Inclusive Education in the Digital Era: Special Education Teachers' Perspectives on Technology Integration and Inclusive Practices

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The European Conference on Education 2024
Official Conference Proceedings

Abstract
As innovative technologies continue to permeate educational settings as useful tools to enhance the learning experience, understanding the perceptions of teachers is crucial. Assistive technologies show promise in supporting diverse learners, and special educational needs (SEN) teachers are pertinent in ensuring the meaningful, directional use of such technologies. Existing research emphasises the importance of users feeling comfortable with the innovative technologies in order to effectively utilise them. Therefore, it is important to understand potential barriers to technology integration through the lens of trainee SEN teachers. With new technologies emerging as valuable tools for inclusive learning, we aim to explore the relationship between technological competence and attitudes toward inclusive education. To gain deeper insights, we investigate the perspectives of Italian students enrolled in the specialisation course for support activities, recognising the pivotal role of educators and future educator's voices. Utilising a quantitative, questionnaire-based, correlational design, the present study examines the Technological Pedagogical and Content Knowledge (TPACK, Mishra & Koehler, 2006) of SEN teachers in relation to their Sentiments, Attitudes, and Concerns about Inclusive Education (SACIE-R, Forlin et al., 2011). Grounded in a critical disability studies framework, the research aims to understand the socio-cultural, ethical and pedagogical implications of incorporating technologies into educational settings through the lens of SEN educators. Our findings contribute to understanding teachers' readiness to embrace innovative technologies in relation to their inclusive practice, offering valuable implications for teacher training programs, curriculum development, and the design of assistive technologies tailored to meet the diverse needs of students.

Keywords: Inclusive Education, Innovative Technology, TPACK, SACIE-R, Correlation, Questionnaire

1. Introduction

Innovative assistive technologies (AT) increasingly permeate educational settings, offering valuable tools to enhance learning experiences, particularly in inclusive classrooms where the aim is to create safe and supportive environments for all students to participate and learn (Méndez et al., 2022). However, a gap remains in understanding how these technologies are effectively utilized by teachers, especially those working with special educational needs (SEN) students. Effective use of assistive technologies (AT) depends significantly on teachers' training and competence in navigating these new digital environments. Inadequate training often leads to the underuse or misuse of AT, which highlights the critical role of teachers in implementing these tools meaningfully (Pérez, 2014).

ATs have the potential to greatly benefit diverse student populations, however, teachers' comfort and competence are critical factors in their success. Many trainee SEN teachers face challenges in adopting these tools due to limited technological knowledge (Anderson & Putman, 2020), or practical concerns regarding implementation (Ellis, 2008). This study addresses the need to explore the relationship between SEN teachers' technological, pedagogical, and content knowledge (TPACK) (Mishra & Koehler, 2006) and their sentiments, attitudes, and concerns regarding inclusive education, measured by the Sentiments, Attitudes, and Concerns about Inclusive Education Revised (SACIE-R) (Forlin et al., 2011) scale.

Focusing on trainee SEN teachers in Italy, this research examines how TPACK intersects with attitudes towards inclusive education. The study employs a quantitative, correlational research design grounded in a critical disability studies framework highlighting the ethical dimensions of technology's role in shaping inclusive educational environments. By identifying relationships between TPACK and SACIE-R, the study aims to inform SEN teacher training programmes, curriculum development, and training for the effective and thoughtful use of ATs that align with the needs of future SEN educators.

This paper is organized into several sections: a literature review detailing an overview of the existing body of research and theoretical frameworks, a methodology section outlining the research design, sample, measures and data collection and analysis procedures, a presentation of the key findings, and a discussion understanding these results in the context of the existing literature. The conclusion provides insights and recommendations for practice, policy, and future research. This study is particularly relevant to the Italian context, where historical and ongoing efforts to integrate students with disabilities into mainstream education highlight the importance of revising school systems to incorporate innovative approaches (Marsili et al., 2021). By exploring the relationship between technological competence and attitudes towards inclusion, we offer guidance for professional development programmes and supporting diverse student needs.

2. Literature Review

Inclusive Education and Technology Integration

Inclusive education has significantly evolved in recent years, with an increasing recognition that inclusion is more than solely physical integration of students with disabilities into mainstream classrooms, instead true inclusive classrooms include social inclusion, agency, and meaningful participation (Francisco et al., 2020). According to Hoogerwerf et al. (2021),

inclusive education encompasses "how we develop and design schools, classrooms, programmes, and activities so that all students can learn and participate together" (p.1, 2021).

