

Technological Preparedness of Educators to Meet the Learning Needs of Children with Hearing Impairment

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ABSTRACT

This study assesses the Technological Preparedness of educators to meet the learning needs of children with hearing impairment. It uses descriptive survey design. Samples were selected randomly using an incidental system from all the inclusive schools of Noida and Delhi-NCR with a population of 150 educators teaching the students with Hearing Impairment. A 5-point Likert scale was constructed for the data collection. Descriptive (frequencies and percentages, mean of means and standard deviations) and inferential statistics (independent t-test) were used to analyze the data. The study found that the Educators from the inclusive schools of Delhi-NCR are well prepared with their skill and knowledge about the technology-based instruction for the children with hearing impairment. Further, the study reviewed the impact of gender also on technological preparedness of educators and found that there is no statistically significant difference between the gender of the educators and their technological preparedness for children with hearing impairment. Lastly, the study recommends strongly that the educators should move ahead to model the application of technology so that the children with hearing impairment can upgrade their knowledge and skills through observation and practice. The teacher training institutions should also infuse technology through practical activities in their offered courses. The training programmes should be reconceptualized to address the technological needs of children with hearing impairment.

Keywords: Technological, Pedagogical, Preparedness, Hearing Impairment, Knowledge, Skills.

1. INTRODUCTION

TASTE in 21st Century: The instructional design and the process of teaching learning in 21st century is completely based on 'Technology Assisted Structure of Training and Education'. Computer based teaching and assessment has now transformed the entire mechanism in regular as well as the virtual classrooms. This has provided an open platform of learning for both kinds of learners-with disability and without disability. All kinds of educational and training programs have now presented a more comprehensive and more meaningful pattern to explore the treasure of knowledge and skills. This presents a herculean task for the educators to integrate technology, pedagogy and content in their teaching. Many literatures seem not to confirm the preparedness of educators towards the technological and pedagogical aspects is optimally enhancing their teaching with instructional technologies. (Liu 2011; Gill & Dalgarno, 2010; Zhou, Zhang & Li, 2011; Agyei, 2012; Agyemang, 2012; Clark, 2013). This observed gap was also investigated in this study.

Background to the Study: The emergence of digital natives and digital immigrants has changed the approach to classroom instruction (Sadara, 2001). Classroom instruction is now characterised by an acceleration of instructional technologies designed to increase efficiency, expand productivity, and ultimately enhance students' learning outcome.

The technological preparedness of educators demands for their active support towards the students' ability to operate digital learning resources, digital platforms and their familiarity with the learning devices. Use of digital learning resources works like a catalyst and optimizes the achievement of learning outcomes. Educators of these inclusive schools were requested to submit their responses on the following aspects:

- Understanding about Inclusivity in the classrooms
- Attitudinal acceptance
- Proficiency in operating digital resources during instruction and assessment of the children with hearing impairment
- Their actions to encourage the students to use digital platforms in learning the concepts.
- Preparedness to facilitate better learning experiences by equipping and handling amplification devices.
- Their preparedness for troubleshooting while operating assistive technology in the classrooms
- Preparedness for designing and demonstrating Mid-Tech and High-Tech Teaching Learning Materials.
- Preparedness for digitized tracking of the academic progress and performance of the students with hearing impairment.

The **TPACK (Technological Pedagogical Content Knowledge)** framework introduced by Punya Mishra and Matthew J. Koehler of Michigan State University in 2006 also guides the instructors to integrate technology in their classrooms. As technology has its impact on every aspect and every dimension of our lives, utilizing it effectively to promote efficient educational practices is more vital than ever.

A limited number of studies on the attitudes of the educators towards inclusion have been conducted in South African institutes of education (Bothma **1997**; Harris **1998**; Wessels 1997; Swart, Pettipher, Engelbrecht, Eloff, Oswald, Ackerman & Prozesky 2000, Bothma, Gravett & Swart 2000), but none of these have investigated the actual preparedness of the educators.

