Access and transition in inclusive education: Addressing the digital divide in educational technology

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Abstract

Over recent years, technological advancements have reshaped the education sector. However, limited empirical research has examined the integration of technology within inclusive education (IE). The purpose of this study was to investigate school leaders' perceptions and beliefs regarding essential teaching aids, specialized equipment, and infrastructural provisions necessary for effective IE implementation. This qualitative study employed a phenomenological design. Through purposive sampling, a sample of 12 school leaders was selected. Data were gathered through semi-structured interviews and were analyzed thematically using NVivo software. The findings revealed that effective IE requires a range of resources, including graphic planners, time organizers, alternative communication devices, AI-based tools, computer-assisted software, and assistive technologies such as text-to-speech and speech-to-text systems. Infrastructural provisions, such as ramps, escalators, accessible classroom layouts, and equipment like electronic wheelchairs, adjustable tables, smartboards, and interactive boards, were also identified as essential. It is recommended that AI-based tools and specialized equipment be piloted in one district before being implemented nationwide. The study offers significant implications for research, policy, and the strategic integration of technology in inclusive education.

Keywords: Assistive technology, Classroom environment, Digital divide, Inclusive education, Quality education, SDG4, Teaching aids.

1. Introduction

Inclusive education (IE) is a global movement that advocates equal educational opportunities [1] and access for all students, regardless of their backgrounds, abilities, and impairments [2]. Under this approach, students with and without disabilities are integrated into age-appropriate mainstream schools to receive individualized instruction [3]. However, the targets of IE cannot be achieved without integrating technology into mainstream classrooms [4, 5]. The success of IE mainly depends on the general teachers' preparation and providing a conducive learning environment for students with varying abilities [6]. However, in developing countries, a significant gap exists in providing technology-based environments and assistive devices to students in mainstream schools [7].

In recent years, the rapid advancement of assistive technologies has opened up new possibilities for transforming the IE environment [8]. These innovative tools have the potential to break down barriers and provide greater access and support for students with diverse learning needs [7]. By leveraging assistive technologies, teachers can create an inclusive educational ecosystem that empowers learners to reach their full potential [9]. It is evident from the literature that it is crucial to explore how assistive technologies can be utilized to transform the educational environment for individuals with IE [10, 11].

In this regard, educational leaders can play a crucial role in establishing a supportive educational environment and effectively integrating inclusive policies into educational institutions [12]. They can influence and drive change in educational institutions [13] since they are responsible for policy implementation [14] resource allocation, and decision-making processes [15]. Understanding their perspectives, attitudes, and experiences is crucial for identifying the issues they encounter and their strategies for promoting IE [16]. School leaders (SLs) are the primary stakeholders who can bring about changes in the physical infrastructure [17] and class culture, including classroom facilities for students [18].

The educational landscape of institutions has undergone significant changes in recent years, with a growing emphasis on diversity [19]. The literature supports that technical changes have influenced the evolving educational environment for IE [20]. Global movements such as the International Convention on the Rights of Persons with Disabilities [21] and Sustainable Development Goal 4 emphasize IE [22]. Implementing IE at educational institutions is difficult [23]. These difficulties may include a lack of resources, inadequate teacher training, attitudinal hurdles, and opposition to change [24].

Although school leadership is a widely studied topic in developed or developing countries, research on technology integration is scarce, particularly in IE. School leaders are influential figures in schools, can create the tone and direction of IE projects, provide resources, and establish rules that support inclusive practices. Knowing their perceptions, the researchers can understand the infrastructural challenges and prospects for change inside educational institutions. The purpose of the current study was to investigate the changing educational environment for IE through the eyes of educational leaders and to explore how digital gaps can be bridged. Furthermore, this study examines the constraints faced by school leaders in creating inclusive learning environments and the strategies they employ to overcome these challenges.

1.1. Research Questions

The following research questions guided the present study.
1. What teaching aids (assistive technologies) can benefit students' effective learning in inclusive education?
2. What special equipment is required to create a learning-friendly environment for students with inclusive education needs?