ATs are central to the success of inclusive education and have been identified as critical tools for achieving truly inclusive pedagogy (Yaskevich, 2021). These technologies are designed to empower students with disabilities to fully participate in educational settings. Assistive technologies encompass a wide range of devices, from established tools like screen reading assists and hearing aids to more advanced solutions like interactive learning platforms and communication aids. In recent years, the development of innovative ATs has further extended the possibilities for inclusive education (Karagianni & Drigas, 2023). Examples of these developments include; Online Inclusion Schools, which leverage digital platforms to create accessible learning environments for all students (Nurdyansyah et al., 2022), wearable technologies inclusive of smartwatches, augmented reality (AR) (Cascales Martínez et al., 2016), biosensors for physiological markers (Palermo et al., 2023), as well as integrated augmentative manipulation and communication assistive technologies (IAMCATs) (Encarnação et al., 2017) which offer new ways for students with disabilities to engage with educational content.

The integration of these innovative technologies into educational settings not only enhances the learning experience for students with disabilities but also promotes a more inclusive approach to education that benefits all learners. By reducing barriers to participation and creating more equitable learning opportunities, assistive technologies play a vital role in the ongoing evolution of truly inclusive learning.

Teachers' Perspectives on Technology Integration

A key concept arising from previous research is the role of SEN teachers in reinforcing inclusiveness using educational technologies. Their ability to design and implement inclusive practices, supported by technology, is critical in fostering an environment where all students can thrive. Teachers, as the primary facilitators of learning, play a pivotal role in determining if and how effectively these tools are utilized within the classroom. In the context of SEN settings, where the diversity of student needs requires tailored approaches, the effective use of technology can be transformative. Though attitudes of SEN teachers towards technology for inclusive education have been cited as generally positive (Mohamed, 2018), several studies have identified barriers to technology integration.

Teachers' confidence in using technology has long been cited as an influencing factor for their readiness to introduce new technologies, with anxiety (Henderson & Corry, 2021) and risk-aversion (Howard, 2013) identified as significant barriers. Within the context of SEN teachers, researchers exploring knowledge and confidence in using ATs with students with disabilities found that time spent in college programmes and AT training programmes was positively related to teachers' confidence levels in using these technologies (Alghamdi, 2021). Echoing this, Nordström et al. (2019) report in their study of SEN teacher perspectives of AT for students with reading difficulties that extensive training and support is needed (Nordström et al., 2019). This highlights the importance of training and experience in fostering teacher confidence, which is crucial for successful technology integration (Adamy & Boulmetis, 2006; Ertmer & Ottenbreit-Leftwich, 2010).

Another study revealed a significant relationship between teachers' attitudes toward online teaching and technological proficiency (Alieto et al., 2024). The researchers also found a

significant gender disparity in attitudes and competency with educational technologies. These findings further highlight not only the importance of competencies with technology in their willingness to use assistive technologies to create inclusive environments but also has implications for training programmes regarding gender-based considerations. Siyam (2019) used the Technology Acceptance Model (TAM) to explore influencing factors of SEN teachers' actual use of technology and found self-efficacy as well as access to technology to be significant influencing factors (Siyam, 2019).

In a case study of 18 elementary school teachers' opinions of obstacles within the implementation of new technologies, Kopcha (2012) identified that situated learning activities empowered teachers with knowledge and support that enabled them to utilise the technologies more effectively. Masterman (2023) echoed the need for educator preparedness, underscoring the need to hire technology integration specialists to support educators, with national and state legislative support, to ensure maintainable technology integration. This reinforces the idea that technological competence and confidence among teachers is not just a technical skill but an imperative component of sustainable inclusive pedagogy.

Critical Disability Studies Framework

Critical disability studies provide a valuable framework for understanding the barriers and challenges associated with integrating ATs into educational settings. A key consideration in the meaningful integration of ATs is the need for a collaborative approach that emphasizes empowerment and participation. This approach, often described as "doing with" rather than "doing to" individuals with disabilities, ensures that the use of ATs genuinely supports the needs and autonomy of disabled students (Mankoff et al., 2010; Williams & Gilbert, 2020).

Teacher preparedness, which was previously discussed in this article, is not only relevant in the context of practical skills implementing ATs, but also extends to the ethical and safe use of these technologies. Beardsley et al. (2019) in a study of two high schools identified that teachers had not received formal training in responsible data management. This lack of training can hinder not only the effective use of technology but also its safe application, raising concerns about the protection of student data and overall ethical considerations.

Italian Context and Research Gaps

Looking towards the Italian educational context in which our study took place, though Italy has historically been recognized for its progressive approach to mainstreaming students with disabilities (Aiello & Pace, 2020), there have been obstacles in fully aligning with international legislative standards for inclusive education. Recent studies have highlighted the need for revisions in the school system to incorporate innovative approaches and better meet these criteria (Marsili et al., 2021). It has been found that the attitudes of both mainstream and SEN teachers in Italy play a crucial role in the successful inclusion of students with disabilities in schools (Arcangeli et al, 2020), further highlighting the significance of exploration within an Italian context.