Problem statement

The most focal goal in the current scenario is the Universalization of Education. In a country like India where national policies are designed with welfare oriented schemes for every individual, it becomes essential to provide quality education available, affordable and accessible to every individual residing in the remotest part of the country. Article 21 A of the Indian Constitution presents 'Right to Education' as a Fundamental Right. Agenda 2030 for Sustainable Development has a clear emphasis on Inclusive Education for Quality and Lifelong Learning for All. NEP 2020 also identifies equitable and inclusive education as a primary goal for society's development. This Policy advocates and highlights the commitment of the government to provide accessible education for children with special needs or Divyangjan from foundation level to a higher education level. This policy states about providing regular and special schooling for children with disabilities. Various resource centers have been entrusted with their role in offering assistance in the rehabilitation and education of children with mild to profound disabilities through the use of special teachers. Apart from this, there are various programs and schemes to sensitize and empower the community and parents of the children with special needs. In view of these legislative efforts, it is often asked whether the educators in inclusive schools are prepared and skilled to provide an inclusive environment to the children with hearing impairment. The objectives of this study were framed to investigate a thorough analysis of the status of educators 'preparedness for inclusive education. The findings of this study may help the rehabilitation professionals and other stakeholders to facilitate a proper strategy to detect the best competent educators to teach the children with hearing impairment.

Investigation

Research methodology

Research design

The research adopted descriptive survey design using a quantitative approach. The survey was conducted on multifactorial readiness data. Fink (2001) concurs that the descriptive survey enables the researcher to describe, observe and document aspects of a pointed situation as it naturally occurs rather than explaining it. This design allowed the researcher to ascertain fruitful diagnosis of the condition of readiness among the educators.

Research Tool

Data for this investigation was collected through a self-constructed Likert Scale. The items in the questionnaire provided mainly basic quantitative data supplemented by qualitative data.

The questionnaire (Likert Scale) consisted of 4 Major Domains-Conceptual Preparedness, Attitudinal Preparedness, Pedagogical Preparedness and Technological Preparedness. 10 questions were framed in each domain to investigate the overall preparedness of the educators. These questions had the following points in focus:

- Respondent's knowledge of concepts pertaining to address the learning needs of children with hearing impairment, essential arrangements to maintain inclusive practices
- Respondent's attitude towards the uniqueness and abilities of the children with hearing impairment.

- Respondent's perception and creativity while dealing with the learners with hearing impairment in inclusive classrooms.
- Respondent's commands and skilled functioning with assistive technology in the classrooms.
- Professional preparedness of the respondents in terms of their actions in tracing, tracking and transforming the status of the students with hearing impairment.

Data Analysis:

The data analysis consisted of descriptive and inferential statistical analysis. It included validity and reliability test, normality test and hypothesis testing.

