



Teachers Pedagogical Content Knowledge in Graphical Communication Concept: A Case of Four Selected Township Schools

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ABSTRACT

This study investigated grade 8 teachers' challenges in graphical communication by using a qualitative research approach. We planned to sample eight grade 8 teachers for the study. However, due to the Covid-19 restrictions, we had eight grade teachers offering Technology subjects. The pedagogical content knowledge notion coined by Shulman was used to underpin the study as a framework. Data were collected through face-to-face interviews with the teachers and classroom observation during graphical communication concept teaching. We analysed interview data using verbatim quotes and used classroom observations descriptively. The study's findings revealed that teachers are not adequately trained to teach Technology subjects. Issues such as overcrowded classrooms and poor infrastructure were also challenging. Teachers' instructional strategies were an additional concern as the traditional method is still widely employed in teaching the mentioned concept. Our study recommends that models be sought for abstract concepts to be readily learned. Schools must secure qualified teachers for the subject for teaching and learning to be effective. Technology integration is also advised as a resource that would stimulate learning.

KEYWORDS

Graphical communication; engineering graphics and design; pedagogical content knowledge; content knowledge; pedagogical knowledge.

INTRODUCTION

An inflexible contestation exists on the word “technology” across different countries. In the South African classroom, technology is a subject learned at the primary school level and in some degree courses in selected universities. It allows learners to make informed decisions on engineering careers in high school and ultimately at the university level. However, like in other countries, technology is a resource used to teach. According to Makgato et al. (2015), the word technology as a subject means art, skill, craft, or the way, manner, or means by which a thing is gained and expressed. It means that in the subject of technology, most activities are initiated through art, skill, and craft. However, to be successful in the craft part of technology, they need a drawing, which in this instance is defined as graphical communication in one of the best ways in the South African context. Technology subject is offered from grades 7 to 9, wherein graphical communication is a concept that continues to challenge learners. Such gaps are witnessed in the further education and training (FET) band or high school level, where they (learners) lack basics in engineering graphics and design (EGD). Technology starts in Intermediate Phase grade 4, as natural sciences and technology (NSTECH) and ends in grade 6. Then, it is called a technology subject in Grades 7 to 9, where learners are exposed to many engineering concepts of STEM and practice concepts, like structures, mechanical systems, and control, as well as graphical communication.

The stipulation, as it appears in the policy document, curriculum, and assessment policy statement (CAPS), shows that technology subject in the Intermediate phase is offered for three or five hours a week (Department of Education (DoE), 2011), and it includes practical and theory. It indicates that the subject offers flexible hours for teachers to plan and distribute the content evenly in the classroom that would foreground the learners in their early stages of learning. However, in Senior Phase, it is offered for 2 hours a week, which is dramatically different from how it is provided in the lower levels. Technology as a subject did not exist in the fundamental school calendar; it has recently been introduced. It means that most teachers offering it are not yet well conversant with the subject, particularly the technically oriented concepts, like graphical communication. The main aim of graphical communication is to provide learners with the skill to solve problems graphically (DoE, 2011). It needs good content knowledge (CK) from a teacher to drive the learner’s activities in Graphical Communication content.

According to Reddy et al., cited in Gumbo and Makgato (2008), technology subject teachers were being blamed for their apparent inability to prepare their learners with the knowledge and skills to keep up with changing technological world. The DoE (2000) found that a lack of resources causes difficulties in imparting practical skills in the subject, the teachers not possessing adequate skills and knowledge in the subject as well as poor teaching strategies. Moreover, Reddy et al., cited in Gumbo and Makgato (2008), argue that technology could be better taught and learned if teachers understand what should be taught and learned. According to Cobern et al. (2014), cited in Garcia (2021), a critical aspect of teacher education is gaining pedagogical knowledge of how to teach science for conceptual understanding. It should also be

the case in the subject of technology because it eases specializations like science, mathematics, and engineering courses for learners. Therefore, a teacher must be well trained to master the content to develop good PCK. Teachers should also thoroughly understand how teaching and learning occur in the technology subject classroom, especially in the practical task, as it aims to prepare learners for career choices.