Despite the growing body of research on inclusive education, there is still limited exploration of the relationship between the Sentiments, Attitudes, and Concerns about Inclusive Education Revised (SACIE-R) scale and the Technological Pedagogical Content Knowledge (TPACK) framework. The present study aims to address this gap by contributing valuable insights from the perspectives of trainee SEN teachers in Italy, specifically examining how

their TPACK competencies influence their attitudes toward inclusive education. By doing so, this research not only enriches the existing literature but also offers a unique perspective on the integration of technology in fostering inclusivity within Italian schools.

Research Questions

1. Is there a positive correlation between overall TPACK scores and overall SACIE-R scores among trainee SEN teachers?
2. Does technological competence correlate with more positive attitudes, sentiments, and concerns towards inclusive education?
3. What are the relationships between the domains of TPACK and the subscales of SACIE-R?
4. Which specific domains of TPACK (e.g., Technological Knowledge, Content Knowledge) are most strongly correlated with specific aspects of SACIE-R (e.g., sentiments towards students with disabilities, attitudes towards inclusive education)?

3. Methodology

Research Design

This study employed a quantitative, questionnaire-based methodology with data collected online over a period of approximately two months between May and June 2024 using Google Forms. The research design is exploratory, utilizing Spearman's Rho correlational analysis to investigate the relationships between variables.

Sample

A convenience, non-random sampling method was used to select participants, targeting students enrolled in a specialization course for support activities at the University of Palermo, Italy. Participation was voluntary, and consent was gained in order to process the results. After data cleaning, the total sample consisted of 1723 students, with ages ranging from 22 to 63 years (M = 40, SD = 8.8). The sample included both in-service and pre-service teachers with varying levels of experience teaching students with disabilities, ranging from no experience to more than five years, distribution shown in Figure 1. The gender distribution was 85.43% female and 14.45% male.
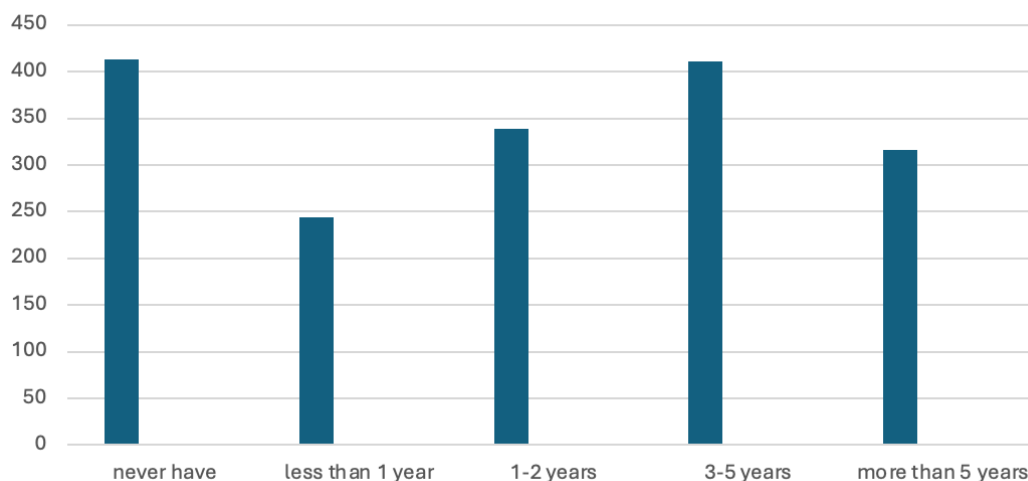

Figure 1: Distribution of participants' years' experience teaching students with disabilities.

Measures

The Sentiments, Attitudes, and Concerns About Inclusive Education-Revised (SACIE-R) Scale (Forlin, Earle, Loreman & Sharma, 2011)

The Sentiments, Attitudes, and Concerns about Inclusive Education-Revised (SACIE-R) scale (Forlin et al., 2011) was used to measure participants' sentiments towards people with disabilities, attitudes towards inclusive education, and concerns regarding inclusive education. The scale consists of 15 items, divided into three sub-scales, each rated on a 4-point Likert scale (1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree), with total scores (of both total overall and subscale scores) calculated by averaging items. The Sentiments subscale addresses feelings towards individuals with disabilities, including items such as 'I am afraid to look directly at a person with a disability' and 'I dread the thought that I could eventually end up with a disability'. The Attitudes subscale assesses attitudes towards the inclusion of students with disabilities in regular classes, with items such as 'Students who need an individualized academic program should be in regular classes' and 'Students who require communicative technologies should be in regular classes'. The Concerns subscale evaluates apprehensions about the inclusion of students with disabilities in mainstream classrooms, featuring items such as 'I am concerned that I will be more stressed if I have students with disabilities in my class' and 'I am concerned that students with disabilities will not be accepted by the rest of the class'.

