AUTHOR:
Prof MT Gumbo[1] (iD)

AFFILIATION:
[1]University of South Africa

PROFESSIONAL DEVELOPMENT OF TECHNOLOGY TEACHERS: DOES THEIR TRAINING MEET THEIR NEEDS?

ABSTRACT

The phenomenological study on which this article is based inquired into Grade 9 Technology teachers' professional development through workshops on pedagogical content knowledge (PCK) as well as their training needs. The workshops took place in Nelspruit in Mpumalanga, South Africa. Data were gathered from two groups of teachers who attended the workshops on two different days, but who were trained in the same way and were subsequently conveniently selected to participate in the study. Semi-structured focus group interviews were conducted with these teachers and the workshop facilitator was also interviewed. The training manual was scrutinised, the facilitation of the workshops was observed and a follow-up visit was done at two schools where the workshop participants taught. The findings revealed that while the teachers felt that the workshops developed them, such training did not fully meet their needs or expand their PCK repertoires. This study will inform the Mathematics, Science and Technology Academy (MSTA), which is tasked with offering in-service training to subject teachers in the province, about whether the workshops meet the needs of the attendees, thereby possibly necessitating a review of the training.

Keywords: *teachers' needs, pedagogical content knowledge, teacher development, Technology, workshops*

1. BACKGROUND OF THE STUDY

The study on which this article is based explored the professional development of Technology teachers regarding their pedagogical content knowledge (PCK) and related needs. PCK, which is an amalgamation of pedagogy and content (what and how), concerns the knowledge of teaching (Shing, Saat & Loke, 2015). PCK is a specific form of knowledge required by teachers that involves the transformation of subject matter knowledge in the context of facilitating learners' understanding (Shulman, 1987). It is about effective teacher preparation in which the teacher understands what is to be learnt *and* taught (Shulman, 1987). PCK consists of seven elements, including

knowledge of a) the subject matter, b) pedagogical content, c) general pedagogy, d) the curriculum, e) learners and their characteristics, f) educational contexts and g) educational aims, purposes and values.

The scarcity of research into the professional development of Technology teachers in South Africa is what motivated this study. Also, Technology (as it is known locally, but also known as Technology Education or Design and Technology in other contexts) was only introduced for the first time into the school curriculum two-and-a-half decades ago.

Professional development is about improving teachers' skills and the competencies they need to produce outstanding learner results (Villegas-Reimers, 2003; Mizell, 2010). This may happen via a variety of modes, for instance coaching, lesson observation, the creation of professional learning communities, support and hands-on activities, amongst others (Mizell, 2010, 5). Schools-based practical experience regarding the subject content, new teaching methods, technological advances and learners' changing needs (Mishra & Koehler, 2006; Mizell, 2010) compel teachers to further their professional development so that they can be properly immersed in their PCK. This suggests that teachers' professional development remains the hallmark of their own competence and, by implication, of learner performance (Knight & Wiseman, 2005; Desimone, Smith & Ueno, 2006). For this reason, teachers should be competent if they are to achieve the desired learner success. Many teachers are seriously lacking the teaching skills needed to support individual differences in learners (Laine & Otto, 2000; Kent, 2004). In South Africa specifically, teachers' conceptual knowledge is limited (Department of Education, 2006). Technology teachers in particular show a lack of understanding of the requisite subject content, pedagogical knowledge and skills (Reitsma & Mentz, 2007), especially in the teaching of design processes (investigate, design, make, evaluate and communicate) (Juuti, Rättyä, Lehtonen & Kopra, 2017). Technology's PCK mainly relies on the design process, as content and pedagogy. Pedagogically, teachers have to develop in their learners multiple skills that will qualify them as technologists (e.g., design, creative, critical and manufacturing skills). In the Senior Phase (Grades 7–9), Technology's subject matter content knowledge includes topics such as the processing of materials, structures, mechanical systems and controls, and electrical systems and electronics. The three aims of this field of study are:

- Develop and apply specific design skills to solve technological problems;

- Understand the concepts and knowledge used in Technology education and use them responsibly and purposefully;

- Appreciate the interaction between people's values and attitudes, technology, society and the environment. (Department of Basic Education [DBE], 2011:8)

The latter aims to address the issue of indigenous technologies as well as the impact of, and bias towards, technology (DBE, 2011:10).