According to DoE (2008), most South African teachers do not possess the necessary knowledge and skills to support English language learning and teach literacy skills across the entire technology curriculum. It means that most Technology subject teachers might often resort to vernacular use instead of sticking to the English medium. Norstrom (2014) studied the view of Swedish technology teachers on technological knowledge and noticed that the technology teachers had different opinions on Technological knowledge, possibly leading them to prioritize what to teach and how to assess. According to Perez and Serrano (2012), the high failure rate among learners of graphical communication is a day-to-day issue emanating from the difficulties in teachers' methods of instruction. These challenges filter down to learners reluctant to continue with EGD in upper levels in their school years.

Furthermore, Branoff and Dobelis (2012) state that the gap between natural sciences and graphical communication continues to be the cause making learners not grasp this concept (graphical communication). As the subject of technology is practical, so is graphical communication. Then, it places the teacher's role and instructional practices at the center. It also requires that learners have their learning experience with the help of good teaching.

Mawson (2007) suggests that learners should be allowed to discover their ability to reach their decisions, state and visualize their ideas during the design process and engage in "lateral thought built on the recognition of their own existing knowledge and ability." Lewis (2006) supports it, also contending that children should be permitted to achieve creativity during graphical communication. By doing so, the drawing's surprise problem/solution spaces will replace the design's default nature for creativity (Dorst & Cross, 2001). In simplicity, constructivism embraces the notion of learners' autonomy or creativity during the learning process (Bodner, 1986). According to Asik (2010), a learner's autonomy is a substantial measure of independence from others' control. This assertion shows that for learners to be able to learn on their own, they need teachings enabling them to achieve that. The subject technology activities are initiated through art, skill, and craft. However, to be successful in the craft part of technology, they need a drawing, which in this instance is defined as graphical communication in one of the best ways. According to South Africa's policy document, CAPS, identify, design, make and evaluate and communicate (IDMEC) processes form a backbone of the technology subject and should be used to structure the delivery of all learning aims (DoE, 2011). Learners should be exposed to a problem, which should eventually give them a need to describe a problem scenario through the first process of Investigation. Then, it requires learners' understanding for the sake of drawing as in art and using appropriate symbols instead of jargon language of graphical communication to design needing drawing skills. The IDMEC process plays

a vital role in teaching and learning technology subjects and centers around drawing concepts embedded within graphical communication.

Currently, more than ten-line types exist that are key in drawing and useful in graphical communication to which learners must be exposed. Meanwhile, Moolman and Brink (2010) contend that for one to excel in any drawing tasks, they need to understand line work and line types used in the school curriculum. Our study aimed to investigate teacher challenges in a grade 8 technology subject class teaching graphical communication concepts.

Our study is critical because the graphical communication concept is the main gateway for learners to make informed engineering and technical career choices and select relevant secondary school fields. It also demands the best instructional practices the study zoom into from the teachers. What pushed me as a researcher to embark on the study is the reluctance of the learners to continue with EGD in Grades 10 to 12. Above all, learners cannot display basic design process skills when they conduct technology subject projects. Learners given them as problem scenarios cannot excel in the design process skills requiring sketches. Such gaps are honed within the graphical communication concept.

LITERATURE REVIEW

Umugiraneza and Bansil (2018) discovered that most teachers use traditional methods when teaching Euclidean geometry to explore teachers' practices in teaching Mathematics and Euclidean geometry. It can always be the case in most subjects because traditional methods mean teachers are in charge and learners are passive. However, learners would be lost in a practical concept like graphical communication. Graphical communication ensures that learners choose a promising career where problem-solving skills would be critical (Skosana, 2017). It is where learners are coerced to be hands-on when making drawing activities that they are given. These activities often lead learners to design and make prototypes as part of their final product of the activity needing the teacher's knowledge. According to König et al. (2017), the teachers' professional expertise for successfully mastering tasks typical of their profession is crucial. Teachers must have professional knowledge from where they were trained to prepare well for the classroom.

Additionally, König et al. (2017) state that general pedagogical knowledge involves "broad principles and strategies of classroom management and organization that appear to transcend subject matter" as well as knowledge about learners and learning, assessment, and educational contexts and purposes. They further say that teachers must exploit this knowledge and weave it into coherent understandings and skills if they are competent to deal with what McDonald (1992) called the "wild triangle" connecting a learner, subject matter, and the teacher in the classroom. In the classroom context, it is vital to ensure that optimal learning through good PK is enhanced.

