Available online at: https://jurnal-fkip.ut.ac.id/index.php/ijrse/issue/archive
**International Journal of Research in STEM Education (IJRSE)**
ISSN 2721-2904 (online)
Volume 6 Number 1 (2024): 76 - 84

# Transforming Teaching Practices: The Impact of ICT-Infused Professional Development Workshops - A Case Study

**[1]Moleboheng Ramulumo, [2]Gabriel Mphuthi, [3]Rankweteke Puleng, [4]Ernest Mazibe and [5]Fulufhelo Mukhati**
[1,4] Department of Science and Technology Education, University of South Africa
[2,3]Department of Mathematics Education, University of South Africa
[5]Department of Curriculum Studies, University of South Africa
[1]ramulmm@unisa.ac.za

## Abstract

This study examines the effectiveness of Information and Communication Technology (ICT)-infused Teacher Professional Development (TPD) workshops in enhancing teaching practices and learning experiences within the Technological Pedagogical Content Knowledge (TPACK) framework. A qualitative research design was adopted to capture the experiences of a single teacher participant involved in these workshops. Findings from thematic analyses of interviews and observational data indicate that the workshops significantly improved teaching practices by aligning them with Bloom's taxonomy and effectively addressing diverse student needs. However, the study revealed a lack of significant change in retention of electricity formulae among students, suggesting the need for varied instructional strategies. The study recommends broader incorporation of diverse teaching methodologies to meet evolving educational demands and to enhance effectiveness in STEM education. Despite its insights, the research calls for further investigation with a larger sample to better understand the widespread impact of ICT-infused TPD workshops across different educational settings.

**Keywords**: *Information and Communication Technology, Teacher Professional Development Workshops, Teaching Practices, Learning Experiences, Technological Pedagogical Content Knowledge*



## INTRODUCTION

### The Impact of ICT-Infused Teacher Workshops

In the ever-evolving landscape of education, teacher professional development (TPD) plays a pivotal role in equipping teachers with the knowledge and skills necessary for excellence. The 21st century presents teachers with new challenges and opportunities that demand continuous adaptation and improvement in their teaching practices (Philipsen, Tondeur, Pareja Roblin, Vanslambrouck & Zhu, 2019). Teachers must continually refine their competencies to provide students with the best possible learning experiences.

Contemporary TPD for teachers recognizes the paramount importance of integrating pedagogical ICT into education. Infusing technology into teaching and learning introduces challenges and exciting prospects. As a result, TPD for teachers must prioritize ICT as a central component (Mwangi & Khatete, 2017). ICT-infused TPD holds the potential to revolutionize teaching and learning practices for both teachers and students. It

Corresponding author:
Moleboheng Ramulumo, Ramulmm@unisa.ac.za
DOI: https://doi.org/10.33830/ijrse.v6i1.1666
Faculty of Teacher Training and Education
Universitas Terbuka, Indonesia

empowers teachers to adopt interactive teaching approaches, align their methods with global standards, and introduce students to the broader global education landscape while nurturing their professional growth.

At the secondary education level, the integration of ICT devices into educational systems becomes pivotal in realizing the full potential of ICT for teaching and learning (Khaliq, Baig, Bakhsh & Ahmad, 2017). ICT integration should assist teachers in adapting their pedagogical practices to meet contemporary challenges (Khaliq et al., 2017). According to Botha, Moodley, and Abdul-Razak (2020), ICT offers teachers a multitude of strategies, techniques, and tools to enhance conventional teaching methods and classroom practices. It enables teachers to explore innovative approaches to education, providing exciting and up-to-date learning opportunities for both teachers and students alike (Botha et al., 2020).

While policymakers plan ICT infrastructure in the education sector, it is teachers who serve as the implementors of these policies at the institutional level. Therefore, teachers require adequate training and TPD to effectively integrate ICT into their teaching practices. Despite efforts in many developing countries to integrate best ICT practices into their education systems, barriers to effective provision and utilization of ICT by teachers persist (Ismail, Jogezai & Baloch, 2020).

This study aims to examine the impact of ICT-infused TPD workshops on enhancing teaching practices and learning experiences among teachers and students, respectively. Specifically, it seeks to answer the following research question: How do ICT-infused TPD workshops impact teaching practices and learning experiences, and what are the implications for teachers and learner learning outcomes? By addressing this question, we aim to shed light on the role of TPD in equipping teachers with the skills and strategies necessary to thrive in a technology-enhanced educational landscape.

