Teacher Educator Pedagogies in Assistive Technology for Inclusive Education: Lessons from Kenya School of TVET

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ABSTRACT

Inclusive education requires the effective integration of assistive technologies (ATs) to remove learning barriers for trainees with disabilities. This study examined teacher educators' competencies, institutional support mechanisms, and implementation challenges in integrating ATs at the Kenya School of Technical and Vocational Education and Training (KSTVET). Adopting a mixed-methods design, data were collected from 100 participants (80 teacher educators and 20 institutional administrators) using structured questionnaires, semi-structured interviews, observation schedules, and document analysis. Quantitative data were analyzed descriptively using SPSS, while qualitative data underwent thematic analysis. Findings revealed significant competency gaps: only 20% of teacher educators demonstrated high technical proficiency in AT usage, 45% exhibited moderate competence, and 35% reported low competence. Similarly, pedagogical integration was low, with only 15% effectively embedding ATs into instructional delivery, despite 60% maintaining positive attitudes toward inclusive education. Institutional findings indicated that 53% of educators considered available AT resources insufficient. While departments like ICT and ODeL showed higher familiarity, 58.2% of educators in other departments acquired AT skills informally. Key barriers identified included inadequate structured professional development (63%), limited access to advanced AT devices, and insufficient practical training. The study concludes that positive attitudes alone are insufficient to drive inclusive pedagogy without targeted technical and pedagogical capacity building. It recommends establishing mandatory continuous professional development programs, expanding modern AT infrastructure, and reinforcing policy implementation to enhance TVET trainer preparation for inclusive classrooms.

Keywords: Assistive Technologies, Inclusive Education, Teacher Educator Competencies, TVET, KSTVET, Kenya.

BACKGROUND

Inclusive education has become a global priority, driven by international frameworks such as the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), the Salamanca Statement, and Sustainable Development Goal 4 (SDG 4), which advocate equitable access to quality education for all learners. Within this agenda, assistive technologies (ATs) have become essential for reducing learning barriers, promoting learner independence, and improving participation and academic outcomes for learners with disabilities. However, the effectiveness of these technologies depends not only on their availability but also on educators' ability to integrate them meaningfully into teaching and learning.

Teacher educators play a critical role in this process because they prepare future teachers to implement inclusive education. Beyond technical knowledge of assistive technologies, they require competencies in inclusive pedagogy, curriculum adaptation, learner assessment, and the practical application of ATs. Studies show that well-prepared teacher educators produce graduates who are more confident and capable of supporting learners with diverse needs. Conversely, inadequate preparation of teacher educators limits trainee teachers' practical skills and weakens the quality of inclusive education.

Despite growing policy support for inclusive education, the integration of assistive technologies into teacher education remains inconsistent worldwide. Common challenges include inadequate professional development,

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limited institutional investment, insufficient access to modern assistive technologies, weak curriculum integration, and inadequate technical support. These challenges are particularly evident in Technical and Vocational Education and Training (TVET), where competency-based and practical learning requires accessible technologies to ensure that all learners participate effectively.

In Africa, governments have strengthened their commitment to inclusive education through regional and national policy frameworks. However, implementation continues to be constrained by inadequate infrastructure, limited financial resources, shortages of trained personnel, and insufficient capacity to integrate assistive technologies into teacher education. While considerable attention has been given to increasing access for learners with disabilities, less emphasis has been placed on strengthening the competencies of teacher educators who prepare future teachers.

Kenya has established a supportive policy framework through the Basic Education Act (2013), the Sector Policy for Learners and Trainees with Disabilities (2018), the National Special Needs Education Policy Framework (2022), and ongoing competency-based education reforms. Although these policies recognize assistive technologies as essential for inclusive education, implementation remains uneven due to inadequate institutional capacity, limited professional development opportunities, insufficient curriculum integration, and inadequate access to assistive technologies within teacher education institutions.

The Kenya School of Technical and Vocational Education and Training (KSTVET), as the national institution mandated to prepare TVET trainers and provide Continuous Professional Development (CPD), plays a strategic role in strengthening inclusive education across Kenya. The competencies of its teacher educators directly influence the preparedness of TVET trainers to support learners with disabilities. However, empirical evidence on teacher educators' competencies, institutional support mechanisms, and the challenges affecting the integration of assistive technologies at KSTVET remains limited.