2. Literature Review

Chambers [25] highlights that assistive technology (AT) enhances the effectiveness of inclusive education (IE) in mainstream classrooms. He mentioned the benefits and difficulties of adopting AT to support students with disabilities, particularly in developing countries. In another study, the role of AT in IE is discussed. He argued that AT, as a collection

of technologies and services, helps students enhance their potential and skills and adjust to or minimize difficulties. A specific AT has been designed specifically for a particular function. Students with SEN can adapt AT to enhance their assistive capacity. There is the possibility for increased inclusion in educational settings where AT fosters social engagement, curricular access, and the capacity to articulate understanding McNicholl et al. [26].

Ahmad [27] also argued that the potential for technologies to ensure that all students have equal access to the core curriculum is immense. Almost anything that can be used to make up for a lack of a given ability falls under the umbrella term of AT, which also encompasses "adaptive," "assistive," and "rehabilitative" devices for people with disabilities. Encarnação et al. [28] also emphasize that teachers viewed the technology as an asset that could be integrated into the classroom's daily routine without compromising the integrity of the curriculum. The school system and the lives of children with disabilities were improved as a result. Teachers noted that it was difficult to maintain order in the classroom, even with a second adult present, due to the additional time required for children with impairments to complete the exercises.

Furthermore, Hunt [29] argued that educational systems should be able to recognize, evaluate, and supply the required AT concerning educational use and all-inclusive and integrated use if early recognition of such devices has not occurred. This may be achieved by sufficiently funding support services for inclusion and forming multidisciplinary teams of experts. Karagianni and Drigas [30] discussed the importance of AT services in IE and presented various models and resources for AT implementation that offer guidance to general and special education teachers. In connection with the provision of AT, Evmenova [31] acknowledges some barriers to technology use in inclusive settings and encourages teachers to overcome fears and existing challenges to provide better learning opportunities to all students, including those with unique abilities.

Bhatnagar et al. [32] discuss the concept of creating participatory and inclusive AT innovation clinics in design schools and present two case studies to demonstrate the steps toward this approach. The case studies show that this approach can lead to the creation of bespoke and scalable AT innovations that meet the needs of people with disabilities. Ravihansa et al. [33] emphasized the multidisciplinary nature of the practice, which involves designers, engineers, makers, clinicians, and people with disabilities. They also envision that this practice can become a movement that contributes to the global understanding of the needs of children with disabilities.

Žalytė-Linkuvienė [34] investigated the potential of multimedia technologies in alignment with the fundamental principles of IE and concluded that multimedia technologies could be a valuable tool for achieving the goals of IE. The study emphasizes the importance of teachers' competencies in inclusive settings and calls for more attention from researchers working with multimedia technologies to pedagogical goals. Goodley et al. [35] provide a literature-based review of the relationship between disability and new technologies, specifically focusing on IE for vulnerable children. The authors critically explore disability and new technologies in an era of industry, outlining concerns they have, especially regarding the peripheral positionality of people with disabilities concerning these new developments. Hotson and Bell [36] focus on the area of IE, teasing out conflicts between inclusion and education, and arguing that we cannot dissociate the promise of new technologies from the challenges of IE.

Azzahra et al. [37] conducted a study on school infrastructure for IE and found that different types of special-needs children have distinct facility and infrastructure requirements. Rooms, tools, media, and educational resources were also identified as areas that may be set apart for children with varying degrees of special needs. Ackah-Jnr and Danso [38] examined the physical environment regarding the mobility and independence of students with physical disabilities. They argued that it could be enhanced by installing accessible physical infrastructure, such as ramps, elevators, and expanded doorways. Adjustable desks and ergonomic chairs are just two examples of specialized equipment that help make classroom activities more tolerable for pupils.

Table 1.
Participants Information.

Sr no	District	Gender	Designation	Academic qualification	Administration experience (In years)
P1	Lahore	Male	Headmaster	M.Phil.	7
P2		Female	Principal	Masters	20
P3		Female	Headmistress	Masters	12
P4	Kasur	Male	Principal	M.Phil.	22
P5		Female	Senior headmistress	Masters	15
P6		Male	Headmaster	Masters	9
P7	Nankana	Male	Senior headmaster	Masters	14
P8		Female	Principal	M.Phil.	20
P9		Male	Principal	Masters	24
P10	Sheikhupura	Male	Headmaster	M.Phil.	7
P11		Female	Headmistress	Masters	7
P12		Female	Senior headmistress	M.Phil.	14

Note: P* = Participant.