## Challenges and Opportunities in ICT Integration: A Review of the Literature

The literature review underscores the imperative of ICT in education, particularly in the contexts of teaching and assessment. Recognizing the value of ICT in teaching and learning sets the foundation for this exploration (Barton, 2004). It is essential to stress that ICT should not replace traditional teaching aids, but rather complement them to enhance the educational experience (Osborne, 2006). Teachers have found that combining various teaching aids, including ICT, yields fruitful outcomes (Ofsted, 2002).

However, challenges arise when teachers attempt to integrate ICT into their teaching practices. Among these challenges, one recurrent issue is the scarcity of time, even among technologically savvy teachers (Bingimlas, 2009). The pressure to cover the entire curriculum in preparation for high-stakes assessments often leaves teachers with limited time to explore and effectively incorporate ICT (Gomes, 2005). Additionally, the lack of adequate support for ICT integration exacerbates these challenges, which is the specific focus of this study. As highlighted by Becta (2004), teacher training in ICT integration is a multifaceted endeavor, involving considerations such as the timing of training sessions and the pedagogical practices informed by such training.

Given the complexity of ICT integration, it is understandable that numerous scholars advocate for a holistic approach that seamlessly integrates content, pedagogy, and technology (Mishra & Koehler, 2006). This approach emphasizes the need to align the curriculum, teaching methods, and technological resources to create a cohesive and effective learning environment.

Moreover, challenges in ICT integration extend to issues of access and support. Many teachers face obstacles related to limited access to ICT resources, hindering their ability to implement technology-enhanced teaching methods (Bingimlas, 2009). Furthermore, timely and relevant support, tailored to address immediate challenges in ICT integration, remains a crucial, but often unmet need in the education sector. In light of these

challenges and the broader context of ICT integration in education, this study aims to investigate the impact of ICT-infused TPD workshops on enhancing teaching practices and learner support.

## Research Objectives

As the educational paradigm shifts towards more digitally integrated environments, the role of ICT-infused Teacher Professional Development (TPD) becomes increasingly critical in shaping effective teaching methodologies. This study delves into how these TPD workshops not only refine teaching strategies but also profoundly influence the overall learning experience, preparing educators to overcome the hurdles of modern educational demands and leverage the advantages that technology offers. The intention is to dissect the nuanced impact of such workshops on the enhancement of teaching practices and to understand the broader implications for learners' experiences and outcomes in an era where technology and education are becoming inseparably intertwined. To explore these dimensions, the study will address the following research questions:

1. How do ICT-infused TPD workshops directly influence the pedagogical practices of teachers, particularly in terms of integrating technology effectively within their teaching methods?
2. What are the observable impacts of these TPD workshops on student learning experiences, specifically regarding engagement, comprehension, and the acquisition of skills necessary for the digital age?
3. Considering the barriers often encountered in ICT integration, how do TPD workshops equip teachers to overcome these challenges and what support mechanisms prove most effective in enhancing their instructional capabilities?

## THEORETICAL FRAMEWORK

This study is anchored within the theoretical framework of technological pedagogical content knowledge (TPACK), originally proposed by Mishra and Koehler (2006). The TPACK model serves as the foundational lens through which we investigate the impact of ICT-infused TPD workshops on the enhancement of teaching practices and learning experiences. This framework is particularly valuable due to its capacity to delineate and interconnect three essential knowledge domains: content knowledge, pedagogical knowledge, and technological knowledge (Mishra & Koehler, 2006).

Content knowledge, as defined by Grossman (1990), encompasses teachers' deep understanding of the subject matter, which they must transform into accessible forms for their students. It constitutes the cornerstone of effective teaching, requiring teachers to possess a profound grasp of the content they intend to convey. Pedagogical knowledge encompasses the art and science of teaching, encompassing a repertoire of instructional strategies, classroom management skills, and the ability to engage and facilitate student learning. Effective pedagogy is pivotal in translating content knowledge into meaningful and accessible learning experiences. Technology knowledge pertains to the comprehension of technological tools and their applications in the context of teaching and learning. In the context of this study, the ICT-infused TPD workshop specifically addresses teachers' technological knowledge, equipping them with an essential understanding of ICT and its pedagogical application, with a focus on its use within a specific content area for instructional transformation.

