

## Chapter # 29

### TOWARDS A FRAMEWORK TO SUPPORT NOVICE TEACHERS IN RURAL AREAS: IMPLICATIONS FOR BLENDED PROFESSIONAL DEVELOPMENT INITIATIVES

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#### ABSTRACT

Research indicates that teacher professional development significantly influences teaching practice. The widespread adoption of online and blended modes of professional development that occurred in response to the COVID-19 pandemic was expected to enhance access to professional development for teachers in remote and rural areas of South Africa. However, research on the use of blended professional development in these settings remains limited. This study addresses this gap by employing a qualitative approach to examine the key components of a blended teacher professional development intervention in a rural area. Data was collected using classroom observations, interviews, and field notes and was analysed thematically. The study identified several components that contributed to the effectiveness of the intervention: sustainability, content focus, coherent, access to digital tools, active engagement, longer duration, individual support, and collaboration. The study also underscored the importance of facilitators of blended professional development possessing Technological Pedagogical Content Knowledge (TPCK) competency.

*Keywords:* teacher professional development, blended professional development, novice teachers, rural areas, technological pedagogical content knowledge (TPCK).

#### 1. INTRODUCTION AND BACKGROUND

Professional development has been shown to play a significant role in improving teaching practices and, ultimately, learner performance (Darling-Hammond, Hyster, & Gardner, 2017). As teachers engage with new knowledge and skills related to the subject content and appropriate pedagogical practices, they reflect on and revise their teaching practice (Darling-Hammond et al., 2017). Mushayikwa and Lubben (2009) argue that, for professional development to be effective, it should incorporate four components: the acquisition and enhancement of content knowledge and pedagogical content knowledge; active learning; coherence; and collaboration amongst teachers. Over the years, this conceptualisation has gained widespread acceptance among researchers (see Darling-Hammond et al., 2017; Desimone, 2009; Patton, Parker, & Tannehill, 2015). For professional development to be coherent, Kaino et al. (2015) explains that it should be aligned to the needs and interests of teachers and, ultimately, to the improvement of learners' performance. This aspect is important since teachers engage in professional development to improve the achievement of their learners (Letloenyane & Jita, 2020). Bayar (2014) adds that professional development should also be aligned to the needs and interests of learners, as well as the goals of the national education authorities and schools. Researchers contend that professional development can be effective if it is of longer and continuous duration

(Darling-Hammond et al., 2017; Desimone, 2009; Patton et al., 2015). ‘Longer’ duration entails at least 20 hours of contact time (Desimone, 2009). However, in rural contexts in South Africa, geographical, financial, and time constraints present challenges to incorporating these components into teacher professional development.

## 2. LITERATURE REVIEW

Researchers agree that traditional approaches to professional development that use face-to-face, top-down, theory-driven workshops that are not tailored to the needs and teaching contexts of participants typically involve little or no collaboration between participants and result in passive learning (Little, 1993; Guskey, 2002; Darling-Hammond et al., 2017). This approach to professional development was designed to meet the systemic needs of the education authorities and seldom considered the variable contexts in which educators actually teach. In contrast, current professional development initiatives place greater emphasis on the needs of individual teachers and employ pedagogies such as learning on the job through lesson studies (Lewis, Perry, Foster, Hurd, & Fisher, 2011), coaching and mentoring (Kraft, Blazar, & Hogan, 2018), and professional learning communities (PLCs) (Dufour, 2004). There has also been a shift towards active and collaborative learning through peer observation and coaching.

These traditional and modern models of professional development have relied on face-to-face interaction. This modality presents a particular set of challenges which are often exacerbated in rural settings. Transport costs and time constraints may be amplified because of the greater distances teachers must travel to gather at a professional development workshop, and human capital may be a constraint as there may be fewer teachers teaching the same subject. A blended modality, which combines face-to-face and online modes, may be a more practical approach for professional development in rural settings.

