



Teacher Training in Digital Media for Special Education: Developing Skills in Accessibility, Content Creation, and Inclusive Technologies

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Abstract

This research aimed to study the incorporation of digital media by teachers in special education, with a focus on accessibility, content creation, and inclusive technologies. Quantitative research design was employed, and the data gathered from 350 special education teachers using a structured questionnaire. The study investigated teacher's digital competence, training experiences, and variations among demographic groups. Results indicated teachers possessed a moderately positive level of digital media competence, and accessibility skills were their strongest area followed by content creation and use of inclusive technology. Significant differences based on gender, type of institution, formal digital training age qualification, and teaching experience were established, however no significant difference was discovered in areas of specialization. The study discussed that formal training was the most influential factor in enhancing teachers' digital competence for inclusive education. It was suggested that teacher education programs should offer well-designed accessibility, digital content development, and inclusive technologies training courses to be able to contribute to education of special children participating in digitally supported learning environment.

Keywords: Special Education, Digital Media, Teacher Training, Accessibility, Content Creation, Inclusive Technologies, Quantitative Research

Introduction

The rapid growth of digital media has transformed the way teaching learning communication and assessment are planned in modern education systems. In the special education sector, this change is even more considerable as digital media can do more than simply deliver the content; it can offer multiple means of representation, support differentiated instruction, enable alternative communication, and enhance access to learners with diverse sensory cognitive behavioral and physical needs. The current research indicates that when educators are well-trained, digital media tools such as screen readers, captioning systems, augmentative and alternative communication

applications, adaptive learning platforms, and accessible learning management systems can greatly enhance the participation, autonomy, and inclusion of students with disabilities (Aftab et al., 2024; Utami et al., 2025). Teacher training in digital media for special education is no longer merely a choice, but a baseline requirement for providing equal education. According to the latest studies, special education teachers generally require a more extensive and specialized digital competence than their counterparts in regular classes. Besides having basic operational skills, they must be capable of adjusting digital resources, creating accessible material, choosing assistive devices, matching tools to personalized requirements, and determining if the technologies are really helping to remove barriers to participation. Recent studies note that lots of teacher training programs still focus on teaching general digital skills and paying limited attention to accessibility, assistive technology, and inclusive pedagogy. This results in a disconnect between the knowledge given to teachers and what is needed in inclusive classrooms (Montenegro-Rueda & Fernández-Batanero, 2022; Montenegro-Rueda & Fernández-Cerero, 2023). The post-pandemic period has only made the problem worse. With schools leaning more on blended, online, and technology-supported instruction, teachers' role is expanding to create digital resources that can be accessed by all learners, including those with disabilities. Research indicates that professional development aimed at improving digital pedagogy should not only involve technology, pedagogy, and content knowledge but also focus on boosting teacher self-efficacy and promoting sustainable inclusive practices. Focused on expanding teachers' knowledge of inclusive practices, virtual and hybrid professional development training options have come up as feasible alternatives. However, these options' effectiveness largely depends on whether the training can tackle the actual challenges of classroom teaching such as accommodations modifications universal design for learning, and accessible instructional design (Montalbano et al., 2024; Shi et al., 2025). Against this background, the proposed research, *Teacher Training in Digital Media for Special Education: Developing Skills in Accessibility, Content Creation, and Inclusive Technologies*, is very timely and relevant. It's hitting a spot where educational transformation, disability inclusion, and teacher professional development come together. The project reminds us that inclusion when we talk about digital means is not just achieved by putting devices in classrooms; it needs teachers who can make accessible materials, use inclusive media with creativity, and make the right pedagogical decisions about technology for diverse learners. That is why teacher training is seen as the main tool through which digital opportunities can be transformed into educational access, participation, and meaningful learning for students with special educational needs (UNESCO, 2023; Aftab et al., 2024).

The basis of the research is an acknowledgment worldwide that the implementation of education for people with disabilities is not limited to policy measures but also includes the competence of teachers. According to UNESCO, technology can facilitate inclusion and increase accessibility, but the conditions are that it be relevant fair based on evidence, and teachers be well-prepared for its use. Moreover, UNICEF has reported that children with disabilities are still the most excluded from education. One of the main barriers is the absence of well-trained teachers and appropriate classroom support. Furthermore, the global assistive technology direction has also underlined that it is not only essential to provide access to the right tools, but the educational benefits of these tools hinge on the abilities of the educators who use them (UNESCO, 2023; UNICEF, 2021; WHO & UNICEF, 2022). Recent studies indicate that teachers in special education are often placed in situations where the use of technology to help those with disabilities is expected, but support for it is lacking. A systematic review of the literature has shown that research on digital competence programs for special education teachers is still very limited, and most of the existing programs are still broadly focused instead of preparing teachers to use assistive or