The SACIE-R has been validated with 542 pre-service teachers from Hong Kong, Canada, India and United States (Forlin et al., 2011). The authors reported acceptable internal consistency coefficients of $\alpha = .75$ for the total scale, $\alpha = .75$ for sentiments, $\alpha = .67$ for attitudes, and $\alpha = .65$ for concerns. In the current study, internal consistency coefficients were found to be high, Table 1 includes the Cronbach's alpha values from the present study, along with descriptive statistics for the total scale, and subscales. The Italian translation of the questionnaire was provided by the original author.

Technological, Pedagogical, and Content Knowledge (TPACK) Model (Koehler & Mishra, 2005; 2006)

The Technological, Pedagogical and Content Knowledge (TPACK) model (Koehler & Mishra, 2005; 2006) was used to assess participants' knowledge in integrating technology into their teaching. The survey was composed of the translated and adapted instrument that was developed and validated by Schmidt et al. (2009), inclusive of the 7 dimensions of the TPACK model (Technological Knowledge, Content Knowledge, Pedagogical Knowledge, Technological Pedagogical Knowledge, Technological Content Knowledge, Pedagogical Content Knowledge, and Technological Pedagogical Content Knowledge) (Mishra & Koehler, 2006; 2009). The survey consisted of a total of 49 items based on a 5-point Likert scale which allows for a self-assessment of participants' competencies and knowledge in relation to each of the 7 domains. Scores for each subdomain as well as the overall total were calculated by averaging items.

The TPACK framework is recognized as a critical foundation for the professional development of educators, including in higher education settings (La Marca et al., 2018). The model illustrates the interplay between three key knowledge domains: Content Knowledge (CK), which encompasses understanding the subject matter; Pedagogical Knowledge (PK), which refers to knowledge of teaching and learning strategies; and Technological Knowledge

(TK), which involves familiarity with relevant technologies. The interaction of these domains generates four complex components: Pedagogical Content Knowledge (PCK), which involves the integration of appropriate teaching methods with specific subject content; Technological Content Knowledge (TCK), which focuses on selecting the most suitable technologies for teaching a given subject; Technological Pedagogical Knowledge (TPK), which examines the influence of technology on teaching and learning processes; and finally Technological Pedagogical Content Knowledge (TPCK), which represents a nuanced understanding of how these domains interact and the ability to apply this expertise in various educational contexts.

The total TPACK demonstrated high internal consistency in this study, with a coefficient of α = .982. Cronbach's coefficients for the 7 domains were also high, demonstrated in Table 2 alongside descriptive statistics for the total overall TPACK, and each domain.

Dimension	No. Of Items	N	Mean	Standard Deviation	Minimum	Maximum*	Cronbach's alpha
Sentiments	5	1723	3.49	0.472	1.00	4.00	0.725
Attitudes	5	1723	3.64	0.454	1.00	4.00	0.820
Concerns	5	1723	3.29	0.499	1.00	4.00	0.736
Total scale	15	1723	3.47	0.365	1.87	4.00	0.834

Theoretical minimum and maximum values for all domains and the total scale are 1 and 4, respectively.

Table 1: Descriptive statistics and internal consistency of SACIE-R and subscales.

Dimension	No. Of Items	N	Mean	Standard Deviation	Minimum	Maximum*	Cronbach's alpha
TK	22	1723	3.72	0.696	1.73	5.00	0.967
CK	6	1723	3.94	0.679	1.83	5.00	0.923
PK	6	1723	3.93	0.688	1.50	5.00	0.952
PCK	3	1723	3.87	0.738	2.00	5.00	0.942
TCK	3	1723	3.87	0.772	1.33	5.00	0.931
TPK	5	1723	3.98	0.708	2.00	5.00	0.932
TPCK	4	1723	3.84	0.744	1.75	5.00	0.934
Total	49	1723	3.83	0.622	1.88	5.00	0.982

Theoretical minimum and maximum values for all domains and total TPACK are 1 and 5, respectively.

Table 2: Descriptive statistics and internal consistency of TPACK and subdomains.