In this context, professional teacher development risks becoming nothing more than a state-funded skills development programme (Steyn, 2008:3). Many programmes are unsatisfactory, failing to meet the intended professional teacher development goals (Mewborn & Huberty, 2004). It is in this light that Mouton, Tapp, Luthuli and Rogan (1999) argue that professional development should be tailored to the needs and expectations of teachers and should be continuous or prolonged. South Africa's Mpumalanga province has responded to this challenge by prioritising Technology teacher training through workshops, as part of

the main Mathematics, Science and Technology project. Hence, the issue explored here is about understanding the PCK aspects that the workshops addressed (or failed to address) in response to Technology teachers' training or developmental needs.

The present study aims to contribute to the body of knowledge on teachers' workshops, in particular whether these respond to attendees' professional needs. Tailoring workshops according to teachers' needs is important, as it has been found that certain offerings train teachers away from their actual areas of need (Gusky, 1986). This study can be regarded as breaking new ground, since no research has yet been conducted into the MSTA's initiatives regarding professional teacher development in that context. Further, a study of this nature is crucial, given the contextual dynamisms of professional development workshops and the questions they raise. The MSTA, which is tasked with training Technology teachers with respect to PCK as part of their professional development, has adopted workshops as its main strategy. In partnership with MSTA, the Department of Science and Technology Education (DSTE) from the University of South Africa (UNISA) conducted research aimed at informing teacher training and development in Mpumalanga, with a view of making improvements. To this end, the following research questions were posed to guide the study:

- What are Technology teachers' PCK-related professional development needs?
- How do Technology workshops respond to teachers' professional development needs?

2. LITERATURE REVIEW

Professional development is defined as the intensive, ongoing and systematic process of enhancing teaching, learning and school environments (Fenstermacher & Berliner, 1985; Elmore, 2002). It aims to improve teachers' skills and the competencies required to produce outstanding learner results (Reading First, 2005). In addition, teacher development describes "the professional growth which a teacher achieves as a result of gaining increased experience and examining his or her own teaching systematically" (Gatthorn in Villegas-Reimers, 2003, 11). Reasons for professional development include the certification of unqualified teachers, teacher upgrading, preparing them for new roles, and curriculum-related dissemination or refresher courses (Greenland in Villegas-Reimers, 2003). Professional teacher development is crucial for the effective implementation of any curriculum, and for boosting learners' interest and performance in a subject (here, Technology in particular).

As stated earlier, the usefulness of professional teacher development in South Africa has been called into question. This is backed up by examples of research in the field, including a qualitative study by the South African Democratic Teachers' Union (SADTU, 2014) in Mpumalanga that interrogated teachers' perceptions about their professional developmental needs. In that case, focus groups were held and a questionnaire was administered to teachers while individual interviews were conducted with principals. The findings revealed that the teachers' concerns revolved around workshops being too short, a lack of classroom resources, learners' disadvantaged backgrounds, high learner:teacher ratios and a disregard of indigenous languages as mediums of instruction. In an American study on Science and Mathematics teachers' experiences, needs and expectations in terms of their professional development, it was found that many such programmes fail because they do not consider teachers' backgrounds, experience, knowledge, beliefs or needs (Chval, Abell, Pareja, Musikul & Ritzka, 2008). The first study cited above did not target teachers of a specific subject, while the second investigated Science and Mathematics teachers without focusing

on specific grades. What both studies achieved was to illuminate the problems surrounding professional teacher development and to signal that further research is required.