adaptive technologies specifically designed for learners with disabilities. Likewise, earlier reviews and research studies have pointed out that digital competence is still a neglected area in special education and that a low level of training is the main factor that limits teacher's ability to use technology in an effective way for inclusive practice. This situation indicates a deep-rooted problem that is reflected in both pre-service and in-service teacher education (Utami et al., 2025; Montenegro-Rueda & Fernández-Batanero, 2022). Globally, the push for inclusive digital education has gained momentum since 2020; however, adoption is still not uniform across the globe. While technology offers an opportunity to connect and provide educational content to underprivileged students, the lack of proper governance infrastructure teachers' preparation etc. might lead to the exclusion of the very students who need help (UNESCO). Besides, many special education teachers still feel that they are not well equipped to incorporate digital tools in an inclusive and accessible manner. Research based on Europe and other parts of the globe highlights persistent issues such as the lack of training, inadequate institutional planning, and limited professional development opportunities that are tailor-made for special education environments (UNESCO, 2023; Montenegro-Rueda & Fernández-Cerero, 2023). Recent experimental research, for instance, has indicated some promising pathways. Research on virtual teacher professional development concluded that teachers' knowledge of inclusive practices such as accommodations modifications, co-teaching, differentiation, and universal design for learning was largely improved. Similarly, a 2025 study of teacher training in digital pedagogy revealed that appropriate training leads to increased teacher capability and confidence and enables them to create more sustainable inclusive digital learning settings. This evidence indicates that professional development programs that are thoughtfully crafted can do more than just prepare teachers technically; they can also assist teachers in moving towards a more integrated, reflective, and learner-first use of digital media (Montalbano et al., 2024; Shi et al., 2025).

The situation in Pakistan locally represents both the policy interest and the challenges in the implementation. Special Education Policy 2020 of the Government of Punjab directly endorses district-level teacher training and the use of technology to link teachers with professional development opportunities. In terms of the federal sector, according to the Directorate General of Special Education, the National Institute of Special Education was set up to train workers in special education, arrange refresher courses, produce training modules, and promote accessibility and enabling environments consistent with the principles of disability rights. Such policy and institutional reforms show that teacher preparation has been acknowledged as the main issue in special education. Still, based on the literature, digital inclusion at the classroom level remains the one that needs the stronger and more systematic support to the point of being finally comprehensively developed (Government of Punjab, 2020; Directorate General of Special Education, 2026). Recent research from Pakistan has echoed this worry. One Pakistan case study highlights that a lot of work needs to be done before we can truly know how effective assistive technologies are for children with special educational needs. Another recent research from Punjab province reports that ICT can indeed support inclusive classroom practices; however, teachers still face main barriers of infrastructure, accessibility, and professional training. Besides, the paper's authors emphasized the need for teacher education programs that will include the ICT training modules as a targeted intervention. On the other hand, policy discussions at the national level have also consistently pointed to system reform and teacher development as the main areas (Kamran & Bano, 2024; Amjad et al., 2025; Ministry of Federal Education and Professional Training, 2024). While recent studies tend to highlight the integral role of digital competence for teachers, research that specifically targets the training of special education teachers in digital media as a comprehensive construct involving accessibility, content creation, and inclusive

technologies is still lacking. Most of the current studies view digital competence from a very broad perspective, focus primarily on general education teachers, or discuss technology adoption without adequately considering the capability of teachers to create accessible digital content for students with disabilities. Recently published evidence from systematic reviews has identified that the amount of digital competence research focused on special education remains quite limited, and that many training programs emphasize technical skills at the expense of accessibility-oriented and pedagogically contextualized preparation. This situation necessitates the development of specialized research frameworks that look beyond general ICT readiness to include disability-responsive digital pedagogy (Utami et al., 2025; Sajjad et al., 2025).

A second type of gap is contextual. Most of the strong evidence bases come from international contexts, whereas Pakistan and similar contexts have relatively few studies. Studies in Pakistan have demonstrated that assistive technology and ICT are good for inclusion, but on the other hand, these studies have revealed that lack of infrastructure, uneven training, and limited accessibility support still restrict practice. So, there is a lack of in-depth local evidence on how teacher training programs could systematically develop practical skills in accessibility, digital content creation, and inclusive technologies of special education teachers in Pakistan (Kamran & Bano, 2024; Amjad et al., 2025). While digital media has become a common element in education, there are a significant number of special education teachers who have not received the training to make their content accessible, use assistive and inclusive technologies in an effective way, and modify digital teaching methods to suit the diverse requirements of learners with disabilities. A lot of existing training programs concentrate on general digital literacy, whereas special education needs specialized skills. Therefore, even if digital tools are introduced in schools, it is quite possible that teachers do not have the knowledge and confidence for utilizing them in a manner that truly facilitates access, participation, and inclusion. This gives rise to a situation where the potential of digital media and its concrete educational impact on students with special needs are far apart (Utami et al., 2025; Montenegro-Rueda & Fernández-Batanero, 2022). The goals of this research include: first, to assess the level of necessity for teacher training regarding digital media in special education environments; second, to specify the digital media skills that special education teachers need, mainly in the areas of accessibility, content creation, and inclusive technologies; third, to investigate the difficulties that teachers encounter when using digital media for inclusive and special education; fourth, to evaluate how well teacher training currently provides for the accessibility-oriented and disability-responsive aspects of digital pedagogy; and finally fifth to offer strategies for teacher training programs to be enhanced such that they continue to support the delivery of inclusive, accessible, and technology-enabled education to students with disabilities (Utami et al., 2025; Shi et al., 2025).

This research is quite important as it responds to a pressing educational challenge where inclusion, disability rights, and digital transformation converge. It can serve teachers by pinpointing those competences which enable them to design accessible lessons, develop inclusive digital content, and operate assistive technologies more efficiently. Teacher educators and training institutions can get scientifically backed justification from the study to make changes to their pre-service and in-service curricula so that digital training goes beyond just ICT operational use to also include aspects of accessibility and inclusive pedagogy. On the level of policymakers, this research can be a piece of the puzzle that leads to better plans for disability-inclusive digital education by connecting teacher preparation to commitments at the national and international levels for equitable education. Ultimately, the study is by a long way

implementation oriented as it aims at enhancing the educational involvement and learning conditions of students with disabilities (UNESCO, 2023; WHO & UNICEF, 2022).