Online professional development is characterised by using available digital technologies to promote teacher development. Online sessions may incorporate the same components that are used in face-to-face or traditional professional development, e.g. content focus, coherence, collaboration, and active learning (Powell & Bodur, 2019). Powell and Bodur (2019) explain that active learning is characterised by the completion of authentic tasks and reflection, while coherence is determined by the relevance and usefulness of the professional development content. The intersection of technology with content, pedagogy, and knowledge – technological pedagogical content knowledge (TPCK) – differentiates online professional development. TPCK refers to a teacher’s knowledge and skill to be able to use technology effectively in their teaching to enhance learning (Kulaksız & Karaca, 2023). It is important that the designers and facilitators of online or blended professional development interventions have a high level of TPCK competence to enable them to effectively transform content knowledge – rather than simply transferring it to a digital online format – to facilitate meaningful changes in teaching practice (Powell & Bodur, 2019). As professional development may be offered online using synchronous or asynchronous modalities, designers and facilitators also require the competence to design interventions that are effective for each of these approaches.

While online professional development may address some of the challenges that arise with face-to-face interventions, it does present its own set of challenges. One of the factors that may constrain the effectiveness of an online professional development intervention, regardless of context, is resistance on the part of teachers towards the use of digital technology (Dille & Røkenes, 2021). Teachers may experience negative attitudes toward the use of digital technology if they do not have adequate competence and experience using the

technology to be able to engage in online professional development activities without experiencing barriers (Belland, Burdo, & Gu, 2015; Tsiotakis & Jimoyiannis, 2016). Belland et al. (2015) add that teachers may also have a negative view of using online modalities if they are not familiar with interacting asynchronously with their fellow teachers. In synchronous online professional development sessions, participants tend to turn off their cameras. While the reason for this may be to reduce bandwidth use and visual distractions, Gherheş, Stoian, Fărcaşiu, and Stanici (2021) argue that this behaviour should be investigated to determine whether participants engage as fully and effectively in a synchronous activity when their cameras are turned off. While Gherheş et al.'s (2021) study focused on students, this consideration is also relevant to teacher professional development activities that are conducted online.

Hunt-Barron, Tracy, Howell, and Kaminski (2015) investigated the challenges faced by teachers in rural areas when new technologies were introduced to enable online professional development. They found that teachers felt overburdened and were unable to cope with additional tasks, such as posting a reflection online. These findings correspond with those of Tsiotakis and Jimoyiannis (2016), who also found that teachers' lack of personal time influenced their participation in online activities. This is mainly because online teacher professional development is usually scheduled outside of teachers' working hours. Teachers at rural South African schools have been found to carry a heavier workload due to the shortage of teachers in these areas (Masinire, 2015). Hunt-Barron et al. (2015) also found that teachers who engaged in online professional development were uncomfortable with the lack of privacy when they were required to post, share ideas, or ask for help in a public online space. Lastly, they found that teachers frequently experienced challenges with network coverage and connectivity, hindering their access to professional development (Hunt-Barron et al., 2015). Mukuna and Aloka (2020) found that lack of electricity, poor network coverage, and the cost of data were some of the factors that constrained online learning in rural areas in South Africa. While lack of electricity and poor network coverage are issues beyond the control of any professional development programme, the issue of cost of data can be addressed. Research shows that lack of data is a barrier that negatively affects the level of engagement in any online activity, regardless of the context (Campbell, 2019). Thus, teachers must be provided with adequate resources, such as data bundles and technological learning devices, to enable access to online opportunities for professional development (Mukuna & Aloka, 2020).

To overcome the challenges of each of the modes of professional development discussed above, Palvia et al. (2018) proposes that the strengths of the online and face-to-face modes be blended to enhance professional development. Several models for blended teacher professional development have been put forward. For example, Philipsen, Tondeur, Pareja Roblin, Vanslambrouck, and Zhu (2019) developed a conceptual framework that identifies important components of teacher professional development for online and blended learning. Wittmann and Olivier (2021) developed a model for blended teacher professional development that considers the experience of teachers, as well as their individual differences, in terms of learning needs, preferences, and styles. However, none of these models consider the contextual aspect of teacher professional development – for example, the rural context. Consideration of context is crucial to ensure that teacher professional development initiatives are relevant, effective, and sustainable. These models are not easily customised to different contexts, and thus are not appropriate or useful in rural contexts, which have unique challenges.