3. Research Methodology

3.1. Research Design

The research design of the present qualitative inquiry was phenomenology. According to Williams [39], phenomenology is considered a more suitable research design for examining the nature of any existing phenomenon. The literature supports the notion that phenomenology is the most effective design for examining participants' perceptive experiences in-depth and in detail in qualitative research [40]. Considering the implications of phenomenology, we adopted it in the current study to examine the perspectives of SL to bridge the digital divide in IE.

3.2. Participants

The participants were the SL (headmasters/headmistresses, senior headmasters/headmistresses, and principals) of the public schools in the Lahore division. Lahore division comprises four districts: Lahore, Kasur, Nankana, and Sheikhupura. A total of 12 participants (6 males and 6 females) were selected for the current study using a purposive sampling technique. After obtaining consent, they were interviewed. The authors established a criterion for respondents' experience, requiring at least five years of working experience to ensure the collection of in-depth and detailed viewpoints from experienced leaders. Additionally, all respondents were aware of IE and its limitations, as they had attended sessions on IE during their induction and promotion link training. The demographic information of study participants is provided in Table 1.

In Table 1, the researchers presented the basic information for study participants. There were equal numbers of male and female respondents. Five respondents held the position of headmaster/headmistress with a BS-17 rank in secondary schools, while three held the position of senior headmaster/headmistress with a BS-18 rank in secondary schools within the Lahore division. The remaining four respondents were working as principals in BS-19 in secondary schools. They had experience ranging from 7 to 24 years in the public secondary schools of the Lahore division.

3.3. Instrument Development

For data collection, we designed a semi-structured interview guide. Initially, we developed 25 main interview questions, along with tentative supplementary questions. An interview guide was then sent to three experts in inclusive and special education. They provided feedback on the interview questions, including their relevance to research questions, language, and the format and sequence of questions in the interview guide. The researchers revised the interview questions and finalized 20 primary and supplementary questions based on the feedback from experts. To explore and investigate school leaders' perspectives on the selection of necessary teaching aids/tools and the development of a learning-friendly environment for inclusive students, the authors asked questions like, "What teaching aids or tools do you currently utilize in IE classrooms?", "How do these teaching aids or tools contribute to students' effective learning?", "Are there any specific teaching aids or tools that you have found particularly effective in enhancing learning outcomes for IE students?", "How do you determine the appropriateness of different types of special equipment for individual students' needs?", "Are there any additional special equipment or resources that you believe could further enhance the learning-friendly environment for IE students?", "Why do you think they would be beneficial?", "Based on your experience and insights, what recommendations would you give to teachers and policymakers regarding the provision of special equipment in IE settings?" and "How do you ensure the maintenance and sustainability of the special equipment and resources provided in IE classrooms?"

3.4. Data Collections

After developing the interview guide, the researchers obtained informed consent from participants and conducted face-to-face interviews, following the respondents' ease and comfort levels as outlined in the guide. These interviews were recorded using the smartphone's recording feature. After conducting the interviews, the recordings were protected with a password and transcribed immediately.

3.5. Research Ethics

The researchers strictly adhered to research ethics throughout the research process of the current study. As humans were involved in the present study, we maintained the SOPs for the safety and comfort of the respondents. They were allowed to withdraw from the study if they felt any threat to their physical and psychological well-being. To avoid any social constraints, female researchers interviewed the female participants. Considering their anonymity and confidentiality, the authors assured them that their names and demographics would not be shared with any publishing agency, organization, or institution. The School Education Department, Government of Punjab, Kasur, Pakistan, has an ethical committee that approved this study (Approval #SE/GOP/076-2024).