According to Khumalo (2004), 67.45% of technology teachers received in-service training before introducing technology as a subject. However, it has changed because most higher

education institutions (HEIs) produce technology teachers. As it may, the school system still has those teachers who have not gone through the current system where technology was learned. It implies that many teachers in the system were not trained to implement the technology subject. Then, this fact could pose challenges for learners who might not have gone through the superior teaching technology subject strategies in their classroom. In a study by Garrone-Shufran (2021), they indicate that teachers can only offer explicit instruction in the academic English of an academic discipline if they are trained to do so. This assertion includes any other field in the school setting, and graphical communication is included because Shulman (1986) attests that a teacher's CK is one of the driving forces toward one's PCK in any instruction.

According to Nakin (2003), a child's ability to perform a given cognitive task depends on his intellectual development. Depending on its nature, a child cannot complete it unless he is biologically mature enough (in cognitive terms) (Nakin, 2003). If a child cannot perform a given task, they must be given a more concrete (practical) task to stimulate learning (Nakin, 2003). It makes demands on the instruction of the subject, including graphical communication. It implies that graphical communication must be well understood by the learner because through drawing and sketching, learners learn concretely if they know what they draw (Khoza, 2017). However, to make all this possible, a teacher should be there presenting one of the best instructional practices of the concept, which is what the study aims to ascertain.

Research Problem

Graphical communication prepares learners to choose and be competent in elective subjects at the secondary school level. It provides learners with opportunities to decide on which pathways they can choose between civil, mechanical, or electrical technologies. However, currently, we have noted the reluctance among technology teachers during seminars and workshops when trained on graphical communication as being concerned. Technology teachers are not keen on attempting graphical communication tasks, the same attitude that most learners show at the secondary level when they do civil, mechanical, or electrical technologies. We worry that if such practices persist, this could rid learners of the opportunities to choose relevant career paths and be competent in EGD, serving as one of the compulsory subjects in engineering. The continuing practice by teachers to overlook graphical communication would add to the continuous challenges that the science, technology, engineering, and mathematics (STEM) subjects experience. Therefore, learners fail because of lacking foundation that they should have had at lower levels like the general and education and training (GET) band. The challenges that learners showcase at the secondary school level are the gaps experienced in graphical communication in the lower grades, particularly in Grade 8 and 9. It then puts the teachers' instructional practices into the spotlight hence this study's undertaking. This study used Schulman's (1987) pedagogical content knowledge (PCK) theory as an underpinning body to investigate teacher challenges in graphical communication in a grade 8 class.

Research Question

What are the teachers' PCK in graphical communication concepts in a grade 8 technology class?

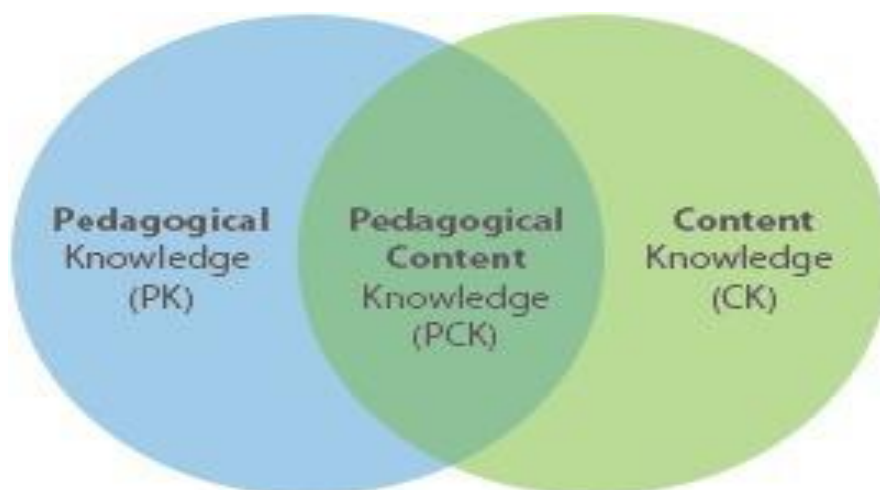
Research sub-questions are;

- What are teachers' instructional practices in graphical communication in grade 8 class?
- How do grade 8 teachers assess graphical communication in their classes?