The aim of this study was to determine the key components that are needed to ensure that blended professional development initiatives targeting novice teachers in rural contexts are effective. This was articulated as the research question: *What are the critical components of effective blended professional development initiatives for novice teachers in rural areas?*

### 3. METHODOLOGY

This study was part of a larger research project that facilitated a professional development intervention for 13 Physical Science teachers from a circuit of rural schools in the Mpumalanga province of South Africa. The purpose of the intervention was to enhance the teachers' subject content knowledge (SCK) and pedagogical content knowledge (PCK) for Physical Science, with the aim of improving the performance of their learners. The intervention consisted of workshops covering key topics in Grade 12 Physical Sciences, including: electrodynamics, electrochemistry, Newton's laws, vertical projectile motion, acids and bases, rates of reactions, chemical equilibrium, and organic chemistry. The selection of topics was informed by a pre-intervention questionnaire assessing teachers' needs. Collaboration was facilitated through a WhatsApp group for resource sharing and discussion, while individual support was informal and unstructured. The intervention spanned 16 hours, delivered through face-to-face sessions on Saturdays and online sessions on Wednesdays and Fridays after school hours. Digital access was not financially supported.

This paper presents the findings related to one group of participants: novice teachers – those with less than five years of teaching experience. Novice teachers were selected because they often experience transfer shock – a transition period caused by moving into an unfamiliar setting – making it difficult for them to adjust and to perform their jobs competently (Caspersen & Raaen, 2014). Rural South African schools often face a shortage of experienced teachers; in this context novice teachers may be required to teach subjects for which they have had no formal training to teach, exacerbating their experience of transfer shock (Du Plessis, Carroll, & Gillies, 2015). To make matters worse, as novice teachers are often appointed on a temporary basis in the South African school system, schools may not be willing to invest adequately in supporting them, leaving them to 'sink or swim' (Du Plessis, Gillies, & Carroll, 2014). Only three of the 13 teachers in the larger study were novices and thus participated in this study.

This study employed a qualitative approach as it focused on understanding how people perceive their experiences, the meanings they assign to those experiences, and how this shapes their reality (Merriam & Tisdell, 2016). A case study design was used, which provides "an in-depth description and analysis of a bounded system" (Merriam & Tisdell, 2016, p. 37). In this study, the three teachers constituted a multicase since the teachers had different qualifications, taught at different schools in the circuit, and had different lengths of teaching experience. An interpretivism paradigm was employed as it aims to understand human experiences from the perspective of those experiencing the phenomenon under study (Cohen, Manion, & Morrison, 2011).

Table 1, below, summarises the characteristics of the sample. The teachers' qualifications varied: one held a Bachelor of Education, while two held a Bachelor of Science: one had specialised in Mathematical Sciences and Statistics and the other – who was the only one with any training in the physical sciences – in Physics and Applied Mathematics. Thus, as the Grade 12 Physical Sciences subject is comprised of Physics and Chemistry, none of the three teachers had received adequate formal training in the subject. The three teachers each had two or three years of experience teaching Physical Science at the Grade 12 level; for two teachers, this represented their entire teaching experience, while the third had been teaching for 14 years previously.