4. Results

After transcribing interviews, we used thematic data analysis, following Braun and Clarke [41] six-stage guide. We used NVivo (12 Pro version) software for data analysis and graphical representation. We extracted the themes and sub-themes from the data presented in Figure 1.
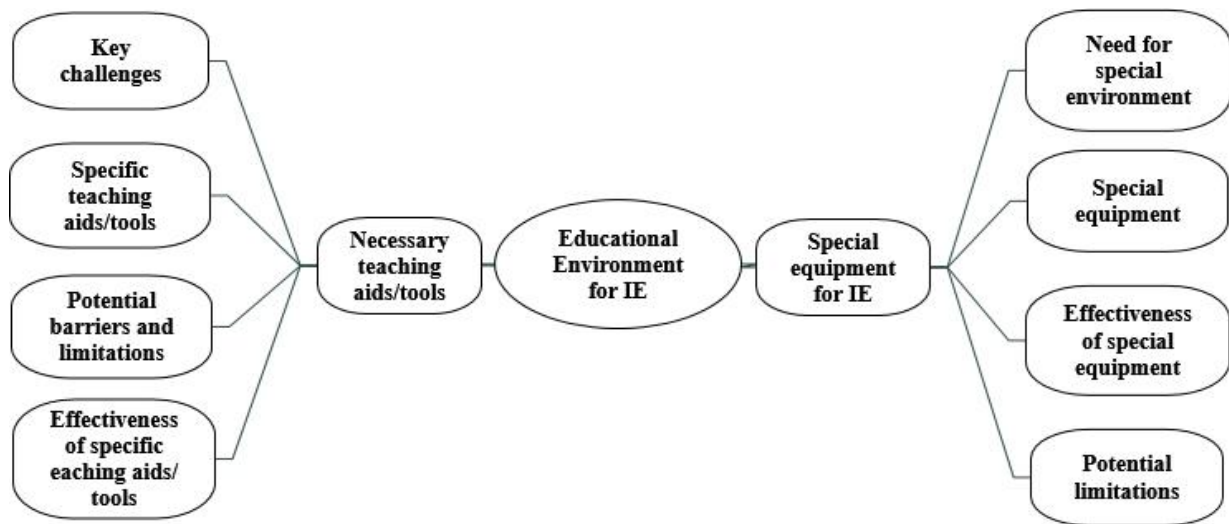
Figure 1.
Details of Themes and Sub-themes.

In Figure 1, we presented the details of the study's themes and subthemes. It is revealed that the global theme that emerged from the data was the educational environment for IE, which has two main themes: a) necessary teaching aids/tools and b) special equipment for IE, which were aligned with both of the research questions of the study. These two themes had four sub-themes, presented below under the relevant headings.

4.1. Necessary Teaching Aids/Tools

This theme encompassed the key challenges that teachers and leaders faced or might face. It also includes their perception of the specific teaching aids and tools, potential barriers and limitations to arranging these specific teaching aids/tools for IE, the effectiveness of these teaching aids and tools in IE, and the recommendations for policymakers to include IE and relevant provisions on providing particular teaching aids, assistive devices, and tools for students with special educational needs (SENs).

4.1.1. Key Challenges

A sub-theme related to key challenges includes respondents' perceptions of the challenges they face in managing and teaching students with SENs in their mainstream schools. When the question related to key challenges was asked, P11 responded,

"My school teachers are unfamiliar with the specific teaching aids/tools to teach inclusive students. My school teachers always complain when students with SENs are in their classes. When I ask them to prepare themselves well for teaching in IE, they show a lack of awareness."

The above response of P11 indicated that he felt the challenge of a lack of awareness from the teachers' side. It shows that P11 is concerned about the lack of awareness regarding the need to develop teaching aids and tools in IE. In response to the same question, P3 argued,

"When we enroll students with psychological needs or physical imbalances, the main problem is that we do not have the resources and funds to provide the special teaching aids and tools to teach these students. This creates panic, and we often do not accept such students in our regular schools."

The above response of P3 is about the challenge he faced in managing students with SENs in his school. He showed concern about the lack of funds to manage teaching aids and tools for these students. In reply to the same question, P8 responded,

"I fear that my teachers do not have sufficient training to teach these innocent students. A lack of teachers' preparedness might hinder the abilities of such students. I believe these students had great potential. If they are deprived on the one hand, they are given more than average skills on the other hand."