The problem of teacher development in South Africa is exacerbated by their lack of qualifications and/or their under-qualification. The DBE (2011) reports that about 40 per cent of practising teachers are unqualified and/or under-qualified, with certain teachers holding outdated qualifications (e.g., a Primary Teacher's Diploma, a Senior Primary Diploma in Teaching, a Junior Primary Teacher's Diploma or a Senior Teacher's Diploma) (Welch, 2009). This could mean that teacher training has not yet put teachers on solid ground in respect of their PCK. The implementation of Technology as a subject has raised concerns about teachers' knowledge (Stein, McRobbie & Ginns, 1999; Mapotse, 2012). Reitsma and Mentz (2007), corroborated by Rohaan, Taconis and Jochems (2012), argue that many Technology teachers lack subject content knowledge and skills, pedagogical knowledge and skills and PCK. This is mainly because Technology is a relatively new subject to teach, for which few teachers are qualified (Taylor & Vinjevold, 1999; Department of Education [DoE], 2006; Mapotse, 2012). In support of their pedagogical skills, teaching resources are needed to be integrated in their teaching, particularly modern technology such as smartboards (Banks, 1996; Mishra & Koehler, 2006). Banks (1996, 176) borrows from Shulman to refer to the teaching resources as "the materia media or pharmacopoeia from which teachers draw their equipment that present or exemplify particular content". Technology integration is emphasised as it is perceived as branding teaching in the 21st century. Mishra and Koehler (2006) extended PCK to include the integration of technology, introducing PCK the technological pedagogical content knowledge (TPACK) to the PCK framework.

To investigate this topic on a local level, a centralised continuous professional teacher development model was used to frame the study.

3. CENTRALISED CONTINUOUS PROFESSIONAL TEACHER DEVELOPMENT

Different continuous professional teacher development models exist, namely the centralised, decentralised and cascade models. Centralised training takes place at a central venue (teachers converge from different schools), decentralised training takes place at teachers' own schools, while cascaded training happens with senior staff at a central venue, who in turn train their colleagues at their own schools (Conner, 1991; Craft, 1996; Engelbrecht & Ankiewicz, 2016). All these models are facilitator driven (Engelbrecht & Ankiewicz, 2016).

The centralised model was chosen for this study and involved teachers from various schools being trained at a common venue. According to Craft (1996) and Muhammed (2006), most training lasts for a day or longer, and workshops are the dominant training mode employed in this model (Fareo, 2013). The MSTA relies heavily on this model, which sees personnel from higher education institutions being tasked with monitoring high-quality planning, presentation and training materials (Engelbrecht & Ankiewicz, 2016, 264) – in this instance, UNISA provided that service. However, the model used has many flaws (Craft, 1996, 8–14):

- inappropriate aims on the macro level do not reflect the true needs and expectations of teachers;

- inappropriate activities are planned with no regard for the outcomes;

- teachers lack motivation because they are unwilling to attend training, as there is very little perceived incentive (financial or otherwise) to further their qualifications; and

- it is not very popular, as teachers' private lives are disrupted and single parents struggle to accommodate such training.

Despite taking place at a separate central venue, the expectation with this model is that what takes place during the training should align with what takes place at school (Engelbrecht & Ankiewicz, 2016), i.e., it should reflect the needs of the school/teachers. Day (in Engelbrecht & Ankiewicz, 2016) claims that school-focused training covers natural learning experiences and conscious and planned activities that can benefit an individual or school directly, all of which can facilitate the provision of quality education.

4. RESEARCH METHODOLOGY

This was a phenomenological study that described and interpreted the experiences of workshop participants (Eddles-Hirsch, 2015). The focus was on how the participants experienced the professional development workshops (Eddles-Hirsch, 2015) they attended. As phenomenology reflects participants' experiences and reality, their lifeworld, sense-making and sense derivation (Eddles-Hirsch, 2015), the participants' experiences and the sense they made of those experiences were sourced for this study.

The workshops, content and facilitation

The workshops in question were conducted in Nelspruit during 2015, on two different dates, as two-day sessions, with two groups of Grade 9 Technology teachers from different districts being accommodated.

A single workshop will be discussed here, as it was basically duplicated for the second group on another occasion, and thus also lasted two days. The content of the workshops was outlined in the training manual, which covered electronic systems and control, processing and mini-Pat (i.e. practical assessment tasks based on design processes). The sub-sections of electronic systems and control included electronic components, simple electrical circuits and the impact of technology and electronics in the media. The manual, which contained learning activities for the teachers, featured illustrations (such as a diagram on input-process-output, and another showing electronic components). Throughout, the facilitator referred to the training manual that had been specifically developed for the workshops.