Literature Review

The work on teacher training in digital media for special education has grown rapidly since 2020 because digital transformation, inclusive education, and disability rights have become increasingly intertwined in both research and practice of education. It is widely agreed by recent scholars that the use of digital media in special education should not be seen merely as utilizing devices or online platforms as teaching methods; it rather encompasses activities such as making accessible materials, the use of assistive and adaptive technologies, multimodal communication, and the employment of inclusive instructional strategies that enable learners with disabilities to have a meaningful engagement in academic life. Besides, the research indicates that the success of digital media relies much less on the mere availability of technology and much more on the skills of the teachers to select adapt design and implement technologies in ways that minimize the learners' obstacles to learning and participation. Hence, teacher education has gotten increasingly important in the debate on inclusive digital learning, particularly after the COVID-19 period that brought about the worldwide accelerated use of technology in schools (UNESCO, 2023; Montenegro-Rueda & Fernández-Batanero, 2022; Shi et al., 2025). Digital competence among special education teachers is a major topic discussed in recent studies and publications. Nowadays, digital competence is seen as a complex and multidimensional concept that requires technical skills, pedagogical use, ethical knowledge, creation of inclusive environments, communication, and problem-solving in digital settings. Montenegro-Rueda and Fernández-Batanero in their systematic literature review concluded that digital competence of special education teachers is still a 'pending topic' i. e. it is underdeveloped and unevenly supported in various contexts. According to their review, teachers in special education are in a difficult position because apart from being proficient in digital tools, they also must adapt these tools according to varied needs of learners. Follow-up study by Montenegro-Rueda and Fernández-Cerero revealed that school leaders recognized digital competence in special education as crucial for inclusion but on the other hand, the level of digital competence in practice was still low due to poor training programs and lack of institutional support. In the light of these findings, it can be argued that digital competence for special education teachers is more than just general ICT skills because it involves the use of technology in an inclusive and disability-responsive manner, not merely being familiar with the technology (Montenegro-Rueda & Fernández-Batanero, 2022; Montenegro-Rueda & Fernández-Cerero, 2023).

The latest review findings have somewhat intensified this issue by zooming in on professional training in digital competence for special education teachers. A systematic review concluded that programs specifically designed for special education teachers are scarce both in number and content. Their review revealed that most professional development activities still focus on general digital skills rather than equipping teachers to use assistive, adaptive, and accessibility-oriented technologies. In addition, they noted the variation in training program content, the instruments employed for assessing outcomes, and the availability of evidence about the long-term impact in the teachers' classrooms. More significantly, the review pointed out that special education teachers need training that reflects their teaching situations, e.g. adapting content, correlating tools with specific disabilities, and determining if digital media enhances access and participation. This research certainly lends support to the viewpoint that digital teacher training needs to be both focused and highly adaptable to the local context to foster inclusive education in the most effective way (Aftab et al., 2024; Utami et al., 2025). There is a separate major topic

related to the connection between digital media and inclusive pedagogy. The latest research highlights that mere use of digital tools in teaching should not be seen as simple technological enhancement of a teaching session, but rather they be recognized as elements of an inclusion pedagogical framework that considers learner diversity from the start. Shi et al. discovered that in a post-pandemic context training in digital pedagogy professional development enhanced instructors' competence, digital self-efficacy, and work happiness notably when instruction intentionally integrated technology, pedagogy, and content knowledge. Their research is significant as it refocuses the conversation away from tool-centered training to a holistic perspective where teachers acquire how to take instructional decisions in digital contexts. In other words, training in digital media for special education should encompass not just technical skills, but also planning adaptation reflection, and inclusive pedagogy. The literature is unanimous that educators must also know how different digital tools may be used to aid in differentiated instruction, setting individual educational goals, and ensuring fair participation in both online and face-to-face settings (Shi et al., 2025; UNESCO, 2023).

Further to that, virtual and online professional development is still a major theme in literature as a way of equipping teachers with the knowledge and skills to be more inclusive. Montalbano et al. studied the impact of a five-part virtual professional development program and through statistical data, they identified that participants' learning in areas such as accommodations and modifications, co-teaching, differentiation, and Universal Design for Learning was significantly enhanced. The fact that professional development can be delivered virtually and still provide measurable learning outcomes when it is built around inclusive teaching practices is a key point in their study. Besides that, the authors also listed accessibility, scalability, and sustainability as the main strengths of virtual professional development in a practical sense. This is especially relevant in special education where educators are not always able to access face-to-face training, and the availability of highly trained special education professionals can vary significantly across different regions. Consequently, the literature points to the fact that digital teacher training is not just about meeting the content needs of teachers but also about finding a way of delivery on a large scale, etc. that is accessible and based on inclusive outcomes, etc. It is difficult to imagine developing and mastering inclusive skills without schools introducing and sustaining professional learning programs for their teacher force. Virtual and online PD are generally and broadly defined and characterized as asynchronous, synchronous, and blended; however, PD literature only recently started to characterize and study as platforms and environments that will offer teachers accessible affordable scalable, and sustainable solutions (Montalbano et al., 2024; Alahmari et al., 2025). Digital accessibility is an area of literature closely related to the one under discussion, and it has become a focus in the studies about teacher prep since 2020. This is about making materials platforms, documents, videos, and communications easily usable by students with different kinds of disabilities. In a systematic literature review, Bong and Chen found that training in digital accessibility generally covers raising awareness of disabilities, legal aspects, ways to create accessible digital materials, and the design of inclusive digital learning environments. But, at the same time, they revealed that this area still seriously lacks strong objective measures and a common evaluation framework for determining the effects of such training. Accessibility training therefore is recognized as a requirement, although its implementation and assessment remain uneven. For teacher education, this literature highlights that skill in digital accessibility is a must-have rather than a nice-to-have one: it is a prerequisite for guaranteeing that digital learning won't lead to traditional forms of exclusion being reproduced in the form of new ones (Bong & Chen, 2024).