*Table 1.*  
*Profile of participating novice teachers.*

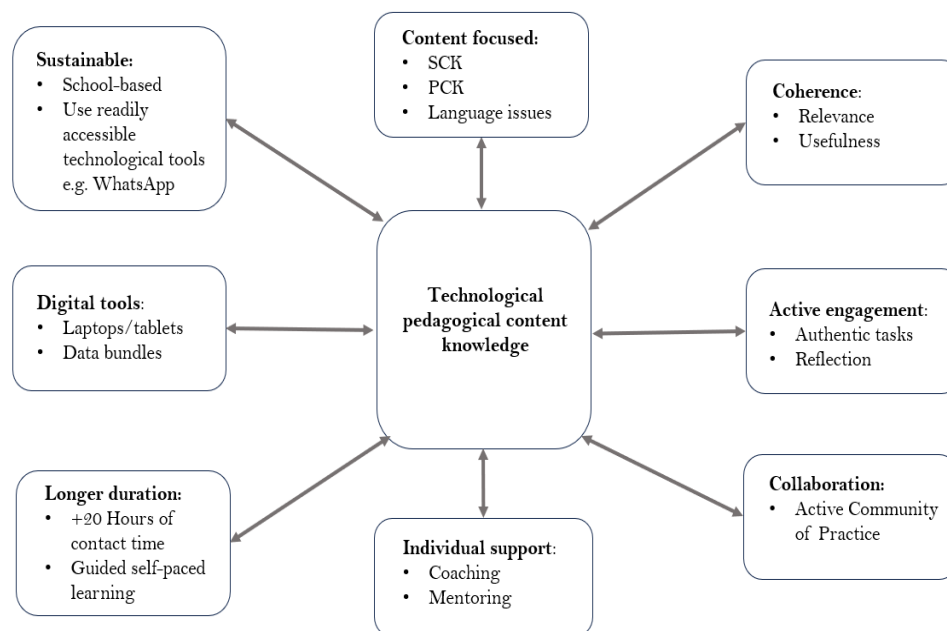
| Teacher          | Qualifications                                                                     | Teaching Subjects                 | Teaching experience | Experience teaching Grade 12 Physical Science |
|------------------|------------------------------------------------------------------------------------|-----------------------------------|---------------------|-----------------------------------------------|
| <b>Teacher 1</b> | Bachelor of Education                                                              | Physical Sciences and Mathematics | 2                   | 2                                             |
| <b>Teacher 2</b> | BSc in Mathematical Sciences and Statistics, PGCE; Pursuing BSc Hons in Statistics | Mathematics and Technology        | 3                   | 3                                             |
| <b>Teacher 3</b> | BSc in Physics and Applied Mathematics, PGCE                                       | Mathematics and Natural Science   | 16                  | 2                                             |

Data was collected from two lesson observations, which were video-recorded, and from semi-structured interviews with each novice teacher before and after the intervention. Field notes were also taken during the intervention workshops. Themes were generated inductively from the data in line with the aim of the study. To enhance the reliability and validity of the findings, triangulation of data sources, which entails the consultation of different sources of the data to support emerging findings, was used. This approach enabled cross-verification of information and identification of consistencies or discrepancies across different data sets, thereby providing a comprehensive understanding of the findings.

#### 4. FINDINGS

Analysis of the data identified several key components, as shown in Figure 1, that are significant for enhancing the effectiveness of blended teacher professional development initiatives in rural areas to effectively support novice teachers: they should be sustainable, content focused, coherent, employ appropriate digital tools, promote active engagement, have adequate duration, provide individual support, and promote collaboration.

Figure 1.  
Components that support effective blended teacher professional development in a rural context.



Each of these components is discussed below.

#### Content focused

The study found that the intervention's focus on promoting teachers' subject content knowledge (SCK) and their pedagogical content knowledge (PCK) – in tandem – was key to achieving the aim of the intervention. During the intervention, teachers participated in a total of eight workshops that were focused on Grade 12 Physical Science topics and how to teach them. While teachers' knowledge of these topics was enhanced, methods for teaching these topics were also shared with the teachers. The extracts below illustrate the teachers' views about the content focus of the workshops.