The facilitator started the workshop by outlining the next day's activities, which would be more practical in nature. Thereafter, he gave the attendees a pre-test consisting of multiple-choice questions that he could mark quickly with their help. The teachers marked each other's tests and supplied the answers aloud. He then discussed the first topic, electronic systems and control, and left two more for the following day. He introduced the topic by referring to real situations in which electronic systems and controls are applied (e.g., in cars), and explained logic gates using a flip chart. He relayed the historical context of electronics from a military perspective, having initially been used in radios and television sets. He also touched on concepts such as Ohm's Law, electrical diodes and power sources. Despite having organised a data projector, laptop and screen, he relied more on the flip chart and training manual.

The next day the facilitator instructed the workshop participants to build a simple electrical circuit. He engaged the teachers in individual and group activities from the workshop manual, and asked questions based on electronic components, simple electrical circuits and the impact

of technology. He discussed the processing of metals before the teachers performed practical tasks to follow up on the work of the previous day. He focused on preservation techniques (painting, electroplating and galvanising) associated with metals and asked a few questions. He treated concepts such as oxidation, corrosion and processing, and then gave the teachers a practical task on electroplating. He ended by explaining the mini-Pat and giving teachers a post-test that was marked in the same way as the pre-test.

Data collection methods, participants and procedures

The two focus groups of Grade 9 Technology teachers were conveniently selected with the aid of the facilitator and were interviewed for approximately 40 minutes each. This happened outside of workshop times, at the same venue. There were 12 teachers in the first group and 8 in the second. A 30-minute semi-structured interview was also conducted with the workshop facilitator after the workshops had concluded. The interview guides for the teachers and the facilitator included biographical information and questions regarding the teachers' views of the workshop and their professional training needs. The facilitator was asked about the intention behind the workshops and the planning that went into them. The training manual was also evaluated based on the content and design of the learning activities, using a specifically designed evaluation tool. The facilitation of the workshops was observed using an observation tool that targeted the teaching approaches, concepts taught and integration of resources. The observation and evaluation of the training manual added to the researcher's understanding of the teachers' expressed views about the workshops, and their specific needs. Two schools were visited after the workshops to observe the teaching being done by the former workshop attendees. This extension of the inquiry helped create a deeper understanding of the impact the workshops had on teacher knowledge and practice (their PCK).

Ethical clearance and permission to conduct the study were granted by UNISA and the Mpumalanga DBE respectively. The participants were asked to sign a consent letter. All ethics-related imperatives were observed, including participant confidentiality, their consent to record the interviews and their liberty to terminate their participation in the study.

Data analysis

The interview data were coded, manipulated, summarised and organised into themes to obtain answers to the research questions (Bogdan & Biklen, 2003). This entailed preparing the data; reading and re-reading the transcripts; coding, segmenting and conceptualising the data according to emerging patterns; organising the participants' views under a theme for presentation; and substantiating the findings with participants' verbatim statements. An attempt was made to account for the trustworthiness of the study (LaBanca, 2004) in terms of validity and credibility, in accordance with acceptable standards of scientific inquiry (Bowen, 2009). A multi-method strategy helped to corroborate and triangulate the findings. The preliminary findings were presented to the MSTA and peer debriefing was done with colleagues at UNISA, who had participated in the main MST project, to add to the trustworthiness of the study (Bowen, 2009).

The next section presents the findings in an integrated manner, in response to the research questions.

5. FINDINGS

Teachers' biographical information

The data revealed that most teachers had only recently begun teaching Technology and were largely under-qualified to do so. For example, only four had an Advanced Diploma in Technology Education, two had a National Diploma (from technical fields) and one had a Secondary Teacher's Diploma. However, the teachers were highly qualified in specialisations such as Mathematics, Science and Educational Management. Their service in other subjects, which tallied with that in Technology specifically, ranged from four months to 20 years. However, their Technology-specific service was combined with their prior teaching at technical schools. By implication, therefore, when their low qualifications were juxtaposed to their service and the relative newness of Technology as a subject, it transpired that they had not taught Technology for that long, compared to other subjects.