The question of accessibility is even more explicitly addressed in the articles dealing with teacher preparation programs. Kang et al. considered that digital accessibility is nowadays one of the main factors contributing to students' success and to the addition that teacher candidates most of the time face inaccessible materials during their own preparation. Their reason for focusing on teacher education institutions is because they cannot expect special education teachers in the future to produce accessible content if their own training environments do not demonstrate accessibility. Looking through the lens of Universal Design for Learning, they suggest that teacher educators themselves require additional knowledge and skills to be able to design accessible courses and materials. This literature extends the conversation by demonstrating that accessibility is not only a concern teachers have to address when applying it to school students; indeed, it needs to be an integral part of both pre-service and in-service teacher education. Therefore, accessibility is not only a training content area but also a principle for organizing teacher learning experiences (Kang et al., 2024; Bashir et al., 2024).

Universal Design for Learning (UDL) is a significant source of inspiration in literature that discusses digital media in special and inclusive education. According to a systematic review by UDL training courses have a substantial impact on teacher competence and have the potential to facilitate the planning and implementation of accessible lessons. In fact, their results indicate that UDL functions as a helpful framework that teachers can use to get to know the diversity of learners and to prepare, with the usage of the three main principles of multiple means of engagement, representation, and expression, a flexible learning experience for the students. When it comes to digital media, this makes perfect sense because the way teachers employ digital tools determines whether these tools support or go against UDL principles. Thus, training teachers in UDL not only helps teachers link accessibility, content creation, and inclusive technologies but also provides a sound pedagogical model. The review also highlights that the advantages of training with a focus on UDL are not limited to a specific group of teachers or one mode of delivery, which further supports the idea of it being one of the main special education teacher development tools at different levels (Rusconi & Squillaci, 2023; Bagadood et al., 2025). A separate set of research looks at inclusive technologies and assistive technologies in general. One of the recent systematic reviews points out that the kinds of technologies employed for inclusive education are screen readers, braille devices, audio support, augmentative communication applications, adaptive software, and immersive tools such as augmented reality. Such technologies may help in opening opportunities, ensuring participation, stimulating interest, facilitating communication, and aiding the acquisition of academic and social skills. On the contrary, at several points, the literature warns that the advantages of such tools entail selection, contextual adaptation, and training of teachers. In a paper by Gonzalez and her team, it was underlined that, on the one hand, technologies are a way out, but on the other hand, they are a problem: although they may help in creating fairer and more motivating learning environments, their implementation is generally hindered by the cost factor, lack of proper teacher training, social inequalities, and policy gaps. This body of literature supports further the point that inclusive technology does not happen just because it is there; it needs teachers who know which tool suits which learner in which pedagogical condition (González et al., 2025; WHO & UNICEF, 2022).

International policy-oriented literature also highlights the importance of teacher training in digital media to support the educational case. The 2023 UNESCO Global Education Monitoring Report stresses that the integration of technology in education should be on fair, evidence-based, and educationally justified terms rather than only based on availability or market pressure. Its

interpretation of inclusion is that digital media needs to be tailored to the needs of learners and teacher capacity should be a decisive factor. According to UNICEF reports on disability and education, children with disabilities continue to be the most likely to be excluded from schools and lack of trained teachers, inadequate classroom support, and non-accessible facilities or learning materials are the main obstacles. These international documents are extremely valuable as they bring teacher training into a rights-based perspective: digital media becomes educationally meaningful only when teachers are equipped to use it in ways that promote access, equity, and participation of learners with disabilities (UNESCO, 2023; UNICEF, 2021). The literature from developing contexts, Pakistan included, reveals both a hope and some persistent implementation constraints. Thus, Kamran and Bano in their case study from Pakistan have found that assistive technology has the potential to greatly enhance the academic participation communication confidence, and inclusion of children with special educational needs. But they also pointed out that there were issues of accessibility, availability awareness, funding, and lack of expert knowledge in selecting the right technology for the right child. Greatly relevant to our topic here is the author's point that the successful use of assistive technology hinges on the understanding of the professionals, and not only on the procurement of the devices. This is in line with the wider literature which shows that teacher training must be more than just raising awareness about technologies. It must also cover skills in assessment selection adaptation, and instructional integration. According to the literature, digital inclusion in Pakistan and similar contexts is not only limited by lack of infrastructure but also by the absence of specialized teacher training (Kamran & Bano, 2024; Naz et al., 2024).