*With the intervention, I got to learn a different approach introducing a topic or a different way of explaining the very same thing but with various options. It allows you to know that 'oh, it can also be tackled this way,' unlike if you just stick, or glued, to one way only. You may find that having different strategies for different learners helps. So, I think that one was very much helpful. (Teacher 3)*

*There's a part of electrochemistry. Actually, also with electrodynamics. There are certain things which I was not quite sure of and some things. Even if you can try to search from your textbook or Internet, you might find that explanation as saying that experience count. So, someone with experience has encountered these challenges not once, or two times. Later they found a solution. Then we got to be given the opportunity to receive the new strategies. That's why I'm saying in electrodynamics most of my learners got a total because we copied what we got from the intervention or from the workshop we attended there at School D. (Teacher 2)*

*There was a strategy that the facilitator was using on Paper One – on electrodynamics. I have copied that one the way it is. I came with it to my learners, and they understood within few minutes. I know that they know are good in that topic. I think maybe it's because of the way she taught the lesson. Then I also came and taught the same way, and learners were able to grasp it quick. (Teacher 1)*

The excerpts above show that the teachers found the intervention beneficial as they learned new methods they could use to address each of the topics covered during the workshops. Teacher 2 indicated that he also had the opportunity to improve his content knowledge for some of the topics.

### **Coherence**

This component emphasizes the importance of the relevance and usefulness of the professional development content. In the professional development intervention in this study, the teachers were asked to indicate which topics they found challenging and where they needed more training to be able to teach the Grade 12 Physical Science curriculum effectively.

'Acids and bases' was a topic that the teachers identified as challenging, followed by 'electricity', 'organic chemistry', and 'work, energy, and power'. While these particular topics were covered in the workshops, not all topics the teachers identified as challenging were addressed in the intervention. Other topics, such as 'organic chemistry', were selected by the workshop designers and facilitators based on their weighting in the examination and learners' past performance in recent years. Since the inclusion of the teachers' four priority topics in the workshop directly addressed their needs, they found the workshops relevant and useful to their teaching, as shown in the excerpts above.

Some of the workshops that focused on the topics that teachers had identified as challenging to teach were held a few days before the learners wrote the Physical Sciences preliminary examination. Some schools took advantage of the timing and had their learners participate in these workshops with their teachers. Teacher 2 explained that, during the workshop, the teachers would ask questions on behalf of their learners as the facilitators had not been informed that learners would be attending via the online link.

*I was able to connect here [his classroom] and then they [learners] were listening. Yeah, they filled this place. They were watching here, and if we are busy asking questions, they were listening. I was asking questions as a learner, they were also listening and benefiting, taking notes. (Teacher 2)*

In one of the workshops attended by Teacher 1's learners, the facilitator taught the learners directly, to demonstrate how the pedagogical content knowledge that the workshop was presenting could be implemented in the classroom and to enable the participating teachers to see how learners would respond. The teachers found this approach effective, as articulated by Teacher 3 in the excerpt below:

*I think, soon, it would be best if, like, they did last intervention workshop at School A, where learners were amongst us. Yeah, I think that strategy can do miracles. Yeah, go to combine a whole lot of schools: it will require some financial muscles, yeah, but I think that could help. Yeah, because seeing different faces, presenting different chapters – it helps them. What happened after you left: we had a group of teachers rushing to School D to assist – teachers from different schools. Each teacher was*

*given a topic to address. We had this on Saturday and Sunday. So, it helps if they see different people. Yeah, you see, the approach will be different as well. (Teacher 3)*

Teacher 3 reported that the strategies shared by the facilitators had been useful and that the teachers had immediately implemented them in their classrooms, on their own initiative.

### **Active engagement**

This component stresses the need for critical reflection and authentic tasks. In this intervention, teachers were required to verbally reflect on their experiences with implementing the shared teaching and learning strategies at the beginning of each intervention workshop. During these reflective sessions, each teacher shared the challenges they had faced and these were discussed, with other participants sometimes suggesting solutions. The teachers were occasionally asked open-ended questions related to subject matter knowledge and pedagogical content knowledge during the workshops. Since active engagement in the workshops was limited to verbal reflections and question-and-response, it was found that the teachers would quickly lose interest, especially in the online workshops. For example, Teacher 1 indicated that they did not experience as much benefit from the online workshops as they did from face-to-face workshops.