Data Analysis

Statistical analysis was conducted using Jamovi 2.2.5, focusing on correlational analysis to investigate the relationships between the domains of TPACK and SACIE-R. This approach enabled an examination of the correlation between participants' technological, pedagogical, and content knowledge, and their sentiments, attitudes, and concerns regarding inclusive education. After data collection, the raw data underwent preparation, which included handling missing values and reverse scoring certain items in the SACIE-R due to negative coding. Assumption checks for correlational analysis were then conducted. Scatterplots indicated a positive relationship between the two variables, thus meeting the assumption of linearity. Given that responses on both instruments were based on Likert scales and thus treated as ordinal, Q-Q plots were used to assess normality. The plots confirmed a violation of the normality assumption, therefore the non-parametric alternative, Spearman's rho test was used. Cohen's guideline was used to interpret the strength of the correlation coefficient (Cohen, 1988, 1992), with .10 to .29 considered small, .30 to .49 considered moderate, and .50 to 1.0 considered large.

4. Findings

The study examined the relationship between perceived technological, pedagogical and content knowledge and sentiments, attitudes and concerns towards inclusive education. Relationships between the total combined TPACK and SACIE-R scales as well as the subscales and subdomains were evaluated using Spearman's rho correlation. The correlation analysis, as shown in Table 3, revealed statistically significant, small to moderate strength correlations between all domains and subscales. There was a significant positive correlation ($r = .26$, $p < .001$) between overall TPACK scores and overall SACIE-R scores, indicating that as participants' perceived competence in TPACK increases, so do their positive sentiments, attitudes, and confidence in supporting inclusive education. Additionally, small to moderate correlations were observed between specific TPACK domains and the SACIE-R subscales, which further highlights the integral role of TPACK in shaping teachers' approaches toward inclusivity.

Technological Knowledge (TK), which refers to the teachers' ability to use technology effectively, was positively correlated with all domains of the SACIE-R. Specifically, TK was significantly correlated with sentiments towards people with disabilities ($r = .11$, $p < .001$), attitudes towards the inclusion of students with disabilities in mainstream classrooms ($r = .19$, $p < .001$), and concerns about the challenges of including students with disabilities ($r = .11$, $p < .001$). Though the correlations are small in strength, the statistical significance of these findings provides evidence that teachers with higher technological knowledge tend to have more positive sentiments and attitudes towards inclusive education, while being less concerned about the challenges it might present.

Similarly, Technological Content Knowledge (TCK), which represents the intersection of technology and content knowledge, also showed significant correlations with all SACIE-R domains. The correlations were observed in the overall scale ($r = .25$, $p < .001$) as well as sentiments ($r = .14$, $p < .001$), attitudes ($r = .25$, $p < .001$), and concerns ($r = .20$, $p < .001$). This indicates that teachers with a strong understanding of how technology can enhance content delivery are more likely to support the inclusion of students with disabilities in their classrooms.

Technological Pedagogical Knowledge (TPK), which involves understanding how technology affects teaching methods and learning processes, was also significantly correlated with the overall SACIE-R domains. TPK was significantly associated with sentiments ($r = .17$, $p < .001$), attitudes ($r = .27$, $p < .001$), and concerns ($r = .21$, $p < .001$). These findings emphasize that teachers who are knowledgeable about the pedagogical implications of using technology are more inclined to have more positive attitudes towards inclusive education and are better equipped to address concerns related to the inclusion of students with disabilities.

The strongest correlation was between the total SACIE-R scores and Pedagogical Content Knowledge (PCK) ($r = .30$, $p < .001$), which indicates that teachers who are proficient in aligning their teaching strategies with the content they teach are likely to have more positive sentiments, attitudes, and fewer concerns regarding inclusive education. This indicates that a more inclusive learning environment is related to the adaptability of teachers.

In summary, the findings clearly demonstrate the importance of TPACK in shaping teachers' attitudes toward inclusive education. As teachers' knowledge and confidence in integrating technology with pedagogy and content increase, so does their readiness and positive

disposition towards inclusive practices. These results suggest that enhancing TPACK among educators is crucial for fostering inclusive educational environments.

		Sentiments	Attitudes	Concerns	Total
TK	Spearman's rho	0.113	0.188	0.108	0.174
	p-value	<.001	<.001	<.001	<.001
CK	Spearman's rho	0.161	0.242	0.207	0.257
	p-value	<.001	<.001	<.001	<.001
PK	Spearman's rho	0.159	0.284	0.240	0.288
	p-value	<.001	<.001	<.001	<.001
PCK	Spearman's rho	0.184	0.270	0.253	0.300
	p-value	<.001	<.001	<.001	<.001
TCK	Spearman's rho	0.144	0.246	0.201	0.254
	p-value	<.001	<.001	<.001	<.001
TPK	Spearman's rho	0.165	0.274	0.206	0.274
	p-value	<.001	<.001	<.001	<.001
TPCK	Spearman's rho	0.154	0.270	0.204	0.265
	p-value	<.001	<.001	<.001	<.001
Total	Spearman's rho	0.158	0.262	0.192	0.260
	p-value	<.001	<.001	<.001	<.001

Table 3: Spearman's rho correlation matrix.