One of the main issues that keeps cropping up in recent research is that content creation is still a very neglected area, yet it is a vital part of teacher digital training. Research on digital accessibility and UDL reveals that teachers require hands-on skills in making accessible documents, presentations, worksheets videos multimedia materials, and online assessments. Among other things, these skills include captioning, all text writing, readable formatting, multimodal presentation of concepts, proper contrast and layout, and flexible response options for learners. However, most of the recent publications show that training programs are still mainly centered on the use of the platform or general ICT skills rather than on the art of producing accessible learning content. Since special education teachers usually alter materials much more intensively than general teachers, this deficiency is a major concern. The research therefore argues that content creation should be regarded as a fundamental competency area in teacher training, just as important as technical operation or pedagogical theory (Bong & Chen, 2024; Kang et al., 2024; Rusconi & Squillaci, 2023). Literature brings to the fore the role of teacher beliefs, confidence, and self-efficacy as a determinant of technology integration success. Teachers can still underuse technology even when the tools are there, if they do not feel that they are capable, they are supported, or that the use of technology can enhance learning. Professional development can improve digital self-efficacy and enhance teacher well-being, among other benefits, if it is well-planned, according to Shi et al. Likewise, UDL and inclusive education studies reveal that training changes not only skills but teacher's concept of learner diversity as well as their confidence to deal with it. This is a critical area in special education where teachers deal with complex learner profiles and may be under more pressure when technology is unfamiliar. The literature therefore suggests that training which is capable of effectively changing attitudes and thoughts of teachers should be alongside technology and pedagogy (Shi et al., 2025; Rusconi & Squillaci, 2023; Montalbano et al., 2024). Overall, the review of related literature indicates a solid and increasing agreement that training teachers in digital media is a must for special education, yet it also points to several issues that remain unresolved. One,

special education teachers need a specific set of digital skills that make up a combination of accessibility, content creation, assistive technology, and inclusive pedagogy. Two, even though the area of research is growing, it still lacks strong and context-specific training models, especially in low- and middle-income areas. Three, accessibility and inclusive content creation are still less practiced than theorized. Four, the research points out strongly that future studies should get away from broad statements on ICT readiness and focus on how teacher training can be systematically geared towards building practical competence for inclusive digital teaching. These are the main reasons why this study was done. It will try to analyze training of teachers in the use of digital media for special education by taking in the different perspectives of accessibility, content creation, and inclusive technologies (Utami et al., 2025; UNESCO, 2023; Kamran & Bano, 2024; González et al., 2025).

Research Methodology

Research Design

The research used quantitative research design. To gather numeric data from respondents to examine teachers training in digital media for special education, a descriptive survey method was used. The focus of the study was on accessibility, content creation, and inclusive technologies in digital media training for special education teachers. A quantitative approach was selected as it allowed the researcher to directly measure the variables, explore the relationships between them, and use statistical methods to generalize the results to the wider population. Moreover, this design made it possible to use well-structured instruments and standardize data collection methods, thus increasing the reliability and consistency of the findings.

Population of the Study

The target population for this research was all special education teachers who worked in both public and private special education institutions. These educators were the ones who regularly taught students with special educational needs and could have different experiences in using digital media and inclusive technologies. Also, the population consisted of teachers from various disability areas such as visual impairment, hearing impairment, intellectual disability, and physical disabilities.

Sample and Sampling Technique

Of the total number of special education teachers, a sample of 350 was taken. The sample size was found sufficient and capable of quantitative analysis and generalization of the results. To make sure that representatives from different types of special education institutions and different areas of disability were included in the sample, a stratified random sampling technique was used. The population was divided into different groups based on the type of institution (public and private) and the categories of disability. Then the participants were selected randomly from each group. This sampling method helped in minimizing sampling bias and at the same time ensured the study had proportionate representation from each subgroup.

Instrument Development

A series of questions was prepared by the researcher in the form of a structured questionnaire to extract information from the respondents. The questionnaire was made with the help of a thorough reading of related research on digital media accessibility, inclusive technologies, and teacher training in special education. This tool mainly included 2 parts: Demographic information and the major variables were accessibility skills, digital content creation skills, use

of inclusive technologies, etc. Participants responses were measured by a five-point Likert scale with 1 = strongly disagree and 5 = strongly agree. Besides having very few ambiguities, the questionnaire items were also relevant and completely in line with the study objectives.

Validity of the Research Instrument

The validity of the research instrument was ensured through an expert review (content validity). The questionnaire was shown to a panel of specialists in special education, instructional technology, and research methodology. They assessed the tool in terms of relevance, clarity, suitability, and consistency with the study goals. On their recommendation, the required alterations were implemented to enhance the quality of the items. This way, the instrument was verified to sufficiently encompass all elements of teacher training on the use of digital media for special education.

Reliability of the Research Instrument

The reliability of the instrument was measured through Cronbach's Alpha coefficient. A preliminary study was done with a small group of teachers (excluding from the main research) to check the internal consistency of the questionnaire. The coefficient of reliability (Cronbach's Alpha) came out to be 0.85, which reflected a high degree of internal consistency and reliability of the instrument. Hence, the instrument was deemed fit for data collection in the main research.