*Let me tell you why the online one doesn't work better. The online one: I'm alone – you do not see me – you only see any of the screen that you project there. In most case, I would be busy with my things, putting the phone down. There was a day when they asked me a question – I was not even there. I was called, saying they are looking for me. I was busy with my things. So, I lose concentration quickly with online workshops because I'm in my space – and if my in my space, I might even sleep. You will think I'm listening, and I am not, you see. So, I think the physical one is best because I'm here and you have my attention. (Teacher 1)*

His experience may have been due to the online workshop not requiring participants to engage actively in authentic tasks: they were only asked to answer a question. This suggests that active engagement is critical in blended professional development initiatives, particularly in synchronous online workshops.

### **Collaboration**

Collaboration emphasises the importance of establishing a community of practice and promoting active participation in it. Since the intervention was administered while the COVID-19 pandemic was at its peak and close interactions, such as group and peer discussions, were restricted, opportunities for teachers to seek assistance were limited. The distance between schools posed an additional barrier. To bridge this gap, a WhatsApp group was set up so that participants could contact the workshop facilitators and each other at any time.

The WhatsApp group was also used to share teaching and learning information and materials. For example, links to videos that the teachers could use were shared with them. Although the WhatsApp group could have been used extensively for collaboration, it was not effectively utilised to contribute meaningfully to the teachers' professional development through facilitated exchanges. This is because it was not utilised to promote collaboration amongst the teachers. Its use was limited to sending announcements to the teachers.

### **Individual support**

Individual support could be provided through coaching or mentoring. The professional development intervention in this study did not use coaching and mentoring, but participants did have the opportunity to engage with their facilitators during short breaks or before and after each workshop – particularly during the face-to-face workshops, as shown in the excerpt below.

*Personal interaction is also - because with this online thing, one might be busy with something else this side. They may be watching, but they won't participate fully. But if sometimes we do physical one, we get to see people, you share your concerns directly to the right person. (Teacher 3)*

Professional development interventions should be designed to include opportunities for participants to engage with facilitators individually and receive tailored responses to their specific concerns.

### **Longer duration**

The findings highlighted the importance of participants engaging for an extended period with the professional development material. The intervention involved 16 hours of engagement by the participants. However, this duration was not found to be adequate, as shown in the excerpt below.

*Not really change per se, but I would say we would start as soon as possible. Unlike this year we started late but would start somewhere around February and we start working with them, gaining those new strategies and skills. (Teacher 2)*

The excerpt above shows that the teacher found the contact time insufficient as he wanted to learn more and develop himself. In the excerpt above, Teacher 2 comments on the starting date of the intervention, which was during the third teaching block (August/September), a few weeks before the learners would write their preliminary examination for the subject. At this time of the year, teachers are expected to have completed teaching and assessment as per the curriculum for the grade. Thus, the teachers found that because the intervention was scheduled late in the year, it was too late for them to implement what they had learned in time for their learners to gain real benefits from it. Two teachers also requested that the facilitators assist them with the other Grade 12 Physical Sciences topics they found challenging to teach.

### **Digital tools**

The study found that digital tools and internet access were needed for blended professional development to be delivered effectively. Participants need data bundles and laptops or tablets to participate in online sessions. In this study, participants were not provided with any resources to enable them to access the online workshops. Instead, they used their own resources. Teacher 1 reported that this compromised his ability to participate in the online sessions:

*For those workshops that are online, data is expensive. If you request the school to help you with data, they say no or promise to assist but they never do. There was this one time where I attended half of the session, because I received a text stating that I have used 50% of the data. (Teacher 1)*

Teacher 3 also raised the need for participants to be provided data so that they can participate in online workshops:

*Sometimes – like the online one – you must have enough data to listen and participate – all of that. So, you might find that a teacher might be logged in now for 10-15 minutes, then he's out – just like that. I don't know how, but if there were some sponsors somehow that could help supplement a little in terms of data, which could be another issue. (Teacher 3)*

This is indicated in Table 2 below, which shows the amount of time the three teachers spent attending the online workshops.