This study therefore examined the competencies of teacher educators, the institutional support available, and the challenges influencing the integration of assistive technologies into teacher education at KSTVET. The findings contribute evidence to inform policy and practice aimed at strengthening teacher educator capacity, improving teacher preparation, and advancing inclusive education within Kenya's TVET sector.

Statement of the Problem

The success of inclusive education depends on teacher educators' ability to prepare future teachers to effectively use assistive technologies in supporting learners with disabilities. Although Kenya has developed strong policies promoting inclusive education, implementation within teacher education institutions remains inconsistent due to limited professional development, inadequate access to assistive technologies, weak curriculum integration, and insufficient institutional support. These challenges are particularly evident in the TVET sector, where competency-based training requires practical and inclusive teaching approaches.

As Kenya's national institution for preparing TVET trainers, KSTVET plays a critical role in strengthening inclusive education. However, little empirical evidence exists on the competencies of its teacher educators for preparing teacher trainers with diverse needs, the institutional factors influencing the integration of assistive technologies, and how these affect teacher preparation. This study therefore examined teacher educators' competencies and the institutional support available for integrating assistive technologies at KSTVET to generate evidence for improving professional development, curriculum delivery, and institutional capacity for inclusive education.

Study Objectives:

The study sought to:

1. Examine the competencies of teacher educators at the Kenya School of Technical and Vocational Education and Training (KSTVET) in integrating assistive technologies for inclusive education.

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2. Assess the institutional support available for integrating assistive technologies into teacher education at KSTVET.

3. Examine the challenges influencing the effective integration of assistive technologies into teacher education at KSTVET.

MATERIALS AND METHODS

This study adopted a mixed-methods approach to examine teacher educators' competencies in integrating assistive technologies into teacher education at the Kenya School of Technical and Vocational Education and Training (KSTVET). The approach combined quantitative and qualitative data to provide a comprehensive understanding of teacher educators' competencies, institutional support, and the challenges influencing the integration of assistive technologies for inclusive education.

KSTVET was purposefully selected as the study site due to its national mandate in preparing TVET trainers, making it a relevant setting to explore AT-related training capacity. The study involved 100 participants comprising 80 teacher educators and 20 institutional administrators purposively selected because of their direct involvement in teacher preparation and institutional decision-making related to inclusive education and assistive technologies. Teacher educators provided evidence on pedagogical competencies and classroom practices, while administrators contributed institutional perspectives regarding policy implementation, resource allocation and professional development.

Data were collected using structured questionnaires administered to teacher educators, semi-structured interviews with institutional administrators, observation schedules to assess the availability of assistive technologies and document analysis to examine institutional policies and curriculum documents. The use of multiple data sources facilitated triangulation and enhanced the credibility of the findings.

Quantitative data were analysed using descriptive statistics, including frequencies, percentages and cross-tabulations generated using SPSS. Qualitative data were analysed thematically following Braun and Clarke's framework. The integration of quantitative and qualitative findings enabled a richer interpretation of teacher educators' competencies and the institutional factors influencing assistive technology integration. The findings were presented through an integrated analysis of quantitative and qualitative data, combining statistical results with thematic insights to provide a comprehensive understanding of teacher educators' competencies, institutional support, and the factors influencing the integration of assistive technologies for inclusive education at KSTVET

Findings:

1. **Teacher educators' competencies at KSTVET for integrating assistive technologies in inclusive education.**

The findings revealed varying levels of teacher educators' competencies in integrating assistive technologies (ATs) within inclusive education at the Kenya School of TVET (KSTVET). Only 20% of teacher educators demonstrated high technical competence and expressed confidence in using a wide range of assistive technologies in their teaching. The majority (45%) exhibited moderate competence, indicating that they could operate basic AT tools but often required technical support, while 35% reported low competence, reflecting limited knowledge, skills, and practical experience in the use of assistive technologies.

Despite these competency gaps, 60% of teacher educators expressed positive attitudes towards inclusive education. However, only 15% reported consistently integrating assistive technologies into their instructional practices, whereas 45% indicated that they rarely or never used ATs during teaching. This disparity suggests that positive attitudes alone do not translate into effective classroom practice without adequate technical and pedagogical competencies.