Data Collection Procedure

The data were collected primarily by means of a survey. The researcher not only personally visited the selected special education institutions but also through online platforms, the questionnaire was distributed to the respondents. Consent of the concerned officials of the institution was obtained before the start of the data collection. Next, the intent of the study was fully communicated to the participants and their consent was obtained. Participants were assured of secrecy, and their identification would be kept confidential. The researchers collected the filled questionnaires within a predetermined period to maximize the response rate.

Data Analysis Procedure

The collected data were analyzed using SPSS (a Statistical Package for Social Sciences). Descriptive statistics such as frequency percentage mean, and standard deviation were relied upon to summarize the data. Inferential statistics, such as t-test and ANOVA, were performed to test differences among groups, whereas correlation analysis was the statistical method chosen to investigate relationships among the variables. The research findings were displayed in the form of tables and figures for ease of understanding. A level of significance at 0.05 was used for testing the study's hypotheses.

Table 1: Demographic Characteristics of the Respondents (N = 350)

Variable	Category	f	%
Gender	Male	158	45.1
	Female	192	54.9
Age	20–30 years	82	23.4
	31–40 years	126	36.0
	41–50 years	91	26.0
	51 years and above	51	14.6

Variable	Category	f	%
Qualification	Bachelor	74	21.1
	Master	168	48.0
	MPhil	81	23.1
	PhD	27	7.7
Teaching Experience	1–5 years	96	27.4
	6–10 years	112	32.0
	11–15 years	83	23.7
	16 years and above	59	16.9
Institution Type	Public	204	58.3
	Private	146	41.7

Demographic Variables Frequency Percentage Gender Male 45. 1% Female 54. 9% Age (Years) 18-30 32. 0% 31-40 36. 0% Highest Qualification.

Table 2: Area of Specialization of the Respondents (N = 350)

Area of Specialization	f	%
Visual Impairment	61	17.4
Hearing Impairment	72	20.6
Intellectual Disability	108	30.9
Physical Disability	64	18.3
Others	45	12.9
Total	350	100.0

The data in the table show that there was the highest number of respondents, i.e. 108 (30.9%), who had a specialization in intellectual disability. Teachers in hearing impairment constituted 20.6% of the samples, whereas those in physical disability and visual impairment were 18.3% and 17.4%, respectively. The "other" category was the one with the smallest number of respondents - only 12.9%.

Table 3: Formal Training in Digital Media (N = 350)

Formal Training	f	%
Yes	213	60.9
No	137	39.1
Total	350	100.0

This table indicates 213 respondents, making up 60.9%, were formally trained in digital media. On the other hand, 137 respondents, which is 39.1%, revealed that they lack this kind of training. The findings show that even though most had formal training, quite a few teachers are still without organized professional development.

Table 4: Access to Digital Tools in the Institution (N = 350)

Access Level	f	%
Limited	89	25.4
Moderate	161	46.0
High	100	28.6
Total	350	100.0

The table indicates that 161 of the respondents (46.0%) reported having a moderate level of access to digital tools in their institutions. Another 100 respondents (28.6%) reported having a high level of access, whereas 89 respondents (25.4%) reported having limited access. The findings imply that moderate access was the norm, but complete access to digital resources was not prevalent across different institutions.

Table 5: Reliability of the Research Instrument

Scale	No. of Items	Cronbach's Alpha
Accessibility Skills	14	.88
Digital Content Creation Skills	13	.86
Inclusive Technologies	13	.89
Overall Instrument	40	.91

The reliability assessment revealed that each of the three subscales possessed very good internal consistency, as indicated by Cronbach's alpha values between .86 and .89. The total scale reached an alpha level of .91, which is considered outstanding reliability. Such scores highlight that the scale had very good coherence and was a good fit for the subsequent research.

Table 6: Descriptive Statistics for the Main Study Variables

Variable	N	M	SD
Accessibility Skills	350	3.89	0.61
Digital Content Creation Skills	350	3.76	0.65
Inclusive Technologies	350	3.71	0.68
Overall Digital Media Training	350	3.79	0.58

The table reveals that the greatest average score was for accessibility skills ($M=3.89$, $SD=0.61$), whereas digital content creation skills were the second highest ($M=3.76$, $SD=0.65$). Inclusive technologies got a somewhat lower mean value of 3.71. Overall, the participants showed a reasonably pleasant attitude towards teacher training in digital media in special education.

Table 7: Independent-Samples *t*-Test for Overall Digital Media Training Scores by Demographic Variables

Demographic Variable	Category	n	M	SD	t	df	p
Gender	Male	158	3.72	0.56	-2.31	348	.021
	Female	192	3.85	0.59			
Institution Type	Public	204	3.83	0.57	1.98	348	.049
	Private	146	3.71	0.60			
Formal Training in Digital Media	Yes	213	3.94	0.52	6.84	348	< .001
	No	137	3.56	0.59			

The merged table shows the independent-samples test results for overall digital media training scores across gender, institution type, and formal training status. Significant differences were found for all three demographic variables, as the *p* values were below .05. Female teachers, public institution teachers, and teachers who had received formal training in digital media reported higher mean scores than their comparison groups.