The workshops and teachers' needs

The participating teachers expressed their passion for teaching the subject but admitted to being incompetent in certain aspects of their PCK. The expectation was that the workshops would assist them with that. They explained that their low subject-specific qualifications (as reflected in the biographical information) made them question their competency. Technological knowledge overlaps with certain knowledge areas of Physical Science and Mathematics knowledge, such as the properties of materials and the calculation of pressure (e.g. in pneumatic systems), but many teachers admitted to lacking basic Physical Science and Mathematics knowledge. As one participant explained:

> *I did my diploma in commercial subjects. I don't have the basics of Physical Science, and sometimes when I am supposed to teach where there are a lot of calculations in relation to things which are happening in Physical Science I sometimes find it difficult.*

Another teacher voiced her frustration with the basic mathematical calculations required:

> *We have a problem with practicals when it comes to the mathematical part, because in almost every term there are calculations for voltage, resistance, current, Ohm's Law, gear ratio, rpm.*

The teachers also felt sympathy for their learners,

> *…because learners do not have a good mathematical background.*

Several participants expressed the need for an expert to teach them to understand difficult sections of the content knowledge:

> *I think it is better if we can have someone who is an expert, like in structures, to train us to have a deeper knowledge so that we can teach it better to our learners.*

The facilitator did his best to help the participants arrive at a clear understanding of the topics being discussed. He let the teachers discuss these among themselves at times, but applied time constraints. The facilitator relied on his work experience and qualifications: he had a National Certificate (N1–N6) and a Diploma in Engineering, backed up by 12 years of teaching experience, all of which made him experienced and reasonably well qualified.

Many teachers attempted to make meaning of what they were being taught by making inputs from an indigenous perspective. For example, one teacher explained "preservation" thusly:

In the olden [days], our parents used animal fat to preserve metals.

The teacher wanted to explain in detail how his grannies did that, and although the facilitator welcomed that explanation, he quickly ended it. The fact that the training manual did not include any indications of indigenous knowledge might explain why he did not encourage the teacher to explain the preservation process further from that particular perspective.

The teachers responded to the interview questions by reflecting on their learners who were battling with certain technological content knowledge areas in which they (teachers themselves) also needed assistance. One such area was graphics, as one teacher stated:

In most cases they are struggling when it comes to drawings because some of them fail to see the top view, side view. Besides learners not knowing drawings, we also do not know these things. I even could not do the two drawings which were included in the last examination.

To address PCK challenges of this nature, the teachers tried to

involve learners [by] explain[ing] in the local language instead of using English [because] some of them experience English as a language barrier.

Another problem area was the new approach to teaching and learning, or mini-Pats (practical assessment tasks based on design projects). Again, the participants admitted that they and their learners struggled in this area. The teachers admitted needing training, as one stated:

Many teachers and learners are struggling with the newly introduced mini-Pat. Most teachers see it as a monster, and they don't know what to do.

The training manual featured a scenario-based activity on the mini-Pat, but the facilitator did not instruct the participants to do it. The teachers' needs in this regard were thus not addressed, perhaps due to time constraints. For large parts of the workshop the facilitator stated that because time was running out, he could not go into details about a certain topic.

The teachers were generally positive about the workshops. From the observation done, the facilitator seemed well prepared and competent, which might have motivated the participants. He did, however, dominate the workshops by presenting material to the attendees, rather than allowing them to try it out on their own and be corrected. He appeared to keep the interactions brief as there was a great deal of content to cover. The participants therefore felt that the workshop lasted for a very short period, adding *"they should give us more time".* They expected to gain more subject knowledge during the workshop, but when faced with time constraints, complained that the "*facilitator [did] not have time to explain and engage [with] us as teachers".*