The above response of P8 shows that she was concerned about the lack of preparedness of her school's teachers. They are willing to include such students in mainstream schools if they are well-trained and equipped with the skills to manage students' SENs.

According to the analysis, the authors found that SL faced various challenges in accepting diversity in schools. They faced numerous challenges, including a lack of funds for managing school diversity and teachers' preparedness in including students with SENs in mainstream schools. Most of them (P1, P3, P5, P6, P7, P8, P9, P11, P12) agreed that their school staff is unaware of the specific teaching aids and tools to teach students in IE.

4.1.2. Specific Teaching Aids/Tools

When the respondents were asked about the provision of specific teaching aids and tools to be provided to special students, P4 respondents,

"Various assistive technology tools and programs can help special needs learners. Some examples are software that converts speech into text, software that converts text into speech, alternate communication devices, adaptable keyboards, and sensory instruments. If the government wants to achieve the education dream for all, we must be provided with this software and technology tools."

In the above response, P4 believes that if the government wants to achieve the dream of education for all, it must provide various assistive technology tools and software required to teach students with SENs in mainstream schools. In response to the same question, P112 commented,

"Students with SENs can benefit from auditory and visual aids such as visual schedules, timers, image cards, and visual cues to help them grasp and follow instructions, practices, and changes."

The response of P12 indicates that he was concerned about the auditory and visual aids, as well as the support to be provided in schools to encourage the inclusion of students with SENs. In reply to the same question, P8 argued,

"I think it is possible to help students with SENs access the curriculum by providing materials at multiple levels of diversity, such as adapted worksheets, graphic organizers, and simplified texts."

In the above response, P8 believes that differentiated instructional material can benefit students with SENs and enhance inclusion in mainstream schools. Although the government has not yet provided differentiated instructional material in schools, it could help promote diversity.

After the analysis, we inferred that almost all respondents were concerned about not having specific teaching aids and tools in IE. They believed that auditory and visual support, assistive technological tools, various software, speech-to-text and text-to-speech applications, and teaching aids such as graphic organizers, visual schedules, and visual timers can help promote inclusion in mainstream schools.

4.1.3. Potential Barriers and Limitations

In the present sub-theme, the respondents indicated that they face various potential barriers and have several limitations that hinder their ability to promote inclusion. One of the respondents commented,

"Providing teachers and staff with continual professional development opportunities to increase their understanding and application of IE principles is very important. It is difficult for teachers to meet the varying needs of children with disabilities if they have not received the training, and they are not ready to accept diversity."

In the above response, P2 believed that the professional development of respondents is crucial for accepting diversity and promoting inclusion. As the government has not yet taken such steps, this represents a potential limitation to implementing IA. In response to the same question, P5 commented,

"I believe resistance to change from teachers, staff, and parents can be a significant limitation to promoting inclusion. I am facing resistance to inclusive practices due to concerns about increased workload, perceived lack of expertise, or fears about the impact on other students' education.

P5 believes that the main stakeholders in education, including parents, teachers, support staff, and SA, are resistant to promoting inclusion in schools.

After the analysis, the researchers believed SL faced different barriers to promoting diversity. The significant limitations mentioned by the majority of respondents were related to the professional development of teachers, the provision of adequate resources, organizational resistance to accepting diversity, the attitudes and beliefs of teaching and supporting staff, inflexible curriculum and assessment practices, and physical and environmental limitations. One of the participants (P8) mentioned that limited community engagement and limited resources are significant limitations to promoting inclusion.

4.1.4. Effectiveness of Specific Teaching Aids

This sub-theme involves respondents' perceptions of the effectiveness of specific teaching aids for inclusive students. The respondents presented their insights on the effectiveness of specific teaching aids. One of them commented,

"I think specific teaching aids like virtual reality (VR) and augmented reality (AR) technology enable students to interact with virtual worlds and objects, resulting in immersive learning experiences. Due to the visual and interactive learning opportunities these technologies offer, students with SENs benefit to learn in IE."