THEORETICAL FRAMEWORK

Lee Schulman's pedagogical content knowledge notion underpinned this study. Pedagogical content knowledge (PCK), according to Shulman (1987), entails how learners' content, pedagogy, and knowledge are blended into an understanding of how particular topics to be taught are represented and adapted to learners' characteristics, interests, and abilities. The PCK informs how the teacher introduces a specific content to learners in a different context. The content knowledge is about what the teacher possesses regarding how they can teach a specific content using different strategies (Shulman, 1987). The PCK notion assisted the study in ascertaining how teachers approach graphical communication in their grade 8 class and what challenges they encounter in the teaching process. Because most technology subject teachers are not adequately qualified to teach the said subject, where graphical communication is a concept, the PCK notions proved useful in exposing grade 8 teachers' instructional gaps. Below is the PCK model depicted by Shulman (1987):

Figure 1. *The PCK Model (Source: Shulman (1987))*



The above model is informed and shaped by the knowledge bases that teachers must make pedagogical decisions to transmit knowledge to the learners better. Shulman (1986 and 1987) understands these to be content knowledge (CK), referring to the amount and organization of knowledge in the teacher's mind. Hence, general PK plays its special reference to the principles and strategies of classroom management and organization as well as PCK. The

teacher should portray this expertise in approaching the content (Shulman, 1987). Kultsum (2017) says that CK and PK are critically needed in teaching a subject. The PCK can thus develop teachers' belief in teaching a particular topic in a better way. It would then help teachers understand how to explore their content knowledge and deliver it into good instruction. According to König (2016), PCK is the knowledge of CK, PK, and knowledge of learners combined. It illustrates that for one to have a good PCK, connecting the other two concepts of Shulman's notion is crucial. On the idea of CK, we observed how the teachers demonstrated their knowledge of graphical communication and asked them through face-to-face interviews on challenges. They experience them in teaching graphical communication as a follow-up question above what we observed in class. The issue of how the teachers utilize various teaching resources and methods was observed under the concept of PK.

Loughran et al. (2012) argue that a need exists for concrete examples of PCK where teachers teach specific topics. It was suitable because we were interested in graphical communication as a concept or subject. In contrast, the combination of how much they know (CK) and how they teach (PK) was used to conclude the strength of their PCK.

METHODOLOGY

Research Approach

The study employed a qualitative research approach as a means of providing answers to the research questions posed. According to Marshall and Rossman (2011), the investigative inquiries often make knowledge claims based primarily on constructivist perspectives (i.e., the multiple meanings of individual experiences, meanings socially and historically constructed, with the intent of developing a theory or pattern) or advocacy /participatory perspectives (i.e., political, issue related, collaborative or chance oriented) or both a qualitative approach. Therefore, qualitative research seeks to understand and interpret "the meaning of phenomenon from the views of the participants" and how they know the world around them.

Research Design

This study utilized a case study research design. According to Creswell (2014), research design refers to the plan or proposal in which the research will be conducted. Therefore, it involves the intersection of philosophy, strategies of inquiry, and specific methods. According to Creswell (2014), a case study is a design and inquiry found in many fields. It primarily evaluates where the researcher develops an in-depth analysis of a case, often a program, event, activity, process, or one or more individuals. Therefore, a case in our study was the technical schools in Johannesburg Central District sharing the same challenges of graphical communication.

Research Paradigm

The research paradigm for the study was interpretive. Myers (2020) argues that the premise of interpretive researchers is that access to reality (whether given or socially constructed) through social constructions such as language, consciousness, and shared meanings. Observation and

interpretation underpin the interpretive paradigm. Therefore, it involves collecting information about events while interpreting to make meaning of that information by drawing inferences or judging the match between the information and some abstract pattern. The researchers were interested in ascertaining the teachers' PCK in graphical communication in their grade 8 classrooms and understanding the phenomenon they encountered while teaching the said concept.