Table 8: One-Way ANOVA for Overall Digital Media Training Scores by Demographic Variables

Demographic Variable	Category	n	M	SD	SS Between	df Between	MS Between	F	p
Age	20–30 years	82	3.88	0.57	2.87	3	0.96	2.81	.040
	31–40 years	126	3.84	0.56					
	41–50 years	91	3.73	0.61					
	51 years and above	51	3.61	0.63					
Qualification	Bachelor	74	3.62	0.63	4.95	3	1.65	5.12	.002
	Master	168	3.78	0.56					
	MPhil	81	3.91	0.52					
	PhD	27	4.02	0.49					
Teaching Experience	1–5 years	96	3.92	0.55	5.31	3	1.77	5.46	.001
	6–10 years	112	3.84	0.56					
	11–15 years	83	3.71	0.60					
	16 years and above	59	3.58	0.64					
Area of Specialization	Visual Impairment	61	3.87	0.58	1.21	4	0.30	0.89	.470
	Hearing Impairment	72	3.79	0.60					
	Intellectual Disability	108	3.74	0.57					
	Physical	64	3.69	0.61					

Demographic Variable	Category	n	M	SD	SS Between	df Between	MS Between	F	p
	Disability								
	Others	45	3.82	0.56					

Note. For age, qualification, and teaching experience, *df* within = 346. For area of specialization, *df* within = 345.

The merged ANOVA table shows that significant differences existed in overall digital media training scores across age, qualification, and teaching experience, as their *p* values were below .05. Respondents with higher qualifications and fewer years of experience reported relatively higher mean scores, while younger teachers also showed somewhat stronger digital media training perceptions. However, no significant difference was found across areas of specialization, indicating that teachers from different special education categories reported similar levels of digital media training.

Table 9: Correlation Matrix Among the Main Variables

Variable	1	2	3	4
1. Accessibility Skills	—			
2. Digital Content Creation Skills	.68**	—		
3. Inclusive Technologies	.72**	.70**	—	
4. Overall Digital Media Training	.88**	.86**	.90**	—

The correlation matrix shows strong positive relationships among accessibility skills, digital content creation skills, inclusive technologies, and overall digital media training. The highest correlation was observed between inclusive technologies and overall digital media training ($r = .90, p < .01$). These findings indicate that improvements in one aspect of digital media training were positively associated with improvements in the other dimensions.

Findings

The study found that special education teachers reported a moderately positive level of competence in digital media for special education, with relatively stronger scores in accessibility skills and comparatively lower, though still positive, scores in digital content creation and the use of inclusive technologies. The descriptive pattern indicated that teachers recognized the basic components of accessibility only, whereas their knowledge of advanced digital design and assistive or adaptive technology integration was limited. This is consistent with recent research that teachers sometimes acquire digital skills only partially; meanwhile, highly specialized proficiency in accessibility and inclusive technology continues to be distributed unevenly across different settings of practice.

The demographic study showed that the sample included a mix of men and women of different ages qualifications teaching experiences, institution types, and specializations. However, the inferential findings revealed that these categorical variables didn't play the same role in differences in digital media training outcomes. Specifically, marked distinctions were recorded for gender, type of institution, and above all formal training in digital media, pointing out that teachers who had undergone a program of training experienced stronger beliefs of competence

than those who had not. This is in line with recent research that has found specific professional development programs increase teacher competence, confidence, and classroom readiness for inclusive digital pedagogy.

The one-way ANOVA findings also revealed that there were considerable variations between teachers because of their age, qualification, and teaching experience. Generally, younger teachers, teachers with higher academic qualifications, and teachers with fewer years of experience reported higher digital media training scores than their respective groups. These results indicated that the latest professional preparation, familiarity with current educational technologies, and advanced academic participation might be some of the factors that influence teacher's digital readiness. Similarly, existing studies have stated that technology-focused teacher development is most effective when professional learning is recent, well-organized, and integrated with pedagogy rather than just the use of devices or software.

Results also revealed that specialization area didn't cause a statistically significant variation in the digital media training scores overall. This means that even though a teacher's specialization was in different disability categories, their level of accessibility, content creation, and inclusive technologies preparation were generally similar. This is logical since the primary concern seems to be teacher preparation rather than isolation due to specialization. International studies have also shown that the biggest issue is not the specific disability category, but the availability of regular and focused training in inclusive digital practices at institutions.

The reliability analysis demonstrated that the instrument had strong internal consistency, supporting the trustworthiness of the responses obtained through the questionnaire. The correlation analysis further indicated strong positive relationships among accessibility skills, digital content creation skills, inclusive technologies, and overall digital media training. This suggested that improvement in one domain was likely associated with improvement in the others, reinforcing the view that these dimensions function as interconnected rather than isolated competencies. Recent systematic and empirical studies similarly describe digital competence in special and inclusive education as multidimensional and mutually reinforcing across pedagogy, accessibility, and technology use.

Discussion

The study results, in line with other reports, show that special education teachers need more than just general ICT literacy; they need targeted digital competence. The positive scores in this research implied that the participants were somewhat prepared for using digital media however the differences among the variables related to training indicated that such competence was quite random and depended on the availability of training. This result was exactly what Utami et al. (2025) highlighted, that special education-specific digital competence programs are very limited and that a lot of current initiatives do not properly deal with the realities of inclusive classrooms. Therefore, digital media competence, as is confirmed by this research, in special education should be acquired through well-focused and context-based training instead of just general exposure to technology (Ashfaq et al., 2024; Utami et al., 2025).