5. Discussion

These results show that the trainee SEN teachers' technological, pedagogical, and content knowledge are related to their sentiments, attitudes and concerns regarding inclusive education. Thus, indicating that SEN teachers with greater knowledge and confidence in integrating technology into their teaching are more likely to hold positive dispositions towards inclusive education. Our findings build upon the existing body of research that highlights the importance of technological aptitude as a core element of an inclusive classroom by demonstrating a relationship between this technological readiness, and their sentiments about engaging with people with disabilities, attitudes towards including learners with diverse needs in mainstream classrooms, and concerns about inclusive education.

The analysis revealed significant, positive correlations between the overall and all domains of teachers' Technological, Pedagogical, and Content Knowledge, and overall and all subscales of their Sentiments, Attitudes, and Concerns about Inclusive Education (SACIE-R). The comprehensive correlations found in this study highlight the critical importance of technological competence in fostering inclusive educational practice. Our results suggest the need for more robust TPACK training, with a focus on practical applications that demonstrate the successful integration of AT in classroom scenarios. Echoing previous research (Kopcha, 2012; Masterman, 2023; Nordström et al., 2019), ongoing support and resources are also crucial in helping teachers develop and maintain their technological skills. The largest correlation coefficient occurring between Pedagogical Content Knowledge (PCK) and overall SACIE-R scores suggests that improving teachers' PCK could be a key strategy in promoting positive attitudes toward inclusion. This could guide the focus of professional development programs, emphasizing the integration of effective teaching methods with content knowledge to enhance inclusivity in the classroom.

Empowering SEN teachers with the skills and confidence to effectively utilize innovative assistive technologies is essential. It is not just about having access to these technologies but understanding their potential as a means of inclusion when used meaningfully. The results from the present study support this. By highlighting the key role of the SEN teacher, we also provide supporting evidence for the need to involve teachers in the design and implementation phases of new and developing ATs, ensuring that these tools are not only usable but also genuinely effective in meeting the needs of diverse learners. Their voices should be integral, not only as they will be one of the main users, but also because their perspectives offer valuable insights into the practical challenges and successes of integrating AT in educational settings.

Considering the central role that SEN teachers play in meaningfully integrating assistive technologies, this study examined the perspectives of future SEN educators on technology integration within their inclusive practices. By exploring the relationship between these variables, the study provides evidence supporting the need for comprehensive training in the integration of innovative technologies, specifically in the Italian context. Teachers who can confidently and meaningfully use technology as a tool to enhance their teaching and support student learning are more likely to successfully integrate it within their inclusive classrooms. On the other hand, those who are uncertain or lack confidence in their technological skills may be hesitant to fully embrace these ever-developing advances.

Recommendations

While this study offers a deeper understanding of pre-service and in-service SEN teachers and their readiness to integrate innovative technologies in inclusive classrooms, several limitations must be acknowledged, which will also guide our recommendations for future research. Firstly, whilst the specific Italian context offers useful cultural insights, the generalisability of these results is also limited by the specific demographic focus of the sample, which may not reflect the experiences of educators in different cultural or educational contexts. Future studies involving participants from various regions or countries would enhance the external validity of findings. Also, the reliance on self-report measures introduces the possibility of bias, as participants may not accurately report their true sentiments, either inadvertently or due to social desirability bias. Triangulating data sources with observational methods to provide a more comprehensive understanding of teachers' perspectives would overcome this.

Though quantitative approaches allow for the identification of patterns, closed questionnaires do not allow for a deep, rich exploration of the concerns and experiences of teachers. Qualitative research using interviews or focus groups, should be used in future studies to gain a deeper understanding of the underlying perspectives of educators. This would also help to inform research regarding the ethical concerns teachers may have surrounding technology integration, which is essential for the exploration of how these devices can be used sustainably, safely, and ethically. Future research could also focus on an exploration of the relationships between demographic factors, levels of experience, and prior knowledge related to technology use. Understanding how these variables influence teachers' readiness and attitudes could inform more targeted interventions and professional development programs, ensuring that educators are adequately prepared to incorporate assistive technologies in diverse classroom settings.

6. Conclusion

This study sought to contribute to the existing body of research by exploring the perspectives of Italian SEN teachers on technology integration within their inclusive attitudes. By focusing on teachers enrolled on the specialisation course for support activities, the findings offer insights for curriculum development for the effective, meaningful use of ATs in SEN settings.