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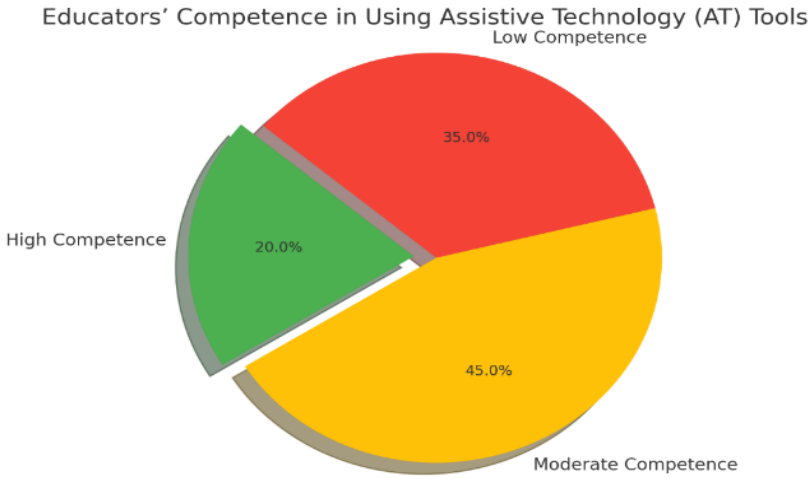
Figure 1. Teacher Educators' Competencies in Integrating Assistive Technologies



Overall, the findings indicate that teacher educators' competencies remain insufficient to support the effective integration of assistive technologies in teacher preparation. With only one in five educators demonstrating high competence, many teacher trainees are unlikely to receive adequate practical exposure to assistive technologies during their training, limiting their preparedness to support learners with disabilities in inclusive classrooms. The findings underscore the need for continuous professional development, curriculum enhancement, and improved institutional support to strengthen teacher educators' technical, pedagogical, and practical competencies in assistive technology integration. Such interventions would enhance the quality of teacher preparation and contribute to more effective implementation of inclusive education.

Cross-tabulation of the findings further revealed a close relationship between technical competence and pedagogical integration. The relatively high proportion of educators with low technical competence (35%) corresponded with the equally high proportion reporting no pedagogical integration (45%), suggesting that limited technical proficiency constrains the effective classroom application of assistive technologies. These findings imply that strengthening teacher educators' competencies is likely to improve opportunities for teacher trainees to develop practical skills in selecting, adapting and applying assistive technologies to support diverse learning needs.

Table 1I Cross-tabulation of Teacher Educators' Competencies and Implications for Teacher Trainee Preparedness in Inclusive Education (N = 100)

Teacher Educator Competency Indicator	High (%)	Moderate (%)	Low/None (%)	Implications for Teacher Trainee Preparedness
Technical proficiency in assistive technologies	20	45	35	Only one-fifth of trainees are likely to receive instruction from highly competent educators, while over one-third may receive inadequate practical guidance on assistive technologies.
Pedagogical integration of assistive technologies	15	40	45	Less than one-sixth of trainees experience authentic integration of assistive technologies during instruction, limiting opportunities to develop practical inclusive teaching competencies.
Attitudes toward inclusive education	60 (Positive)	25 (Neutral)	15 (Negative)	Although attitudes are generally positive, they do not consistently translate into effective classroom practice, suggesting that positive attitudes alone are

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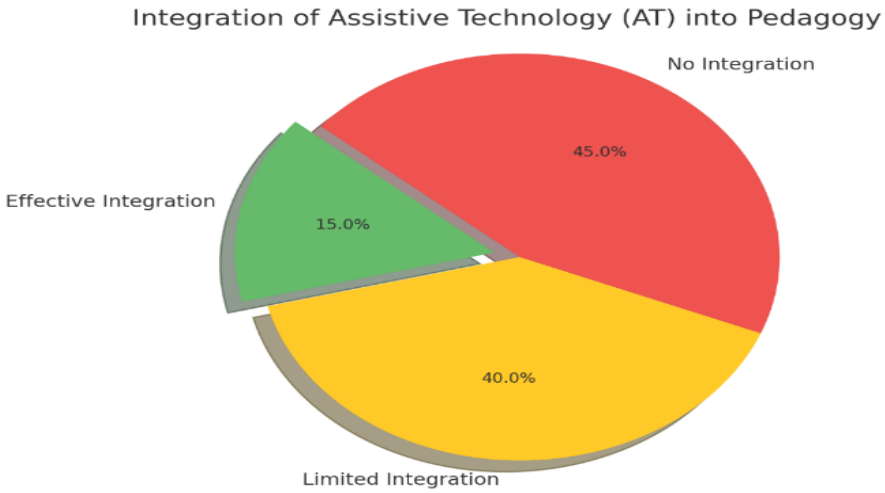
				insufficient for competency development.

