that could cause false conclusions. The study was conducted without randomization, dividing 30 students with hearing impairment into two equal groups (control and experimental) to ensure internal and external validity. The results were based on the independent variable's effect on the dependent variable, ensuring generalization to other settings.

This study lasted nearly three months, covering 60 days, with a weekly English subject timetable and 20-25-minute videos covering lessons. The experimental group was taught through SBVI, with daily classes lasting 35 minutes. The total time for the experiment was 2100 minutes or 35 hours.

The researcher administered a pretest to SWHI in both control and experimental groups to determine their English literacy baseline. The pretest was conducted in an examination environment, with instructions provided in sign language. The researcher also explained the number of questions and time allocation to the students. After the test, all test sheets were collected.

Implementation of Sign-based Video Intervention

The researcher conducted an experiment involving an experimental group taught through Sign-Based Video Intervention (SBVI) and a control group taught using traditional methods. The intervention consisted of 15 videos of 3 chapters of an English textbook for grade 5th of SWHI. Two teacher assistants were employed to assist both groups during the class duration. The experimental group was taught through SBVI, while the control group was taught using traditional methods.

The experimental group was taught through SBVI, with 30 minutes of daily English subject teaching per week. The interpreter interpreted the textbook content in Pakistan Sign Language (PSL). Instructions for lesson delivery were written on a whiteboard.

The intervention was implemented as follows: Students watched the video carefully, opened their books, asked questions, turned on laptops and multimedia projectors, and started lessons through SBVI. Formative assessments were conducted, and videos were replayed if necessary. Students were asked questions for 5 minutes, and worksheets were distributed for summative assessment for 5 minutes.

A post-test was administered to assess the effect of SBVI on the English literacy level of the experimental and control groups. The exact terms and conditions of the pretest were followed, and all sheets were collected for further processing.

Results and Discussion

This study's data analysis was based on the experimentation of a sign-based video intervention to adapt a 5th-grade English textbook for deaf students. It was conducted as a quasi-experimental study.

Table 2
Frequency Distribution of Control and Experimental Group Based on Demographics

Variables	Labels	Control Group		Experimental Group	
		f	%	f	%
Gender	Male	8	53	7	47
	Female	7	47	8	53
Age	12-13 years	15	100	15	100
Degree of Hearing Loss	Severe to Profound	15	100	15	100
Class Level	5th	15	100	15	100

School Name	Innayat Foundation Academy for the Deaf	15	100	15	100

Table 2 shows the frequencies of different variables in both groups (control and experimental). Most participants (53%) were male, and the remaining 47% were female in the control group. As in the post-test, the majority (53%) of the participants were female, and the remaining 47% were male. All (100%) participants of both groups were in the same age group (12-13 years), and all participants had the same degree of hearing loss (severe to profound). The participants of both groups belonged to the 5th class level. All (100%) of the participants belonged to the Innayat Foundation Academy for the Deaf, Lahore.

T-tests for Sign-based Video Intervention

Table 3
Compare the Results of English Literacy Skills based on Gender

	Male		Female				
Variable	**M**	**SD**	**M**	**SD**	**t(28)**	**p**	**Cohen's d**
Pretest	25.40	4.77	28.33	4.60	-1.71	.09	.62
Post-test	45.87	20.40	44.13	18.62	.51	.81	.08

Table 3 compares female and male respondents' English literacy skills based on pretest and post-test. Two independent groups (female and male) were compared with one variable (pretest or post-test) containing ratio level of measurement; the independent sample t-test was applied to identify the significant changes between the results of female and male groups based on pretest and post-test results. The first row of this table exposed that the mean score of the female group in the pretest was higher (M=28.33, SD=4.60) as compared to the score of the male group, which exposed (M=25.40, SD= 4.77), and it revealed no significant mean difference in gender t(28)=-1.71, p>.05 in the pretest. Cohen's d is noted as .62 (>.50), which indicates a medium effect size. So, the null hypothesis claiming no significant difference was accepted, and there is no significant difference between female and male respondents on the basis of pretest results. In the second row of this table, it is shown that the score of the female group in post-test results is lesser (M=44.13, SD=18.62) than the male group (M=45.87, SD= 20.40), and it exposed no significant mean differences in gender t(28)=.51, p>.05 in post-test. Cohen's d is noted as .08 (<.20), which indicates no effect size. So, the null hypothesis claiming no significant difference was accepted, and there is no significant difference between female and male respondents based on post-test results.