The present study has highlighted the position of SEN teachers as the central figures in implementing ATs within the classroom. It is essential to provide SEN teachers with adequate support and knowledge for them to effectively carry out their important role in implementing inclusive practices (Chow et al., 2023) From a critical disability studies perspective, and to move towards a collaborative approach to the use of assistive technologies, it is important to focus not only on the student living with a disability but also on the teacher as the focal point of the classroom and champions of inclusive learning. This study is part of a wider research project that explores the measure of teacher emotion through electrodermal activity using wearable technology. The project conceptualises that emotionally regulated teachers contribute to emotionally safe classrooms, fostering coregulation with students. The present study serves as a foundational step toward using wearable devices to measure teacher emotion by first assessing teachers' readiness to use assistive technologies within the context of their inclusive dispositions.

Acknowledgements

References

Adamy, P., & Boulmetis, J. (2006). The impact of modeling technology integration on pre-service teachers' technology confidence. *Journal of Computing in Higher Education*, *17*(2), 100–120. https://doi.org/10.1007/BF03032700

Aiello, P., & Pace, E. M. (2020). Inclusive Educational Principles, Policies, and Practices in Italy. In *Oxford Research Encyclopedia of Education*. https://doi.org/10.1093/acrefore/9780190264093.013.1282

Alieto, E., Abequibel-Encarnacion, B., Estigoy, E., Balasa, K., Eijansantos, A., & Torres-Toukoumidis, A. (2024). Teaching inside a digital classroom: A quantitative analysis of attitude, technological competence and access among teachers across subject disciplines. *Heliyon*, *10*(2), e24282. https://doi.org/10.1016/j.heliyon.2024.e24282

Anderson, S. E., & Putman, R. S. (2020). Special Education Teachers' Experience, Confidence, Beliefs, and Knowledge About Integrating Technology. *Journal of Special Education Technology*, *35*(1), 37–50. https://doi.org/10.1177/0162643419836409

Arcangeli, L., Bacherini, A., Gaggioli, C., Sannipoli, M., & Balboni, G. (2020). Attitudes of Mainstream and Special-Education Teachers toward Intellectual Disability in Italy: The Relevance of Being Teachers. *International Journal of Environmental Research and Public Health*, *17*(19), Article 19. https://doi.org/10.3390/ijerph17197325

Beardsley, M., Santos, P., Hernández-Leo, D., & Michos, K. (2019). Ethics in educational technology research: Informing participants on data sharing risks. *British Journal of Educational Technology*, *50*(3), 1019–1034. https://doi.org/10.1111/bjet.12781

Cascales Martínez, A., Martínez Segura, M. J., Pérez López, D., & Contero, M. (2016). *Using an Augmented Reality Enhanced Tabletop System to Promote Learning of Mathematics: A Case Study with Students with Special Educational Needs*. https://doi.org/10.12973/eurasia.2017.00621a

Chow, W. S. E., de Bruin, K., & Sharma, U. (2023). A scoping review of perceived support needs of teachers for implementing inclusive education. International Journal of Inclusive Education, 0(0), 1–20. https://doi.org/10.1080/13603116.2023.2244956

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Routledge. https://doi.org/10.4324/9780203771587

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

Ellis, J. B. (2008). *Special education teachers' perceptions of barriers to assistive technology integration in Ohio*. Library and Archives Canada = Bibliothèque et Archives Canada.

Encarnação, P., Leite, T., Nunes, C., Nunes da Ponte, M., Adams, K., Cook, A., Caiado, A., Pereira, J., Piedade, G., & Ribeiro, M. (2017). Using assistive robots to promote inclusive education. *Disability and Rehabilitation: Assistive Technology*, *12*(4), 352–372. https://doi.org/10.3109/17483107.2016.1167970

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher Technology Change: How Knowledge, Confidence, Beliefs, and Culture Intersect. *Journal of Research on Technology in Education*, *42*(3), 255–284. https://doi.org/10.1080/15391523.2010.10782551

Forlin, C., Earle, C., Loreman, T., & Sharma, U. (2011). The Sentiments, Attitudes, and Concerns about Inclusive Education Revised (SACIE-R) Scale for Measuring Pre-Service Teachers' Perceptions about Inclusion. *Exceptionality Education International*, *21*(3), Article 3. https://doi.org/10.5206/eei.v21i3.7682

Francisco, M. P. B., Hartman, M., & Wang, Y. (2020). Inclusion and Special Education. *Education Sciences*, *10*(9), Article 9. https://doi.org/10.3390/educsci10090238

Henderson, J., & Corry, M. (2021). Teacher anxiety and technology change: A review of the literature. *Technology, Pedagogy and Education*, *30*(4), 573–587. https://doi.org/10.1080/1475939X.2021.1931426

Hoogerwerf, E-J., Mavrou, K., Traina, I. (2021) The Role of Assistive Technology in Fostering Inclusive Education:Strategies and Tools to Support Change. Routledge Research in Special Educational Needs.