The TPACK framework operates at the intersections of these three primary knowledge bases, emphasizing the critical interplay between content, pedagogy, and technology. It underscores that effective teaching and learning take place when teachers seamlessly integrate these domains, enabling content to be presented and comprehended through pedagogically sound and technologically enhanced methods. Within the

scope of this research, the ICT-infused TPD workshop catalyzes the development of teachers' TPACK. It enhances their technological knowledge by deepening their comprehension of ICT and its effective use in teaching and learning, all within the context of a specific content area. Simultaneously, it cultivates the pedagogical skills necessary to foster meaningful and impactful learning experiences.

Therefore, by employing the TPACK framework, this study endeavors to explore the intricate connections among content knowledge, pedagogical knowledge, and technological knowledge within the context of ICT-infused professional development. It seeks to understand how participation in such workshops influences the dynamic interplay of these knowledge domains and ultimately shapes teaching practices and learning experiences. Through this theoretical lens, we aim to illuminate the multifaceted role of TPD in equipping teachers with the TPACK necessary to excel in a technology-enhanced educational landscape.

## RESEARCH METHODOLOGY

### Research design

This study employed a qualitative research design, chosen for its ability to capture the firsthand subjective experiences of participants who attended an ICT-infused TPD workshop, as recommended by Du Plooy-Cilliers (2018). The research was conducted within an interpretive paradigm, with a specific focus on the perspectives of one teacher participant regarding her TPD experiences. The research methodology adopted a single-case study approach, allowing for an in-depth examination of this particular context. To select the teacher participant for this study, purposive sampling was utilized, aligning with Yin's (2016) recommendation that purposive sampling is well-suited for selecting participants with relevant information about the research topic. The selected participant brought five years of teaching experience to the study, ensuring a wealth of expertise. Convenience sampling was applied in selecting the school where the research was conducted, primarily due to its accessibility to the researchers, following the guidance provided by McMillan and Schumacher (2014) and Rahi (2017).

The primary method of data collection involved conducting semi-structured interviews with the chosen teacher participant. An interview guide was used to maintain consistency and depth in the data collection process. Open-ended questions were employed during the interviews to elicit comprehensive insights from the participants. The interviews were structured to focus on evaluating the impact of the ICT-infused TPD workshop on the teacher's knowledge, skills, competencies, and other aspects of professional growth. Each interview session had an approximate duration of 45 minutes, allowing for a thorough exploration of the participant's perspectives. To ensure the credibility of the qualitative findings, member checking – as recommended by Mertens (2015) – was implemented as a validation method. Member checking involved the participant reviewing and confirming the accuracy and interpretation of their responses, thereby enhancing the trustworthiness of the data.

Thematic analysis was chosen as the data analysis approach, by the guidance provided by Braun and Clarke (2021). Thematic analysis facilitated the systematic organization and description of the rich dataset, enabling the identification of recurring themes and patterns that emerged from the study. Furthermore, all relevant ethical considerations associated with research involving human participants were meticulously addressed. Ethical protocols and guidelines – as outlined by Gray (2014) – were strictly adhered to throughout the research process, ensuring the welfare and confidentiality of the participants and upholding the integrity of the research.

.

## RESULTS

The results of this study, conducted within a qualitative research design and an interpretive paradigm, revolved around the experiences of a single teacher participant who attended an ICT-infused TPD workshop. The research utilized a single-case study approach, employing purposive and convenience sampling methods, semi-structured interviews, member checking, thematic analysis, and rigorous ethical considerations to explore the impact of these workshops on teaching practice, learner support, and professional growth.

### Impact of TPD Workshops on Teaching Practice

Tammy, the teacher participant, highlighted the profound positive impact of TPD workshops on teaching practice. Her response vividly demonstrated the benefits she and her colleagues had gained from attending these workshops.