Population and Sampling

Gorard (2001) defines the population as the group one wishes to study. Purposive sampling was used to select ten technology grade 8 teachers from all the schools. The study's population included four (4) schools in the Johannesburg Central District, in the Gauteng province of South Africa, offering technology subjects. Currently, ten technology grade 8 teachers and 1015 grade 8 technology learners exist in the said district. However, due to the Covid 19 restrictions, we recruited eight of these teachers. Sampling refers to the activities involved in selecting a subset of persons or things from a larger population (Scott & Morrison, 2006). The purpose is to use a relatively small number of cases to make inferences about the population (Gorard, 2001). The teachers were selected purposefully among those with more than five years of experience teaching technology grade 8 subjects. Data were collected through interviews as well as classroom observations with all eight teachers. Interviews were open-ended to allow teachers to elaborate eloquently on challenges they encounter in teaching graphical communications. Kvale and Brinkmann (2009) describe qualitative interviews as "a construction site of knowledge," where two or more individuals discuss a "theme of mutual interest." We have also conducted classroom observations to pursue how teachers taught graphical communication to their grade 8 class. As researchers, we had to adapt the observation schedule using the PCK notion as coined by Shulman (1987). Observation is central to qualitative research (Marshall & Rossman, 2014) because "observations entail the systematic noting and recording of events, behaviors, and artifacts (objects) in the social setting" (Marshall & Rossman, 2014). Pseudonyms were used to protect the teachers' identities, and all the Covid 19 protocols were adhered to when collecting data. We analyzed face-to-face interviews using verbatim quotes and classroom observations descriptively.

FINDINGS AND DISCUSSIONS

Classroom Observation Findings

The classroom observation helped the study answer RQ1 and RQ2. The PCK notion was used to adapt items in teaching graphical communication lessons. Each teacher was observed once per the teachers' requests due to the restrictions in place in adhering to Covid 19 restrictions. Each class ran for 60 minutes, and not all teachers were observed for the entire duration because some let the learners go at the end of the activities.

Content Knowledge

Not all the teachers displayed the relevant CK on graphical communication. Ms. Ngakane (*pseudonym*), claiming that she has been converted to teach technology, illustrated gaps in ascertaining learners' pre-knowledge during the lesson on graphical communication. Her class and the other four teachers from different schools taught technology subjects for more than five years. However, they did not accentuate the issue of line-work and line types, which are critical in graphical communication, particularly as the foundation for the grade 8s. Nonetheless, Ms. Mdluli teaching technology for seven years, continued the lesson without engaging learners on prior knowledge. Her action is said to play a prominent role in absorbing new concepts in the classroom. According to Shulman (1986), prior knowledge works as a gateway to learning because it assists the teachers in gauging and unpacking their curricula saliency in the topic they teach. With Ms. Mdluli's approach, learners' gaps in applying line-work were not picked up. Her (Ms. Mdluli) explanation of the concept that she taught of orthographic projection was more theoretical than practical, having much abstract content, which we believed was too difficult for the learners to understand. It was worsened because her class, the same as other classes we visited, was overcrowded. Even though both teachers were aware of the practical task learners had to do, they did not accentuate the design process resting solely on line-work. It happens even when line-work is the backbone of any graphical communication activities postulated by Moolman & Brink (2010).

Moreover, Mr. Kgomo came to class and displayed the kind of project learners need at the end of the lesson. He did not take them step-by-step with understanding the IDMEC process, the cornerstone of making technological projects in the technology subject. His display of CK could lend learners to lack cognitive applications when doing graphical communication-related tasks because, according to Nakin (2003), a child's ability to perform a given cognitive task depends on his intellectual development, sourced from the content they receive in the classroom. It could create a new challenge adding to the findings of DoE (2000). The lack of resources, the teachers with inadequate skills and knowledge in the subject, and poor teaching strategies impart difficulties in the practical skills in the subject

Mr. Buthelezi displayed good CK in his lesson; however, he spent much time not aligning his content to what the learners' practical task should be about. According to Shulman (1986), CK refers to the amount and organization of knowledge in the teacher's mind. Nevertheless, not all the teachers displayed that creating challenges to the learners, hence their persistent challenges in graphical communication.