The above response from P4 showed that she is very hopeful and believes that if specific teaching aids, such as VR and AR, are used efficiently in inclusive classrooms, the desired results can be achieved. She believed that if schools attained these advanced, specific teaching aids, they might help promote inclusion in schools. While exploring the effectiveness of specific teaching aids, one of the other respondents argued,

"I believe advanced educational apps and software can provide personalized learning experiences needed for individual students' needs. These tools can adapt content, provide instant feedback to students with SENs, and offer interactive and engaging activities for learners with diverse abilities."

P7 also emphasized the importance of using specific teaching aids for students with SENs in inclusive classrooms. These tools might be very effective in designing learner-supportive teaching.

After the analysis, we found that all respondents are in favor of using specific teaching aids in IE, which can help students with SENs achieve the best possible learning outcomes. As these teaching aids and tools are integrated with AI-based algorithms, they may help students address their specific needs and build upon their previous progress. Most

respondents believed that if students are taught with specific teaching aids and tools, these can help them learn regardless of their physical and psychological disabilities.

4.2. Special Equipment for IE
The second research question was designed to investigate school leaders' beliefs about the need for and importance of special equipment and environment for IE. After collecting data, it was analyzed, and the following sub-themes emerged.

4.2.1. Need for Special Environment
The present sub-theme included school leaders' beliefs about the need for a special environment required for the successful implementation of IE. In response to the question, P1 commented.

"First of all, I believe school infrastructure should be according to the requirements of IE. Each school's building should be designed to ensure that vulnerable students can easily access their classrooms, libraries, examination centers, and indoor and outdoor playgrounds. If the school has a multi-story building, there should be ramps and escalators instead of cemented stairs."

P1 provided his viewpoint on the building infrastructure of schools, which is a prerequisite for implementing IE. He believed these students should be facilitated by moving from one place to another during school hours. P6 responded,

"I think that to promote inclusion, the government should invest in schools in appropriate classroom settings. There should be easy chairs, comfortable armchairs, electronic chairs for disabled students, and appropriate tables for doing classwork."

The above response from P6 indicates that he recognized the need for classroom settings and seating arrangements that accommodate students with SENs in IE. While talking about the need for a special environment for IE, P8 argued,

"As far as the success of IA is concerned, I think peer support programs can promote social inclusion and offer academic and social help in the classroom by pairing usually developing children with students who have special needs."

P8 believes peer support is necessary for promoting social inclusion in mainstream schools. She believes that peers can offer academic support and social help to vulnerable students in the classroom.

After analyzing the data for the current sub-theme, we found that most respondents believe that school infrastructure, classroom design, seating arrangements, furniture, and peer support are fundamental to creating a special environment for IE's success.

4.2.2. Special Equipment
The present sub-theme features respondents' voices on the specialized equipment needed to create tailored learning environments for students in IE. One of the respondents argued in this regard.

"For developing a special environment for inclusive students, I believe that robotics and coding tools provide students with real-world practice with abstract concepts like logic and problem-solving. Students on the autism spectrum or those who learn best through movement will find these resources especially helpful."

P2 believes that specialized equipment, such as robotics and coding tools, is necessary for creating an inclusive environment. She believes that this type of equipment might help vulnerable students in problem-solving situations. While talking about special equipment, P3 commented,

"Ahhhhh, students with mobility impairments or limited motor control can use eye-gaze technology to communicate and engage with computers and other devices. When used with other assistive software and hardware, this technology can help students with multiple disabilities communicate more effectively and gain more classroom participation."

In the above comment, P3 expressed his viewpoint on creating a specific environment that accepts diversity and promotes inclusion in mainstream schools. He believes eye-gaze technology and computer-based devices might help students with SENs interact and engage more frequently. In response to the same question, P7 commented,

"To promote diversity, I think smartboards and interactive whiteboards offer a flexible setting for student-centered learning. Teachers can utilize these resources to create engaging lessons for students of all learning styles and levels through multimedia, interactive exercises, and group projects."

P7 believes that using smartboards and interactive whiteboards may also play a significant role in creating a particular environment that fosters class participation and interaction among vulnerable students. In this regard, P8 commented,

"I believe equipment such as specially designed chairs, tables with armrests, posture correctors, touch panels, and the tools to set up a barrier-free space."