> *"As teachers, going to the TPD workshop has been incredibly beneficial. They present us with crucial possibilities to advance professionally, get new knowledge, and enhance our instruction. The workshops concentrated on crucial topics like assisting us in creating effective lesson plans, utilizing technology in our instruction, and customizing materials for the diverse students we find in our classrooms. As a result, we have improved our approaches, learned new teaching strategies, grown better at teaching for successful learning, and made our classrooms more inclusive."*

The findings of this study suggest that TPD workshops have had a significantly positive impact on the teaching practices of the participating teachers. These workshops have served as valuable platforms for their professional growth, knowledge enrichment, and instructional improvement. Teachers have reported enhancements in several critical aspects of their teaching.

Firstly, participants have noted improvements in their ability to plan and structure lessons effectively, indicating that the workshops have provided them with valuable insights into organizing teaching materials and content. Secondly, the focus on technology integration within these workshops has equipped teachers with the skills to incorporate technology seamlessly into their instructional methods, enhancing their teaching capabilities. Furthermore, teachers have shown progress in customizing teaching materials to cater to the diverse needs of their students. This suggests that they have acquired strategies to accommodate varying learning styles and abilities.

Moreover, participants have expanded their pedagogical toolkit by gaining access to new teaching strategies. This versatility enables them to adapt to different classroom scenarios more effectively. The reported growth in teaching for successful learning underscores that these workshops have empowered teachers to create meaningful and impactful learning experiences for their students. Additionally, the reported improvement in classroom inclusivity signifies that teachers have developed the skills necessary to establish learning environments that are welcoming and supportive of diverse student populations.

Inferences drawn from these results indicate that TPD workshops play a crucial role in enhancing teaching practices. They provide teachers with the knowledge and skills required to tackle contemporary educational challenges, such as integrating technology, meeting diverse student needs, and fostering inclusive classrooms. The positive outcomes reported by participants emphasize the significance of ongoing TPD in equipping teachers with the necessary tools to excel in today's dynamic educational landscape.

## Impact of TPD Workshops on Learning Experience

Tammy also underscored the positive impact of TPD workshops on learner support, as evident in her response:

> *"Yes, I believe that the TPD workshops have provided our students with valuable guidance, assistance, and explanations, helping them overcome obstacles and achieve their learning goals. Moreover, I think the workshops have helped us address any misunderstandings by offering further explanations, providing examples, and facilitating discussions that foster a better understanding among our students. Additionally, these TPD workshops have empowered us to assess our students' progress and adjust our teaching strategies accordingly. Therefore, in my opinion, TPD workshops play a crucial role in promoting autonomous learning and fostering critical thinking abilities. By encouraging our students to think critically and solve problems independently, we equip them with the necessary tools to actively engage in their learning journey."*

These results underscore the positive impact of TPD workshops on learner support and the overall learning experience. They suggest that these workshops have effectively provided valuable guidance, assistance, and explanations to students, aiding them in overcoming obstacles and achieving their educational objectives. Furthermore, the results indicate that the workshops have played a crucial role in addressing misunderstandings by offering additional explanations, and examples, and facilitating discussions, thereby contributing to a better understanding among students. Additionally, the findings propose that TPD workshops have empowered teachers to assess learner progress and adapt their teaching strategies accordingly. This adaptability promotes autonomous learning among students and fosters critical thinking abilities. Therefore, by encouraging students to think critically and solve problems independently, the workshops equip them with essential skills to actively engage in their learning journey.

Inferences drawn from these results emphasize the significance of ongoing TPD for teachers in enhancing learner support, promoting critical thinking, and fostering autonomous learning. It highlights the symbiotic relationship between teacher development and learner outcomes, emphasizing the role of workshops in bridging this connection. Overall, these results suggest that TPD workshops make a substantial contribution to the creation of effective and engaging learning environments.

## Impact of TPD Workshops on Learning Experience

Tammy's insights illuminate the transformative impact of integrating ICT support into TPD workshops, with a particular focus on assessment development. As she stated:

> *"I have greatly benefited from the integration of ICT into my teaching practice. Specifically, it has positively influenced the development of assessments that align with the curriculum and effectively gauge students' cognitive levels. Through the utilization of Bloom's taxonomy, I have been able to craft assessments that encourage higher-order thinking skills in my students. However, I've observed that not all teachers possess the necessary proficiency to effectively utilize ICT tools for creating differentiated assessments that cater to the diverse needs of their classroom students. In this regard, I firmly believe that TPD workshops have been essential in fostering effective and inclusive learning environments."*