Table 4
Comparison between Control and Experimental Groups based on Pretest and Post-test

	Control Group		Experiment Group				
Variable	**M**	**SD**	**M**	**SD**	**t(28)**	**p**	**Cohen's d**
Pretest	25.67	5.09	28.07	4.43	-1.37	.18	.62
Post-test	26.87	4.40	63.13	6.36	-18.13	.00	6.67

Table 4 compares the scores of the control and experimental groups based on the pretest and post-test. Two independent groups (control group and experimental group) were compared with one variable (pretest/post-test) having a ratio level of measurement; an independent sample t-test was applied to see the statistical significance differences between the results of both groups. The first row of this table indicates that the control group's mean score exhibited slightly lower in the pretest (M=25.67, SD=5.09) than the mean score of the experimental group, which showed (M=28.07, SD= 4.43). It is also exhibited that t(28)=-1.37, p>.05 indicates no significant mean difference between control and experimental groups in the pretest. The value of Cohen's d is noted as .62(>.50), which indicates a medium effect size. The second row of this table elaborates that the mean score of the control group is lower (M=26.87, SD=4.40) than the mean score of the experimental

group (M=63.13, SD= 6.36) in the post-test. It is also explained that t(28)=-18.13, p<.05 indicates a significant mean difference between control and experimental groups in the post-test. Cohen's d value is 6.67(>.80), indicating a large effect size.

Table 5
Comparison between Pretest and Post-test of Control and Experimental Groups

	Pretest		Post-test					
Variable	**M**	**SD**	**M**	**SD**	**t(14)**	**p**	**r**	**Cohen's d**
Control Group	25.67	5.09	26.87	4.40	-1.65	.12	.11****	.44
Experiment Group	28.07	4.43	63.13	6.36	-14.63	.00	.01**	3.80

***p<.001, **P>.001

Table 5 illustrates the comparison between the pretest and post-test control group and experimental group scores. Due to two dependent variables of ratio level (pretest and post-test) comparing against one independent group (control group or experimental group), a paired sample t-test was applied to determine the significance difference among the scores of two dependent variables. In the first row of this table, the mean score of the control group on the pretest is lower (M=25.67, SD=5.09) as compared to the mean score in the post-test (M=26.87, SD=4.40), and it is also indicated t(14)=-.1.65, p>.05 indicates no significant mean difference between the pretest and post-test scores of the control group. A set of scores was significantly correlated (r=.11, p<.001). The value of Cohen's d was noted as .44 (>.20), which indicated a small effect size. So, the null hypothesis claiming no significant difference was accepted. The second row of this table shows that the mean score of the experimental group on the post-test is higher (M=63.13, SD=3.36) as compared to the mean score of the pretest (M=28.07, SD=4.43), and it also indicates t(14)=-.14.63, p<.05, which indicates that there is a significant mean difference between the scores of the pretest and post-test of the experimental group. A score set was not significantly correlated (r=.11, p>.001). The value of Cohen's d was noted as 3.80(>.80), which indicated a large effect size. So, the null hypothesis claiming no significant difference was not accepted.

- Based on pretest results, there is no significant mean difference between male and female respondents.
- Based on post-test results, there is no significant mean difference between male and female respondents.
- There is no statistically significant mean difference between the pretest and post-test results of the control group.
- There is a statistically significant mean difference between the pretest and post-test results of the experimental group.
- Based on a pretest, there is no statistically significant mean difference between the two groups (control and experimental).
- Based on the post-test, there is a statistically significant mean difference between the two groups (control and experimental).

Discussion

The digital revolution has significantly impacted the education field, particularly for students with disabilities. This study aimed to assess the efficacy of Sign-Based Video Intervention (SBVI) in improving English reading skills of 5th-grade Special Hearing Impaired (SWHI) students. The study used multiple videos with captions and descriptions in sign language, focusing on technology. The video-guided educational intervention aimed to enhance connectivity and improve students' performance (Baglama et al., 2018;)The experimental group showed a significant improvement in English reading performance

compared to the control group, which was taught using traditional methods. The study also found that using digital video applications in media learning can facilitate the acquisition of basic makeup methods for deaf students (Kurnia et al., 2019). Online videos promote classroom dialogue and help students with hearing impairments learn better. The results of this study are consistent with previous studies that have shown that reading skills of hearing impaired students can be improved through technological-based video methods (Zabala-Vargas et al., 2019; Afzaal, 2024). The sign-based video intervention has a profound effect on improving the English reading performance of deaf and hard-of-hearing students.

Conclusion

The study concludes that sign-based video interventions improve English comprehension and reading among fifth-grade students with hearing impairments. These videos enhance students' reading performance and increase their engagement, motivation, and ability to learn independently. The findings underscore the importance of incorporating technology-enhanced teaching methods in special education to make learning more accessible and practical. While sign-based videos are a valuable resource, they complement rather than replace the essential role of teachers. The study highlights the need for ongoing support and training for parents and educators to maximize the benefits of such interventions.

Recommendations

The study suggests that sign-based video intervention can improve English reading performance in hearing-impaired students. It suggests modifying English textbooks for grade 5th to incorporate this method, adapting other subjects for better comprehension, organizing technological training, teaching using sign-based video intervention, and organizing workshops and seminars. Further research is needed to validate the findings and pilot studies to identify the impact of sign-based videos on academic levels of hearing-impaired students.

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