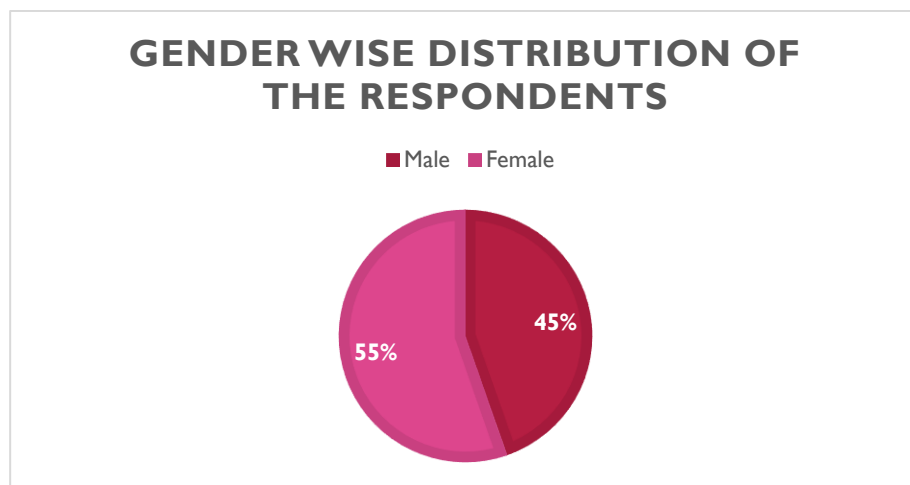
Findings

Table 1 Work Setting

Type of Schools	Principals	Teachers	Advisors
Regular Schools	3	12	0
Special Schools	15	89	5
Inclusive Schools	4	19	3
Total (150)	22	120	8

From Table 1, it is obvious that the largest proportion of the respondents (109) were the special educators including principals and advisors who are well skilled in dealing with the learners with hearing impairment. 26 respondents were the educators teaching in inclusive schools including principals and advisors. Only 15 respondents were from regular schools.

Respondents were asked to mention their gender also while collecting the data. 83 respondents were male educators, and 67 respondents were the female educators but the no significant impact was observed of gender on technological preparedness.



The results obtained through the analysis related to the educators' Technological Preparedness showed that the majority (92%) of the educators responded very well to the questionnaire. The results of the questionnaire analysis reflected that 31.6% of the respondents had very low Technological Preparedness (TP), 25.5% low, 22.4% moderate, 9.5% high, and 11% very high.

Table 2 Years of Experience

Years of Experience	5	6	7	8	9	10	11	12	13	14	15	Total $\Sigma(f)$
Frequency(f)	10	16	15	12	23	21	23	9	7	8	6	150

Range	10
Average	13.63636
Median	12
Mode	23
Standard Deviation	6.391756

Table 2 reflects the average number of years of experience per respondent as well as the median, mode and range for the same. It is obvious that the average number of years of experience is 13.64 with a median of 12.

2. MAIN DISCUSSIONS

This section operates with the discussion of the data collected from the respondents to address the research questions that were formulated to guide the study. The 5-point Likert scale questionnaire that was administered was analysed using mean of means and standard deviations. From the analysis, a mean of 3.50 and above showed the agreement of the respondents to the statements whilst a mean of 2.4-3.4 meant the respondents were not sure about the statements. However, a mean of 2.40 and below showed their disagreement to the statements. A standard deviation below 1.0 showed that the responses from the respondents were homogeneous and heterogeneous when it was above 1.0.

Research Question 1: What is the status of Respondent's knowledge of concepts pertaining to address the learning needs of children with hearing impairment and subsequent essential arrangements to maintain inclusive practices.

Investigating the responses to the above question, there was an analysis to determine the outlook of the educators regarding their preparedness. The results are presented in Table 3.

Table 3 Technological Knowledge Preparedness of Educators

Statement	Mean	SD
I have the technical skills I need to use technology.	3.79	1.05
I know about the Assistive devices to be used while teaching the CWHI	4.21	0.90
I can solve the problems that I encounter when using technology.	3.44	1.09
I know different types of hearing aids	3.53	1.01
I can check the functioning of a hearing aid whether it is active or not.	3.71	1.29
I know about the apps which are very useful for the CWHI	2.94	1.31
I can operate and demonstrate the high-tech TLMs in the class.	2.77	1.36
I can develop AI assisted presentations to teach the CWHI.	3.90	1.21
I can create a document with text and graphics in a word processing programme.	4.09	1.16
I can add captions and graphical prompts to make the session interactive for CWHI	3.69	1.25
I can assess the listening threshold by using an audiometer	3.44	1.41
Mean of Means/Average Standard Deviation	3.59	1.11