Table 2.  
Attendance duration of the teachers per online workshop.

|           | Newton's laws Workshop | Vertical projectile | Acids and bases | Rates of Reactions |
|-----------|------------------------|---------------------|-----------------|--------------------|
| Teacher 1 | 39m 23s                |                     |                 | 1h 32m             |
| Teacher 2 | 42m 23s                |                     |                 | 1h 36m             |
| Teacher 3 |                        |                     | 1h 40m          | 1h 40m             |

Table 2 above shows that all three teachers had the longest attendance duration at the workshop that covered the topic 'rates of reactions'; they attended for almost two hours. Their longer attendance duration at this workshop may be attributed to the fact that the learners were going to be examined on that topic the following Monday, in their national preliminary examinations.

Furthermore, the organisers assumed that all the participants could access the internet from their school and had access to a smart phone or laptop from which they could log into the online workshops. The excerpt below from Teacher 2 shows the influence of poor network on his attendance of online workshops.

*So, the only challenge with online, you know online we'll be experiencing maybe network problem. You know. I remember there was one which I couldn't even log in because of network. I remember I was not around; I [attended the online] workshop and at the place [where I joined the online workshop at], my network was not supported, I am using Telkom. So, if I'll be having a challenge of network, it means I won't be able to attend. (Teacher 2)*

While it is said that one can attend online workshops anywhere, this excerpt demonstrates that poor connection resulting from poor network coverage can obstruct attendance, thereby hindering engagement.

### Sustainability

The study found sustainability to be an important component in the success of the intervention, in terms of using readily available technological resources. To support this, teachers were provided with three key resources during the initial workshop: micro kits for

Chemistry and Physics experiments, an examination guideline for Grade 12 learners, and a booklet covering previous exam questions from various provinces. These resources aimed to aid teaching and learning. The micro kits allowed teachers to demonstrate scientific concepts, while the examination guideline and booklet helped familiarize students with exam structures and probed learners' understanding of the topics. These materials are reusable and adaptable for various topics in Physical Sciences, thus supporting long-term benefits. Additionally, the intervention demonstrated practical teaching strategies using the limited resources available at Teacher 1 schools, showing teachers how to apply these methods in their own contexts. This approach helped teachers to continue developing their skills even without the facilitator, promoting sustainability.

### **Technological pedagogical content knowledge (TPCK)**

The study found that the TPCK competence of facilitators was key to the success of the intervention, as poor technical pedagogical competence could result in passive learning. For example, Teacher explained that he often got distracted during online workshops, sometimes attending to unrelated tasks, or even falling asleep, as shown in the excerpt below.

*The was a day when they asked me a question, I was not even there. I was called saying they are looking for me. I was busy with my things. So, I lose concentration quicky with online workshops because I'm in my space and if am in my space I might even sleep. (Teacher 1)*

Teacher 1 expressed the view that not being physically present at the workshop made it harder for him to stay focused and engaged. He found online workshops ineffective due to a lack of active engagement, a problem that seemed to be exacerbated by the absence of collaborative tasks. Observations of intervention workshops showed a lack of activities that promoted active engagement or collaboration; instead, teachers sat passively as content was delivered. Boredom and disengagement may have also result if the participants did not find the content relevant; for example, the teachers generally did not find the topic 'electromagnetics' challenging to teach, but it was covered during the workshop. The facilitator's TPCK competence plays a significant role in the effectiveness of blended professional development. As shown in Figure 1, TPCK serves as an anchor for the other components of blended professional development, with teachers' experiences of blended professional development strongly influenced by the choices made by the facilitators. In addition, participants also need adequate technological competence to use the digital tools required to participate in online learning.