One of the educational strategies that can significantly change a country's development path is the reform of teachers. Consequently, these results can contribute to the country's educational reform as well as to the teachers' professional development, aiming to encourage effective teaching. Professional teacher development is a kind of education that teachers undergo other

than initial qualification training to improve their skills and expertise in their area of work. Usually, it means a series of activities carried out by a school or a community of schools or a teachers' professional association for a group of teachers, aimed at supporting and increasing teachers' professional effectiveness and leadership at different levels. Teacher professional development (TPD) programs attempt to provide teachers with knowledge and teaching skills through a variety of activities. Over the last few years, technology has increasingly been introduced into teacher professional development programs. Many studies highlight the importance of providing teachers with opportunities to acquire knowledge and skills in ICT to increase their confidence and improve the quality of teaching and learning (Alghamdi, 2016; Askari & Tan, 2015; Staudt Willet et al., 2016).

The observation that younger and less experienced teachers indicated relatively higher digital media competencies could be because teacher education has been changing and the exposure to educational technologies has been increasing over the years. Teachers who have just entered the profession are more likely to have experienced a variety of digital tools during their training and early teaching days, especially with the increase in online and blended learning after the pandemic. Zhang et al. (2024) confirmed this understanding by stating that the quick digital transition after the COVID-19 era had brought about a great demand for teacher training and at the same time made the availability of up-to-date professional development even more important. Therefore, in this study, the more recent use of digital learning methods is likely to account for the better performances of younger and less experienced teachers rather than any inherent abilities (Zhang et al., 2024; Iftikhar et al., 2024).

The fact that there were no significant differences by area of specialization implied that digital preparedness remained a challenge in every field of special education. This implied that accessibility, content creation, and inclusive technologies were not tied to any one category of disability but had to be professional competencies for all special education teachers. This interpretation was in harmony with UNESCO (2023), which argued that technology only becomes inclusive when it is based on fair design, pedagogical relevance, and teacher readiness in all learning contexts. Therefore, the results indicated that digital teacher training should be considered as an overall professional goal for special education rather than a specific intervention by specialization (UNESCO, 2023).

The positive relations between accessibility, content creation, and inclusive technologies were not only statistically significant but also made sense theoretically. Such results implied that enhancing one aspect of digital competence could lead to the improvement of others. To illustrate, a teacher who grasped the concept of accessibility would naturally be inclined to develop digital content that was her/his first step toward the creation of an inclusive digital environment. The same teacher, deeply involved in content creation, would most probably be very efficient in locating and using inclusive technologies. In fact, this is what Utami et al. (2025) revealed through their research when explaining digital competence in special education as a set of interrelated dimensions rather than separate technical skills. Consequently, this paper strengthens the position that accessibility, content creation, and the use of inclusive technologies may well be the object of joint consideration in teacher education and professional development programs (Utami et al., 2025; Amjad, & Aslam, 2025).

All in all, the debate pointed out that the current research aligned with modern international studies revealing that teachers in special education were being demanded more often to operate

in digitally mediated environments, whereas the quality of such work hinged largely on well-designed capacity-building. UNESCO (2023) brought to the forefront that using technology in education should be in conditions that are equitable, backed by evidence, and educationally justified. Against this backdrop, the current research has added to the body of literature by highlighting that accessibility, content creation, and inclusive technologies should be regarded as the main pillars of teacher training. As a result, this will not only enhance inclusive teaching practices but also lead to the increased educational participation of learners with special needs in digitally changing classrooms (UNESCO, 2023; Tariq et al., 2025).

Conclusion

The research found that training teachers in digital media targeted at special needs would be a key factor in improving inclusive education practice. While the participants revealed a tendency towards the positive side in terms of accessibility, content production, and technology for inclusiveness, the data indicated that skills were not at a consistently high level and that significant gaps, especially lack of limited training, still existed. Consequently, the findings pointed out that digital inclusion in special education was a matter of not only having the right tools but also organizing the teachers' professional development in deploying such tools efficiently and in an inclusive way.

The study also showed that formal professional development training was the strongest factor for better digital media competence. Those teachers who went through systematic training were the ones who figured out how to make things accessible, produce appropriate digital materials, and use inclusive technologies during instruction. This agrees with the findings that teachers' skills in technology for special education are not developed only through teaching experience but also need deliberate professional learning in a planned way.

It was also implied that the skillful use of digital media in special education is a single medium of professional competence comprising knowledge of accessibility, ability to create content, and purposeful use of inclusive technologies. Since these fields are so interlinked, pre-service and in-service teacher education programs should consider the whole set of skills instead of focusing on them separately. A disintegrated approach to training is not as effective in achieving inclusive classroom outcomes as a combined model that connects teaching, technology, and disability-responsive practice.

Recommendations

1. It seems to me that digital media training for special education is a very important component of teacher education programs that should not be overlooked. In fact, I think it should include an emphasis on accessibility, content creation, and inclusive technologies as well. It seems to me that this would be the most effective way of developing the professional competence of teachers.
2. Perhaps one way to keep teachers up to date is for institutions to organize regular workshops and training sessions. The best option, I believe, is to base the teacher training programs around practical digital skills.
3. Schools should offer digital tools, assistive devices, and technical support. Sufficient resources are a must for proper implementation. Such implementation will help facilitate inclusive teaching methods.

4. Training curricula must cover not only accessibility, content creation, and inclusive technologies but also their interrelations in practice. These aspects are inseparable. A unified strategy would raise overall digital skills
5. More research is needed in different contexts and with bigger samples. Besides, mixed methods or experimental designs can also be adopted, by future research, to obtain more compelling evidence of the improvement.

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