Table 3 presents the results of the data collected on the Technological Knowledge preparedness of the educators. A majority (M = 3.79, SD = 1.05) of the respondents confirmed that they had the required technical skills to use technology. The respondents were heterogeneous in their responses. In simple terms, educators, to a

greater degree could accept and use varied technologies. For instance, the majority (M = 4.21, SD = 0.90) of them were of the view that they had the knowledge to learn technology easily. This finding is remarkable because technology, like the environment, keeps upgrading, therefore educators should be ready to learn the new emerging technologies. Further, the educators indicated that they were abreast of the varieties of hearing aids (M = 3.53, SD = 1.01). This further confirmed their acceptance of technology. It was, therefore, not surprising that the majority (M = 3.71, SD = 1.29) of the educators revealed

they could examine the functioning of hearing aids which require technological consciousness.

They could also develop AI assisted presentations to teach CWHI ($M = 3.90$, $SD = 1.21$), create documents with texts and graphics in a word processing program ($M = 4.09$, $SD = 1.16$) and add captions and graphical prompts to make the session interactive for CWHI ($M = 3.69$, $SD = 1.25$). Most universities have designed their instructional plan to be delivered digitally where they use the e-learning platforms in order to make teaching and learning accessible to all learners despite the busy schedules of lecturers.

Research Question 2: What are the attitudinal responses of educators towards the uniqueness and abilities of children with hearing impairment in inclusive classroom settings?

Investigating the responses to the above question, there was an analysis to determine the attitude of the educators towards the uniqueness and abilities of CWHI. The observation is displayed in Table 4.

Table 4 Attitudinal responses of educators towards the uniqueness and abilities of CWHI

Statement	Mean	SD
<i>Children with hearing impairment can achieve academic success comparable to their hearing peers if given appropriate support.</i>	2.33	1.45
<i>CWHI are capable of developing strong language and communication skills.</i>	2.25	1.43
<i>I believe that CWHI can participate effectively in group learning activities in an inclusive classroom.</i>	2.26	1.42
<i>Hearing impairment does not limit a child's ability to think critically or solve problems.</i>	2.34	1.40
<i>Children with hearing impairment have unique ways of understanding and interacting with the world.</i>	2.30	1.30
<i>Each child with hearing impairment brings valuable perspectives and strengths to the classroom.</i>	2.27	1.32
<i>I appreciate the diversity that CWHI bring to my classroom environment.</i>	2.25	1.34
<i>CWHI can build meaningful relationships with their hearing peers in an inclusive setting.</i>	2.23	1.35
<i>Inclusive classrooms promote mutual respect and understanding between children with and without hearing impairment.</i>	4.25	1.46
<i>I actively encourage interaction and collaboration between hearing students and those with hearing impairments</i>	3.26	1.45
Mean of Means /Average Standard Deviation	2.57	1.39

Mean scores ranging from 2.23 to 2.34 indicate that educators generally agree with the positive statements about CWHI, though not strongly. **Standard deviations** are relatively high (around 1.30–1.45), indicating considerable variation in educators' attitudes. Educators were commonly agreed that CWHI can achieve academic success ($M=2.33$, $SD=1.45$). Educators were more positive towards the efficiency of CWHI in developing strong communication skills ($M=2.25$, $SD=1.43$). Responses pertaining to the participation of CWHI in group learning indicate modest agreement ($M=2.26$, $SD=1.42$). Respondents showed mixed attitudes about the statement-Hearing loss doesn't limit critical thinking ($M=2.34$, $SD=1.40$). Educators moderately agree with the fact that CWHI have unique ways to understand and interact with the people ($M=2.30$, $SD=1.30$). Majority of the respondents were in favour of the role of inclusive classrooms in promoting mutual respect and understanding between children with and without hearing impairment ($M=4.25$, $SD=1.46$). Many of the educators agree to contribute actively for encouraging interaction and collaboration between hearing students and those with hearing impairments ($M=3.26$, $SD=1.45$).

Research Question 3: To what extent do teachers feel the need to innovate or modify their teaching styles when working with hearing-impaired students?