The participants wished the training manuals had been delivered to them prior to the workshops, so that they could prepare and bring along their own supplementary materials. It is laudable that the teachers were willing to prepare for the workshops by organising materials. Also, they wanted to be notified about the objectives of the workshops beforehand, to be able to participate from an informed position. They claimed that fellow expert teachers could have teamed up with the facilitators, with one participant commenting on the need for *"a teacher*

who is more knowledgeable than everybody to teach us the way they are teaching learners". Many expressed a preference for varied approaches, such as using colleagues who excel in the subject. They were not trained much on the methods of teaching, as the facilitator claimed *"these workshops focus on content knowledge because this is [a] content workshop".* There was, however, a contradiction in the sense that the facilitator emphasised PCK during the interview, claiming that the aim of the workshops was to ensure that teachers were being capacitated:

> One is to make sure that we give them enough content so that they can be able to teach efficiently. That is why we also conduct these trainings, not only content, but PCK, because some teachers have content but do not know how to address this content in the classroom.

"Seemingly non-PCK" aspects

The findings revealed the "seemingly non-PCK" aspects the participants mentioned in their responses to the interview questions. The fact that some schools were under-resourced was a crucial aspect that they wanted resolved. Very few schools that offer Technology are well resourced, whereas rural schools in particular are under-resourced. As one participant stated:

> I was so surprised last year when I was doing some practicals. The only thing I found at school was a [light]bulb.

In addition, in instances where resources were available, teachers needed to be trained on their use during teaching. This related to more sophisticated technological resources, such as how to operate and navigate the applications/tools on the smartboards and laptops that the MSTA rolled out to schools under the auspices of the Mpumalanga DBE. As one participant explained, they did not know how to use this technology:

> We must use smartboards to teach learners. Some of us cannot operate a computer.

The facilitator confirmed that teachers had problems with the smartboards (some were defective, others just collected dust because the teachers did not know how to use them). The facilitator had not planned to train the teachers in the use of smartboards during the workshops, and no smartboard was arranged for this purpose. According to the facilitator, no analysis was done of the teachers' needs prior to the workshops; thus, he relied on his own sense of learners' performance in certain areas of the subject and designed the training manual to target those areas.

Another "seemingly non-PCK" matter that teachers raised had to do with describing their learners. They felt strongly that teachers should know their learners and the contextual factors facing them. The participants claimed that they taught many children from poor backgrounds whose parents were unemployed. However, a "hunger for education" in their communities meant schools were filled with learners, resulting in overcrowded classes and related problems. As the participants mentioned:

> We have small classrooms with sixty to eighty learners […]

> You can't do practicals because of learner overcrowding.

Site visits

Monitoring and support are crucial aspects of teachers' professional development, serving to ensure that what they learn can be implemented immediately and follow-up training

considered. The findings showed that this had not yet been done subsequent to the workshops in question. The facilitator confirmed this during the interview, stating that monitoring and support were in the future plans of the MSTA, but had not yet started. This indicated a need to visit those teachers who had already undergone training and they confirmed that school-based support was non-existent. They admitted to struggling to understand the subject of Technology and especially how to teach it – clearly, they needed assistance in their teaching. One teacher was observed teaching the design process during the school visit. She had assigned learners a project about safety. The scenario was well conceptualised from the road construction taking place about one kilometre away from the school. Having assigned the learners the design task a few days before, she asked them to report what they had done thus far in their groups. In response, the learners merely read out the scenario given by the teacher. They were hesitant to speak and did not appear confident, which indicated that they might not have understood the project brief properly. This confirms that teachers are still struggling to understand the mini-Pat and how to teach the design process. Another teacher, however, was a specialist in graphics, evident in the learners' design drawings. She could be one of those teachers who can be used during the workshops to teach her colleagues. In a brief discussion with her, she indicated that she even helped to train her colleagues in her area. The teachers were motivated to a point of making efforts to display their learners' artefacts made from thrown-away materials.