The above response from P8 indicated that equipment such as specially designed chairs, posture correctors, touch panels, and specially designed tables also play a crucial part in developing a specific learning environment for the successful implementation of IE.

After analyzing the data, the researchers found that various pieces of equipment contribute to creating a special environment that promotes diversity. Most of them believed that equipment such as starboards, interactive whiteboards, specially designed chairs, eye-gaze technology, computer-based devices, robotics, and coding tools are crucial for

developing specific learning environments for students in IE. One of the respondents mentioned that 3-D printing technology and gamification tools might also contribute to developing a learning-conducive environment for students in IE.

4.2.3. Effectiveness of Special Equipment

The current sub-theme encompasses respondents' beliefs about the effectiveness of specialized equipment in creating tailored environments for the successful implementation of IE in developing countries, such as Pakistan. One of them argued,

> *"The special equipment is crucial and effective for developing an adequate environment to promote inclusion. If schools do not have this equipment, teaching special students is like cutting an apple with a hand instead of a knife."*

P4, in the above response, believed that the equipment to engage and teach students with SENs is very effective for quality learning. They cannot accept classroom diversity if this equipment is missing in school. In this regard, P7 commented,

> *"Safety and medical equipment are also required for effective teaching in IE."*

P7's above response indicated that safety and medical equipment are also crucial for designing a learning-conducive environment in schools.

The data analysis for the present sub-theme suggests that providing specialized equipment is crucial for promoting diversity. Most respondents believe that specialized tools are essential in creating a comfortable learning environment for all students in IE. Access to the curriculum, student participation and engagement, student independence, and academic gains are all metrics by which the success of specialized equipment in IE is measured.

4.2.4. Potential Limitations

The researchers found that the provision of special equipment is crucial to the success of IE. Besides its effectiveness, it also had several limitations. In response to the question, one of the respondents commented,

> *"Ahhhhhh (thinking), I believe that schools may experience budgetary restrictions that limit their ability to purchase and maintain the appropriate equipment due to the high cost of special equipment."*

P5, in the above response, argues that one potential limitation of using special equipment might be the cost of the equipment. Smartboards, interactive whiteboards, computer-based software and devices, and other tools may be outside the school budget. Hence, funding is one of the crucial limitations of using special equipment. In this regard, P9 argued,

> *"Without sufficient training, staff members and teachers could find it difficult to make the most of the technology, which would reduce how well it met the needs of students."*

P9 believed that special training to use this special equipment and technical support are also limitations that SL should consider when providing special equipment in schools.

After analysis, the authors found that most respondents believe that funding, training, and technical support to manage special equipment, maintenance and repairing of special equipment, and stigmatization leading to the isolation of vulnerable students in mainstream schools are the few critical limitations of using special equipment in mainstream schools.

4.3. Discussion

In this qualitative study, we investigated school leaders' perceptions of the necessary teaching aids, equipment, and infrastructure for the success of IE in developing countries, such as Pakistan. We found that SL faced various challenges while accepting diversity in schools. They faced numerous problems, including a lack of funds to manage school diversity. The present study supported the results of a study conducted by Hunt [29], who emphasized that the integration of AT is crucial for the adequate functioning of special students' education. However, sufficient funding should be provided; otherwise, promoting diversity could be a significant challenge. In the present study, SL also showed that they face the challenge of a lack of teachers' preparedness for including students with SENs in mainstream schools. In a previous study, the researchers also found that teachers' lack of readiness to accept and promote inclusion is the major stumbling block to implementing IE in Pakistan [42]. One of the other challenges was that most of the SLs showed concern that their teachers were unaware of the specific teaching aids and tools used to teach students in IE.

From this, we determined that most participants were concerned about the lack of suitable instructional resources in IE. They believed that teaching tools, such as graphic organizers, visual schedules, visual timers, auditory and visual support, and various technologies like speech-to-text and text-to-speech, could help encourage inclusion in mainstream schools. The present findings align with those of Chambers [25], Encarnação et al. [28], and Ahmad [27], who argue that the use of AT in mainstream classrooms can enhance inclusion. They discuss the benefits and challenges of using AT to help students with psychological and physical impairments. In the present study, we found that AT is an important factor in the success of IE.