Responses were analyzed to see the extent to which the educators experience the need to innovate or modify their teaching strategies when working with hearing-impaired students. The observation is shown in Table 5.

Table 5 Educators' Perception and Creativity during instruction for CWHI

Statement	Mean	SD
To what extent do you feel your current teaching methods need to be adapted when working with hearing-impaired students?	3.79	1.45
Do you believe that hearing-impaired students can fully engage with traditional teaching methods?	3.72	1.43
Have you made any specific modifications to your teaching strategies to accommodate hearing-impaired students?	3.76	1.44
Have you found yourself incorporating more visual aids, written instructions, or technology when teaching hearing-impaired students?	3.80	1.47
Have you experimented with any innovative teaching tools or technologies specifically to support hearing-impaired learners?	3.79	1.39
Do you feel open if your school or institution is to encouraging innovation in teaching methods for students with hearing impairments?	3.71	1.38
Did your teacher training prepare you to adapt or innovate your teaching for students with hearing impairments?	3.73	1.45
Have you pursued any additional training or professional development to better support hearing-impaired students?	3.74	1.46
Did you receive administrative support and access to assistive technology to better innovate in your teaching?	3.72	1.45
Do you feel these adaptations benefit only hearing-impaired students, or do they improve learning for the entire class?	3.80	1.44
Mean of Means /Average Standard Deviation	3.76	1.44

This table explores how educators perceive their own teaching practices, creativity, and adaptability when working with students who are hearing impaired. Each item was likely rated on a Likert scale (e.g., 1 = Strongly Disagree to 5 = Strongly Agree).

Educators generally agree they must adapt methods for hearing-impaired students (M=3.79, SD=1.45). Slight agreement suggests mixed confidence in traditional methods' effectiveness in engaging the CWHI (M=3.72, SD=1.43). Educators showed their willingness in making changes in their instructional planning to support the CWHI (M=3.76, SD=1.44). Majority of the respondents suggested strongly their reliance on multimodal tools and assistive devices (M=3.80, SD=1.47). A good number of educators were fairly engaged in experimenting with innovations (M=3.79, SD=1.39). Slightly lower responses were received when asked about institutional openness for innovation (M=3.71, SD=1.38). Educators accepted moderate effectiveness of teacher training in instruction planning with innovations (M=3.73, SD=1.45). Educators were taking initiative to improve their skills to deal better with CWHI (M=3.74, SD=1.46). Responses indicate a moderate perception of institutional support towards innovative transaction of knowledge in the class (M=3.72, SD=1.45). Educators see inclusive methods as broadly beneficial for CWHI (M=3.80, SD=1.44).

Research Question 4: What is the status of Preparedness towards Technological and Pedagogical Knowledge of the Educators teaching CWHI?

Research question 4 sought to find out the preparedness of educators towards their technological and pedagogical planning and execution. In view of this, there was an attempt to ascertain the outlook of the educators which is presented in Table 6.

Table 6 Technological and Pedagogical Preparedness of Educators

Statement	Mean	SD
Do you integrate technology into your lessons while teaching CWHI?	3.76	1.44
Are you confident in troubleshooting basic tech issues during lessons?	3.73	1.45

Have you received any formal training in educational technology?	3.74	1.43
Do you design your lessons to integrate both content and digital tools effectively?	3.80	1.46
Do you assess learning of your students with Hearing Impairment in digital formats?	3.79	1.37
Do you adapt your teaching strategies to different learning environments (e.g., face-to-face, blended, online)?	3.72	1.36
Have you experimented with flipped classrooms, gamification, or other innovative practices?	3.74	1.45
Do you ensure inclusivity and accessibility when using digital tools?	3.73	1.44
Do you differentiate instruction using technology to meet diverse student needs?	3.73	1.43
Can you frame activities to help students to construct different representations of the content using appropriate technologies?	3.80	1.43
Mean of Means /Average Standard Deviation	3.85	1.43