Howard, S. K. (2013). Risk-aversion: Understanding teachers' resistance to technology integration. *Technology, Pedagogy and Education*, *22*(3), 357–372. https://doi.org/10.1080/1475939X.2013.802995

Karagianni, E., & Drigas, A. (2023). New Technologies for Inclusive Learning for Students with Special Educational Needs. *International Journal of Online and Biomedical Engineering (iJOE)*, *19*, 4–21. https://doi.org/10.3991/ijoe.v19i05.36417

Kopcha, T. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers & Education*, *59*, 1109–1121. https://doi.org/10.1016/j.compedu.2012.05.014

La Marca, A., Gülbay, E., & Martino, V. D. (2018). Learning strategies, decision-making styles and conscious use of technologies in initial teacher education. *Form@re - Open Journal per la formazione in rete*, *18*(1), Article 1. https://doi.org/10.13128/formare-22617

Mankoff, J., Hayes, G. R., & Kasnitz, D. (2010). Disability studies as a source of critical inquiry for the field of assistive technology. *Proceedings of the 12th International ACM SIGACCESS Conference on Computers and Accessibility*, 3–10. https://doi.org/10.1145/1878803.1878807

Marsili, F., Morganti, A., & Signorelli, A. (2021). The Italian Leadership on Inclusive Education: Myth or Reality? *Science Insights Education Frontiers*, *9*(2), 1241–1263. https://doi.org/10.15354/sief.21.or048

Masterman, S. (2023). Educator Preparedness to Leverage Assistive Technologies in the Classroom. *Doctorate in Education*. https://digitalcommons.csp.edu/edd/44

Méndez, V. G., Suelves, D. M., Méndez, C. G., & Mas, J. A. R.-L. (2023). Future teachers facing the use of technology for inclusion: A view from the digital competence. *Education and Information Technologies*, *28*(8), 9305–9323. https://doi.org/10.1007/s10639-022-11105-5

Mishra, P., & Koehler, M.J. (2006). Technological Pedagogical Content Knowledge: A framework for integrating technology in teacher knowledge. Teachers College Record, 108(6), 1017–1054.

Mohamed, A. H. H. (2018). Attitudes of special education teachers towards using technology in inclusive classrooms: A mixed-methods study. *Journal of Research in Special Educational Needs*, *18*(4), 278–288. https://doi.org/10.1111/1471-3802.12411

Nordström, T., Nilsson, S., Gustafson, S., & Svensson, I. (2019). Assistive technology applications for students with reading difficulties: Special education teachers' experiences and perceptions. *Disability and Rehabilitation: Assistive Technology*, *14*(8), 798–808. https://doi.org/10.1080/17483107.2018.1499142

Nurdyansyah, N., Arifin, M. B. U. B., Astutik, I. R. I., & Rais, P. (2022). Online Inclusive School: A Technological Breakthrough in Inclusive Education During the Covid-19 Period. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, *8*(4), 806–816. https://doi.org/10.33394/jk.v8i4.5995

Palermo, E. H., Young, A. V., Deswert, S., Brown, A., Goldberg, M., Sultanik, E., Tan, J., Mazefsky, C. A., Brookman-Frazee, L., McPartland, J. C., Goodwin, M. S., Pennington, J., Marcus, S. C., Beidas, R. S., Mandell, D. S., & Nuske, H. J. (2023). A Digital Mental Health App Incorporating Wearable Biosensing for Teachers of Children on the Autism Spectrum to Support Emotion Regulation: Protocol for a Pilot Randomized Controlled Trial. *JMIR Research Protocols*, *12*. https://doi.org/10.2196/45852

Pérez, A. G. (2014). Characterization of Inclusive Practices in Schools with Education Technology. *Procedia - Social and Behavioral Sciences*, *132*, 357–363. https://doi.org/10.1016/j.sbspro.2014.04.322

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Preservice Teachers. *Journal of Research on Technology in Education*, *42*(2).

Williams, R. M., & Gilbert, J. E. (2020). Perseverations of the academy: A survey of wearable technologies applied to autism intervention. *International Journal of Human-Computer Studies*, *143*, 102485. https://doi.org/10.1016/j.ijhcs.2020.102485

Yaskevich, D. (2021). Digital Technologies, as a Factor in the Search for a New Quality of Inclusive Education. *E3S Web of Conferences*, *258*, 07086. https://doi.org/10.1051/e3sconf/202125807086

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