This study sheds light on the transformative potential of integrating ICT support into TPD workshops, with a specific focus on assessment development. Tammy's insights serve as a valuable testimony to the

significant impact of this integration. Firstly, her experience underscores that ICT integration positively influences the development of assessments that align with the curriculum and effectively gauge students' cognitive levels. This suggests that technology can enhance the quality and relevance of assessments, making them better suited to evaluating students' understanding. Furthermore, Tammy's observation highlights the role of ICT in promoting higher-order thinking skills among students, particularly through the utilization of Bloom's taxonomy. The ability to craft assessments that encourage critical thinking and problem-solving skills is a crucial aspect of modern education, and ICT can serve as a powerful tool in achieving this goal.

However, the study also infers that there is a disparity in teachers' proficiency levels when it comes to effectively utilizing ICT tools for differentiated assessment creation. Not all teachers possess the necessary skills to harness technology for crafting assessments that cater to the diverse needs of their classroom students. This finding underscores the importance of tailored TPD workshops to bridge teacher proficiency gaps. Ultimately, the results strongly suggest that TPD workshops play a pivotal role in fostering effective and inclusive learning environments. Tammy's firm belief in the essential nature of these workshops implies that they are instrumental in equipping teachers with the skills and knowledge needed to harness ICT effectively. This underscores the critical importance of ongoing investments in TPD workshops to ensure teachers can fully leverage the potential of technology in education, thereby benefiting both teachers and students alike.

## DISCUSSION

The primary aim of this research was to assess the effectiveness of ICT-infused TPD workshops in enhancing teaching practices and learning experiences. Additionally, the study sought qualitative feedback from a teacher who participated in an ICT-infused TPD workshop. The findings from this investigation strongly indicate that engaging in TPD workshops that seamlessly integrate ICT significantly enhances teaching practices and assessment techniques among teachers. These workshops prove to be invaluable resources, equipping teachers with the knowledge and tools necessary to stay current with the latest educational technology trends and best practices.

The extensive literature review corroborates the positive impact of technology-infused TPD, as demonstrated by numerous researchers in the field (Alt, 2018; Baran, Canbazoglu Bilici, Albayrak Sari & Tondeur, 2019; Chatmaneerungcharoen, 2019; Dlamini & Mbatha, 2018; Gondwe, 2021; Parrish & Sadera, 2020; Savec, 2020; Sims & Fletcher-Wood, 2021; Starkey, 2020). These studies collectively emphasize that TPD workshops effectively equip teachers with the essential technology competencies required for effective technology-integrated teaching. Starkey (2020) aptly highlights the pressing need for teacher education programmes to address current technological challenges by providing ongoing TPD opportunities, fostering collaboration, and equipping teachers with pedagogical knowledge and skills for successful technology integration.

Chatmaneerungcharoen's (2019) research aligns closely with our findings, demonstrating the significant impact of TPACK TPD on science teachers' TPACK competencies. The study underscores how participation in TPACK TPD expands science teachers' knowledge base and improves their TPACK skills over time. This mirrors our results, indicating that TPACK TPD offers teachers ample opportunities to enhance their understanding and practices across various domains, including science concepts, pedagogy, assessment, technology-integrated teaching, and the nature of science.

In essence, TPD workshops that incorporate ICT have demonstrated their remarkable potential in enhancing teaching practice. These workshops provide teachers with invaluable opportunities to learn and implement new strategies and technologies, ultimately resulting in improved student learning and

engagement. By participating in these workshops, teachers gain insights into integrating technology into lesson plans, utilizing digital tools for student assessment, and collaborating effectively with peers to enhance their teaching practices. Moreover, attending these workshops ensures teachers remain at the forefront of the latest educational trends and innovations. The undeniable positive impact of ICT-infused TPD workshops on teaching practice underscores the importance of teachers prioritizing such workshops to continually improve their practice and better serve their students.

## CONCLUSION

In conclusion, this study illuminates the transformative potential of ICT-infused TPD workshops in elevating teaching practices and assessment methods. These workshops serve as invaluable resources for teachers, equipping them with knowledge, practical skills, and a deeper appreciation for diversity in education. By participating in such workshops, teachers can effectively integrate technology into their teaching, align assessments with Bloom's taxonomy, and cater to the needs of diverse student populations. The literature review, theoretical framework, methodology, and results collectively support the positive impact of technology-infused TPD workshops on teacher development and student learning outcomes.