6. DISCUSSION

This new initiative by the MSTA in Mpumalanga casts light on Technology teachers' professional development. In the light of the findings of the study, the workshops revealed areas in which teachers were helped to understand the content as part of their development in PCK. The workshops, on the other hand, revealed areas in which teachers' needs were not being fully addressed. The teachers benefited from unpacking concepts related to the topics being covered but seemed to struggle with a concept such as "logic gates". The depth of knowledge that the facilitator showed helped them in this regard. The teachers had certain preferences about the training, though, and in that sense the workshops might have compromised their needs (Mouton *et al.,* 1999). The findings highlighted a number of areas in which the teachers had hoped to be capacitated, including the mini-Pat (as observed in one teacher's struggles during a school visit); and design process through which the mini-Pat is taught (the predominant method for teaching Technology). Teachers' PCK is lacking in this regard, as noted in the literature (Juuti *et al.,* 2017); thus, it is crucial that they be better empowered, especially if they are not yet sufficiently qualified in the subject. The extent of the teachers' needs suggests that they require a training of longer duration (Mewborn & Huberty, 2004; Reitsma & Mentz, 2007; SADTU, 2014). Juxtaposing the under-qualification of the teachers (DoE, 2006; Mapotse, 2012) adds to the need for intensive teacher training over extended periods of time. The study's findings show that the brevity of such interventions may contribute to the allegation that the workshops are largely ineffective (Villegas-Reimers, 2003) and represent little more than state-funded skills development programmes (Steyn, 2008). The fact that the teachers' PCK is lacking in certain areas, and that Technology is still a relatively new subject, creates a need to approach their training differently, e.g. to train them for extended periods of time. This will make them acquire the necessary technological knowledge and become experts in terms of knowledge and teaching (Shulman, 1987).

Teachers' workshops should immerse teachers more in the "how" of facilitating learning for learners (i.e., the pedagogical aspect). Even if they are knowledgeable on the subject matter, but poor pedagogically speaking, they will not achieve the desired results in their teaching. As a learner commented about a Mathematics teacher when the researcher was still a teacher at a secondary school: *"Mr X knows Mathematics, but for himself. He cannot impart it to us"*. This could be the same with Technology teachers if their pedagogical training is compromised.

The workshops did not capacitate teachers regarding their pedagogy – they mostly completed set activities, instead of practising how to teach the concepts. It is important to consider the notion of PCK as being more about presenting (Shing, Saat & Loke, 2015). The findings revealed that the teachers referred to aspects that did not necessarily fall within the PCK framework, which pertained to the plight of their learners and resources. However, knowledge of the characteristics of learners and educational contexts forms part of Shulman's (1987) framework, which suggests that they cannot simply be dismissed as "seemingly non-PCK" elements. Also, pedagogical knowledge directly implies having to use specific resources as delivery modes in teaching subject content. Any training that still treats content as separate from pedagogy thus counters the progressive work of Shulman's framework. A lack of knowledge and skills, especially when it comes to using advanced technological resources (such as the smartboard) or a lack of resources, only complicates the teachers' job. They are forced to cope with learners who are interested in learning, but struggle to understand the subject because it is taught theoretically. Imparting Technology-related pedagogy without the most vital technological resources under serves the learners, thereby denying the importance of Mishra and Koehler's TPACK framework.

7. CONCLUSION

Teacher education should involve the ongoing re-skilling and up-skilling of teachers. Professional development training, which mainly happens through workshops, is an important strategy for achieving this. In response to the research questions, this study has shown that teachers' needs should not be overlooked in their development. The main contribution of this study was therefore to highlight the importance of considering teachers' needs in respect of their professional development. It should thus be borne in mind that professional training should be designed such that it is needs-driven – it may not succeed if teachers' needs are compromised. The MSTA workshops targeted certain subject matter knowledge areas but were not informed by the teachers' needs (e.g., learning how to teach mini-Pat). It is recommended that future workshops begin by exploring the participating teachers' professional development needs so that the content that is presented aligns with those needs. Included may be aspects that might appear to fall outside of the PCK framework but have an impact on teaching practice. Serious consideration should be given to extending workshops to ensure that teachers acquire the necessary knowledge and expertise to enable them to become subject experts who have mastered the necessary pedagogical knowledge and skills. The workshops should be primarily about capacitating teachers so that they can present the content to their learners. The MSTA should offer ongoing support to teachers after such workshops, in order to supplement their training, where needed. The DBE should also consider sponsoring Technology teachers to register for programmes that will qualify them as subject specialists.

The limitation of this study is that it focused on one-off workshops. Hence, a further study should be considered that tracks the professional development of teachers over an extended period.

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