The integration of assistive technology (AT) into pedagogy among KSTVET educators varies significantly. Only 15% confirmed they effectively incorporate AT tools into their lesson plans and classroom activities, demonstrating meaningful and strategic use of such technologies. Meanwhile, 40% make attempts to integrate AT but do so with limited effectiveness, suggesting challenges in application or understanding. The largest group, 45% admitted that they do not integrate assistive technology into their teaching at all, highlighting a substantial gap in inclusive pedagogical practice that warrants attention through targeted training and institutional support.

Figure 1: Integration of assistive technology in training delivery



Orientation and Attitude

The findings across three key competency areas; technical proficiency, pedagogical integration, and inclusive orientation revealed important insights into the educators' readiness to utilize assistive technologies (AT) in inclusive education.

In terms of technical proficiency, only 20% of educators demonstrated high competence, confidently using AT tools. A significant 45% showed moderate competence, as they were able to use basic AT tools with some support, while 35% have low proficiency, indicating limited exposure to such technologies.

For pedagogical integration, just 15% of educators effectively embedded AT into their teaching plans and classroom activities. A larger proportion, 40%, attempted to integrate AT in instruction while about 45% do not incorporate AT into their pedagogy at all. This suggests a major gap between technical familiarity and actual instructional application.

The results for inclusive orientation are more promising as a majority, 60% of KSTVET educators exhibited a high level of commitment to inclusive education values, with a clear understanding of the need to support trainees with diverse needs. Further, 25% demonstrated moderate inclusive orientation, while only 15% fell in the lower category. Although majority of the educators were positively inclined toward inclusive education, substantial gaps remain in their technical skills and practical integration of assistive technologies into teaching. This points to a need for targeted capacity-building efforts that address both the technical and pedagogical dimensions of AT use.

Table 1: Orientation, integration and attitude

Competency Area	High (%)	Moderate (%)	Low (%)
Technical Proficiency	20	45	35

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Pedagogical Integration	15	40	45
Inclusive Orientation	60	25	15

2. Institutional support for integration of assistive technologies into teacher education at KSTVET.

The findings indicate that KSTVET has made important initial efforts to support the integration of assistive technologies (ATs) into teacher education, although opportunities remain to further strengthen institutional capacity. Teacher educators and administrators acknowledged the institution's commitment to inclusive education but noted the need for continued investment in assistive technology resources, professional development, and institutional awareness to enhance implementation.

Slightly over half of the teacher educators (53%) perceived the available assistive technology resources as not yet sufficient to fully support inclusive teaching across all programmes, while 35% acknowledged the presence of AT resources that support learners with physical, visual, and hearing impairments. The remaining 12% were uncertain about the availability of these technologies, suggesting that increased awareness and visibility of existing resources could further enhance their utilization.

Administrators similarly recognized ongoing institutional efforts to strengthen inclusive education. They unanimously emphasized the importance of continuous capacity building to enhance teacher educators' competencies in integrating assistive technologies into teaching and learning. They also observed that while some departments had begun incorporating assistive technologies, particularly the Open, Distance and e-Learning (ODeL) department through its Learning Management System, wider institutional adoption and periodic upgrading of resources would further support effective implementation across all departments.

One teacher educator highlighted the need for greater awareness of available resources, stating:

"I'm not sure whether assistive technologies are available in our institution because there is limited awareness and training on their use."

Overall, the findings suggest that KSTVET has established a foundation for integrating assistive technologies into teacher education and demonstrates a clear commitment to inclusive education. However, expanding access to assistive technology resources, enhancing staff awareness, and providing ongoing professional development would further strengthen institutional support and enable more consistent integration of assistive technologies across teacher education programmes. Such improvements would enhance the preparedness of future teachers to effectively support learners with diverse educational needs.