Recommendations stemming from this study include encouraging teachers' participation in ICT-infused TPD workshops, diversifying workshop offerings to meet various needs, fostering collaboration and peer learning, designing workshops based on current research, and implementing continuous assessment mechanisms. The implications of this study are substantial, benefiting teachers, educational institutions, and policymakers alike. These workshops have the potential to enhance teaching practices, improve assessment techniques, promote diversity and inclusion, facilitate professional growth, and positively influence student outcomes. However, it is essential to acknowledge the research's limitations, primarily the narrow focus on a single teacher participant. Future studies should strive for broader participation to gain a more comprehensive understanding of the impact of these workshops on teachers and their students.

## REFERENCES

Alt, D. (2018). Science teachers' conceptions of teaching and learning, ICT efficacy, ICT professional development, and ICT practices enacted in their classrooms. *Teaching and Teacher Education*, *73*, 141–150.

Baran, E., Canbazoglu Bilici, S., Albayrak Sari, A., & Tondeur, J. (2019). Investigating the impact of teacher education strategies on preservice teachers' TPACK. *British Journal of Educational Technology*, *50*(1), 357–370.

Barton, R. (2004). *Teaching secondary science with ICT*. McGraw-Hill Education (UK).

Botha, H., Moodley, K., & Abdul-Razak, N. (2020). *Teachers' experiences of ICT use in Grade 5 mathematics classrooms* (Doctoral dissertation, University of Pretoria).

Braun, V., & Clarke, V. (2021). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology, 18*(3), 328–352.

Chatmaneerungcharoen, S. (2019). Improving Thai science teachers' TPACK through an innovative continuing professional development program. *Journal of Physics: Conference Series*, *1340*(1), 12017.

Dlamini, R., & Mbatha, K. (2018). The discourse on ICT teacher professional development needs The case of a South African teachers' union. *International Journal of Education and Development Using*

*ICT*, *14*(2).

Du Plooy-Cilliers, F., Davis, C., & Bezuidenhout, R. M. (2018). *Research Matters*. Cape Town: Juta.

Gondwe, F. (2021). Technology professional development for teachers: A literature review and proposal for further research. *SN Social Sciences*, *1*(8), 200.

Gray, D. E. (2014). Theoretical perspectives and research methodologies. *Doing research in the Real World*, *3*, 15-38.

Ismail, S. A. M. M., Jogezai, N. A., & Baloch, F. A. (2020). Hindering and enabling factors towards ICT integration in schools: A developing country perspective. *Elementary Education Online*, *19*(3), 1537–1547.

Khaliq, A., Baig, I. A., Bakhsh, K., & Ahmad, M. S. (2017). Usability of ICT as a tool for professional development of teachers at the secondary level. *JISR Management and Social Sciences & Economics*, *15*(1), 117–142.

Mertens, D. M. (2015). *Research and Evaluation in Education and Psychology*. Los Angeles: SAGE.

Mwangi, M. I., & Khatete, D. (2017). Teacher professional development needs for pedagogical ICT integration in Kenya: Lessons for transformation. *European Journal of Education Studies*.

Parrish, A. H., & Sadera, W. A. (2020). Teaching competencies for student-centered, one-to-one learning environments: A Delphi study. *Journal of Educational Computing Research*, *57*(8), 1910–1934.

Philipsen, B., Tondeur, J., Pareja Roblin, N., Vanslambrouck, S., & Zhu, C. (2019). Improving teacher professional development for online and blended learning: A systematic meta-aggregative review. *Educational Technology Research and Development*, *67*, 1145–1174.

Savec, V. F. (2020). The opportunities and challenges for ICT in science education. *Teknologia Kemian Opetuksessa*, *1*(1), 1.

Sims, S., & Fletcher-Wood, H. (2021). Identifying the characteristics of effective teacher professional development: A critical review. *School Effectiveness and School Improvement*, *32*(1), 47–63.

Starkey, L. (2020). A review of research exploring teacher preparation for the digital age. *Cambridge Journal of Education*, *50*(1), 37–56.

Yin, R. K. (2016). *Qualitative Research from start to finish*. New York: The Guilford Press.