## **5. DISCUSSION**

The findings of this study show strong similarity to those facilitated in various modes, e.g. online and/or face to face, although not in South Africa, as reported in literature (see Darling-Hammond et al., 2017; Desimone, 2009; Patton et al., 2015; Powell & Bodur, 2019). This study affirms previous claims that content focus that builds teachers' SCK and PCK, coherence, collaboration, active engagement, and longer duration are important to the success of teacher professional development initiatives, regardless of the mode of facilitation. In this study, the intervention improved the teachers' SCK and PCK, particularly for the two teachers who were teaching Physical Science yet were unqualified to teach it (Teachers 2 and 3). The teachers also found the professional development initiative to be aligned to their needs, as it addressed some of the topics they had identified as challenging. This aligns with Letloenyane

and Jita's (2020) claim that teachers participate in professional development to benefit their learners.

While active engagement was found to be an important component, in this study, it was challenging to achieve in the online sessions of the intervention as the facilitators lacked adequate TPCK competence to use the available technology effectively to actively engage participants. As Powell and Bodur (2019) point out, simply changing the mode of professional development without adapting the activities and facilitation approach does not guarantee that teachers will benefit substantially from the intervention. In this study, WhatsApp was used as a platform to transmit information, although it could have been used as a vehicle to promote sustainable teacher professional development. The novice teachers reported sleepiness and difficulty paying attention during online workshops. These findings support Gherheş et al.'s (2021) argument that, when participants turn their cameras off, there is no evidence that they are actively engaged in the workshops. This demonstrates that effective TPCK competence is necessary to craft online professional development experiences that employ all components effectively to ensure that the intervention yields positive outcomes. This also highlights the important role of facilitators, whom Perry and Booth (2024) say are under-researched, with their importance in making professional development beneficial to the teachers and learners undermined.

However, the components outlined above are not sufficient for teachers in rural areas, particularly novices who often find themselves teaching subjects that they are not qualified to teach, such as Teachers 2 and 3. The findings of this study show that these teachers also require individual support. This would enable the teachers to share their concerns with the facilitators in safe spaces without fearing negative consequences. These findings are similar to those of Hunt-Barron et al. (2015), who report that teachers preferred to email the facilitators for assistance instead of posting on shared platforms.

Although blended professional development can offer greater flexibility and accessibility, it also demands digital resources. This includes data and a device with the necessary capabilities to enable the user to participate in synchronous workshops and complete activities, as recommended by Mukuna and Aloka (2020). Since these resources were not provided to the participants in this study, their attendance was affected, as shown in Table 2. In addition to the need for data and devices, this study found that poor network coverage may also affect teachers' attendance and engagement in workshops. This requires alternatives to online synchronous workshops that take into account the significant workloads that rural teachers often carry, leaving them with limited personal time to engage in reflective online tasks or asynchronous interactions, as found by Hunt-Barron et al. (2015).

## 6. CONCLUSION

The results of this study suggest that for blended professional development to be effective in rural areas, it must incorporate the strengths of both online and traditional professional development modes while addressing the unique challenges of the rural context. While the frameworks and models proposed by Philipsen et al. (2019) and Wittmann and Olivier (2021) provide a valuable foundation for modelling the key components of effective blended professional development interventions, they do not consider the limiting factors experienced by teachers at rural schools in South Africa, which include limited access to network and digital tools, time constraints, and the need for individual support which enables access to privacy. To enhance the effectiveness of blended professional development initiatives in rural contexts, they should be aligned with the technological, geographical, and resource-related challenges faced by teachers in rural areas. They should provide teachers

with the digital tools and competence necessary to fully engage in online professional development activities, as recommended by Mukuna and Aloka (2020). Due to the heavy workloads and time limitations experienced by teachers at rural schools, professional development initiatives should allow for asynchronous participation and flexible deadlines while ensuring that teachers receive individual support. Lastly, facilitators must have the necessary technological competences to be able to effectively integrate technology into their pedagogies and content knowledge during teacher professional development interventions. While this study involved a small sample, the findings have significant implications that organisers of professional development initiatives should consider to enhance the success of blended professional development in shaping teaching practices. It is recommended that further studies be conducted to further understand these blended teacher professional development components not only in rural contexts but also in other contexts.

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