A third trainer remarked, *"The institution may have assistive technologies available, but greater awareness and training would help educators understand and utilize them more effectively."*

Available ATs at KSTVET for inclusive Education

Type of Impairment	**Function of ATs**	**Available ATs**
Mobility ATs	• To aid in mobility	• Ramps • Rails
Visual Impairment ATs	• To aid in vision	• Screen readers (e.g., JAWS, NVDA) • High contrast • Magnifiers and screen magnification software

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		• Speech recognition • Text to speech
Hearing Impairment (HI) Ats	• Assist individuals who are deaf or hard of hearing.	• Speech-to-text software (e.g., Otter.ai, Google Live Transcribe) • Video relay services (VRS) • Flashing alert systems • Real-time captioning and subtitling
Communication Ats	• Help individuals with speech or language difficulties	• Speech-generating devices (SGDs) • Augmentative and Alternative Communication (AAC) tools (e.g., communication boards) • Text-to-speech (TTS) software (e.g., NaturalReader, Read&Write) • Voice recognition software (e.g., Dragon NaturallySpeaking)
Cognitive and Learning Aids	• Support individuals with cognitive or learning disabilities (e.g., ADHD, dyslexia, autism).	• Audio books and e-readers • Word prediction software (e.g., Co: Writer) • Simplified interfaces and distraction-free apps • Timers and visual schedules

Figure 2: Summary of ATs available at KSTVET for inclusive training

3. Challenges influencing the effective integration of assistive technologies into teacher education at KSTVET.

Data collected through interviews, questionnaires, and classroom observations revealed three interrelated challenges affecting teacher educators' competencies in integrating assistive technologies (ATs) at KSTVET: inadequate professional competence, limited access to assistive technologies, and insufficient practical training.

The findings showed that 63% of teacher educators experienced difficulties integrating assistive technologies into their teaching due to limited competencies**.** Although 33% reported being conversant with the use of ATs, most indicated that they had acquired these skills informally through workplace experience rather than through structured professional training. As one trainer explained:

"During my training, we barely touched on assistive technologies. I've had to rely on internet searches and informal chats with colleagues to even understand what's available, whenever I realize I have a trainee who needs some of these technologies."

Limited institutional resources further compounded this challenge. A substantial proportion of respondents indicated that KSTVET lacks adequate and advanced assistive technologies to effectively support trainees with special educational needs. While 35% acknowledged the availability of some assistive technologies for

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learners with physical, visual, and hearing impairments, many observed that these resources were insufficient for effective training. One participant noted:

"We had theory lessons on inclusive education, but without the actual devices or software to demonstrate, it's difficult to bring the concepts to life for our trainees."

The quantitative findings reinforce these perceptions. Only 20% of teacher educators demonstrated high competence in selecting and using assistive technologies, 45% reported moderate competence**,** while 35% exhibited low competence, indicating limited exposure and practical experience. These findings suggest that awareness of assistive technologies exists, but significant gaps remain in technical skills and pedagogical application.

Overall, the findings indicate that inadequate professional preparation, limited practical exposure, and insufficient institutional resources collectively constrain teacher educators' ability to integrate assistive technologies effectively. These challenges reduce opportunities for teacher trainees to develop practical competencies required for inclusive education, underscoring the need for continuous professional development and greater investment in assistive technology resources within teacher education institutions.

Study Limitations

The study focused primarily on teacher educators and institutional administrators. Consequently, the perspectives of teacher trainees and learners with disabilities were not captured directly. Future studies should incorporate these stakeholder groups to examine how teacher educator competencies influence trainee learning outcomes and classroom experiences from the learner perspective. Such evidence would provide a more comprehensive understanding of the effectiveness of assistive technology pedagogy in teacher education.

CONCLUSION AND RECOMMENDATIONS

The study concludes that teacher educators' competencies are critical to integrating assistive technologies and advancing inclusive education in Kenya's TVET sector. However, gaps in technical skills, pedagogical practice, institutional support, and access to assistive technologies continue to limit effective implementation.

It recommends strengthening professional development, increasing investment in assistive technologies, enhancing institutional partnerships, and expanding future research to include multiple institutions, teacher trainees, and learners with disabilities.

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