Moderate responses were received confirming the integration of technology into lessons for CWHI ($M=3.76$, $SD=1.44$). Educators were confident in troubleshooting for technical issues ($M=3.73$, $SD=1.45$). Many of the educators have received formal training in educational technology ($M=3.74$, $SD=1.43$). A slightly higher level is observed in skill level in tech-integrated lesson planning ($M=3.80$, $SD=1.46$). A good number of educators confirmed that they were using digital platforms for assessing learning of CWHI ($M=3.79$, $SD=1.37$). Scope for growth is observed in the responses of educators pertaining to adaptability in teaching strategies to different environments ($M=3.72$, $SD=1.36$). Moderate responses were there for the acceptance of experimentation with modern pedagogy through innovative practices ($M=3.74$, $SD=1.45$). Awareness ensuring inclusivity and accessibility with digital tools was observed among the educators ($M=3.73$, $SD=1.44$). Mixed responses were received when asked about the technological efforts to meet diverse needs of learners with hearing impairment ($M=3.73$, $SD=1.43$). Most of the educators were in favour of engaging students through technology in creative and content-based activities ($M=3.80$, $SD=1.43$).

3. MAJOR FINDINGS AND CONCLUSIONS

In conclusion, while the data reflects a generally positive outlook towards technology integration, it also emphasizes the need for more standardized training opportunities and institutional support to ensure consistency and equity in pedagogical preparedness among educators. This is especially critical in serving diverse learners, including those with hearing impairments.

Overall, educators demonstrate a sound foundation in the use of educational technology for CWHI, supported by training and moderate confidence. However, further development is needed in flexible pedagogical approaches and the application of technology to meet varied learner needs. Focused professional development and resource support could enhance these areas and lead to more inclusive, innovative teaching practices.

The study suggests that educators acknowledge the need to adapt instructional methods to better support children with hearing impairments (CWHI). There is a clear willingness among educators to revise lesson planning, experiment with innovative strategies, and rely on multimodal tools and assistive technologies. However, confidence in traditional methods remains mixed, and perceptions of institutional openness and support for innovation are moderate. While teacher training is seen as somewhat effective, many educators are proactively seeking to enhance their skills. Overall, inclusive teaching methods are broadly recognized as beneficial for CWHI, but stronger institutional backing and targeted professional development are essential to fully realize innovative and adaptive educational practices.

The findings reflect a generally moderate and cautiously optimistic attitude among educators toward children with hearing impairments (CWHI). While educators agree that CWHI are capable of academic success and can develop strong communication skills, their agreement is not strong, and responses show notable variability. There is only modest confidence in the participation of CWHI in group learning and mixed attitudes toward their critical thinking abilities. Nonetheless, educators recognize the unique ways in which CWHI engage with others and acknowledge the value of inclusive classrooms in fostering mutual respect. Many also express willingness to support interaction and collaboration between hearing and hearing-impaired students. Overall, while attitudes are moderately positive, greater consistency and stronger conviction could be cultivated through targeted awareness, training, and inclusive educational practices.

The study indicates that educators possess a strong foundation in technological knowledge, with the majority expressing

confidence in their ability to use and adapt to various technologies. High mean scores suggest that educators are not only comfortable with existing digital tools but are also willing and able to learn emerging technologies—a critical trait given the constantly evolving tech landscape. Their familiarity with hearing aids and ability to evaluate their functionality further highlights their preparedness to support children with hearing impairments (CWHI) through technological means. Additionally, educators demonstrated competence in creating AI-assisted presentations, using multimedia tools, and enhancing interactivity through captions and graphics. The integration of digital platforms by most universities also supports the accessibility of instruction, reinforcing a system-wide shift toward inclusive, tech-enabled education. Overall, educators are well-positioned to leverage technology in meeting the diverse needs of CWHI, though continued upskilling and institutional support remain vital.

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