We also found that SL confronts several challenges regarding encouraging diversity. Most respondents mentioned significant limitations related to teacher professional development, inadequate resource provision, organizational resistance to accepting diversity, the attitudes and beliefs of teaching and supporting staff, inflexible curriculum and assessment practices, and physical and environmental constraints. Our study supported the findings of Evmenova [31], who recognizes some barriers to teachers' preparedness and skills for using technology in inclusive settings to overcome anxieties and existing challenges, thereby providing greater learning opportunities for all students.

We explored how technological equipment helps to create a unique atmosphere that promotes diversity. The study found that SL expressed concerns about the school infrastructure and building design, supporting the study findings of Morgado [43], who examined how the school environment is critical to the success of inclusive education (IE). They discussed how school buildings, infrastructure, and classrooms should be designed to meet the needs of vulnerable students. Similar to this study, they also proposed removing structural impediments such as narrow corridors and entrances, insufficient bathrooms, and rooms with stairs.

Most respondents in this study stated that equipment such as smartboards, interactive whiteboards, specifically designed chairs, eye-gaze technology, computer-based devices, robotics, and coding tools were practical and critical for creating customized learning environments for IE students. Our study highlighted the significance of the findings of Azzahra et al. [37] who explored the fact that different categories of special-needs students require different types of facilities and infrastructure, including rooms, equipment, media, and educational resources. These have also been identified as potential areas for children with varying levels of special needs. One respondent discussed 3D printing technology and gamification tools that could help create a learning-friendly environment for students at IE.

4.4. Conclusion

Inclusive education is being adopted worldwide, and stakeholders of IE are making efforts to ensure its success. In all developed and developing countries, education is every child's right, regardless of their background or circumstances. Although many challenges threaten IE, countries are still determined to promote inclusion. The present paper was designed to explore the necessary teaching aids and tools for teaching in IE and the special equipment and environment needed for the success of inclusion. The researchers found that SL believes that teaching aids and tools, such as graphic organizers, time organizers, alternative communication devices, AI-based tools, and computer-based software like text-to-speech and speech-to-text, alongside many other auditory and visual aids, are necessary for promoting diversity in mainstream schools. The researchers also investigated their narratives to explore the nature of special equipment for designing inclusive classrooms. It was found that building infrastructure (ramps, escalators, designs of class theatres and corridors, doors of rooms and halls), as well as classroom settings (electronic wheelchairs, adjustable tables, room heating and cooling systems, smartboards, interactive boards, and worksheets), are necessary elements for the success of inclusion. It was also found that eye-gaze, computer-based devices, differentiated curriculum, and peer support programs are essential for inclusive students. It was also found that all the SLs expressed concerns about the lack of professional development for their staff members and inclusive teachers, as well as the shortage of funds and material resources for purchasing necessary teaching aids, tools, and equipment required for the success of IE in developing countries like Pakistan.

4.5. Implications, Limitations, and Recommendations

The present study has several practical implications: a) from the present study, all the SL might gain awareness about the necessary teaching aids/tools and special equipment required for inclusive education (IE); b) they can also benefit from the study's findings to explore the challenges faced during the promotion of inclusion; c) this paper would help SL of developing countries understand the stumbling blocks for implementing IE. It also has a few limitations. Firstly, it is a qualitative study, which generally has limited generalizability. Secondly, responses from participants were obtained through semi-structured interviews, which may lead to response manipulation. Respondents often provide filtered and selective information during interviews. The paper offers several suggestions and recommendations: a) for the successful implementation of IE, SL should be provided with adequate funds and resources; b) special equipment, AI-based tools, computer-based devices, and software are recommended for use in one district as a pilot project. After evaluating its effectiveness, it can be expanded to the provincial and national levels. Besides funding, teachers' specialized training and development in using these devices and equipment should be arranged to ensure they are fully equipped with the necessary skills before being provided with these teaching aids and tools.

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