Pedagogical Knowledge

Pedagogical knowledge (PK) refers to the methods and processes of teaching and includes knowledge in classroom management, assessment, lesson plan development, and student learning (Shulman, 1986). The classroom observations depicted that teacher lacked relevant instructional pedagogies separating the lack of appropriate drawing instruments and non-existent drawing models. Therefore, this condition would allow learners to learn concretely and

poor teaching approaches where pre-knowledge was none. Learners were keen to start with the design process of their practical task, but they lacked support from the teachers on how they were supposed to use drawing instruments. Mr. Kgomo came and displayed the final product of an isometric (three-dimensional) view to the learners without unpacking the IDMEC process using the overhead projector. This approach could lead learners to quickly rush to the final product without proper understanding and to struggle with the concept of graphical communication at upper levels. The method Ms. Mdluli used, not ascertaining learners' prior knowledge, could create a situation where a teacher persists with their lesson without noticing learners' misconceptions about the topic. This fact could endanger them in the linked concepts to graphical communication. Lack of equipment as well left much to be desired. None of the teachers integrated ICT except for Mr. Kgomo, who came close by using the overhead projector, regarded as one old teaching resource. Some schools did not even have drawing instruments and models, making learning difficult. The issue of crowded classrooms was also a concern. These observations posed challenges for the teachers because, according to Shulman (1987), PK plays a role in one's principles and strategies of classroom management and organization. This poor pedagogical knowledge added to the learners' challenges in graphical communication rendering them not unable to solve problems graphically, as alluded to by the policy document (DoE, 2011).

Pedagogical Content Knowledge

Pedagogical content knowledge (PCK) is a concept dealing with explanations and demonstrations. It executes the ways of representing and formulating the subject, making it comprehensible to others (Shulman, 1987). With the current overcrowding in most classes we observed, coupled with poor CK and the lack of PK, it was difficult for teachers to showcase a good PCK. As Ms. Ngakane has no official academic experience with technology subjects, displaying good PCK is often difficult because of poor teaching methods (Shulman, 1987). König et al. (2017) attest to it, claiming that PCK is the knowledge of content subject matter (CK), PK, and knowledge of learners combined. And the moment one fails to connect the first two concepts, the instructional practices are not balanced, causing continued challenges in graphical communication. With Ms. Mdluli continuing the lesson without engaging the learners on what they already know, she could link their knowledge to the new concept. Her PCK was affected because, according to Shulman (1986), PCK is interrelated to the teacher's CK and PK. The same applies to Mr. Kgomo, who used a challenging method in the grade 8 class and demonstrated the final product without taking them step by step toward achieving it. Learners could culminate in rushing toward the final product without clearly understanding how to reach there and make Mr. Kgomo's PCK weak.

Face-to-face Interview Findings

The interviews were held with technology teachers teaching technology in grade 8 classes. When responding to the first question on challenges faced in teaching graphical communication,

teachers cited a lack of support from the schools in securing models for abstract concepts in graphical communication. Teacher 1 (Mr. Buthelezi- pseudonym) said:

It is difficult to explain abstract concepts to learners at a lower level like grade 8, and we end up losing them.

Another teacher, Ms. Ngakane, said:

I have been teaching technology for five years, but I never went to train for it. So, it is difficult for me to teach the drawing part, and I end up skipping it.

One teacher from the third school, Mr. Pule, added:

How do you explain isometric drawing on a square grid? It all becomes difficult to do, and that is where we lose these learners.

However, Ms. Mdluli said:

I find it annoying to teach while checking who is misbehaving in class. We have many learners, as you have seen in my class, and if I decide to go and check on them, I end up not accomplishing what I go for to the class.

It was echoed by Mr. Kgomo, who added:

I have 63 learners in technology grade 8, of which I should teach, mark, and evaluate. How do I do that if I am limited to a chalkboard to teach? It would be great if there were some technological gadgets, I could use together with them so that we can all be on the same page.

The above findings prove that teachers do not have a good PK due to issues beyond their control. Some have a weak CK; thus, their PCK is affected because they seem to have poor teaching strategies. It negates what Shulman (1987) says: PCK is a special amalgam of content and pedagogy unique to the teachers. According to Kultsum (2017), CK and PK are critically needed in teaching a subject, and combined concepts make one have good PCK. However, technology teachers lack dismally in that regard hence the continuing learners' challenges in graphical communication due to their difficulties.

When asked how they allow learners to work together in planning and making technology projects, here are their responses: Mr. Itumeleng said:

We do not have time to make learners work as a group because of this rotation of learners due to the Covid 19 restrictions.

His colleague (Ms. Ngakane) said:

I often get on the wrong side of the law with my head of department due to material wastage when I leave learners working alone.

Nonetheless, Mr. Buthelezi said:

I personally do not give the learners projects because marking the design process is still something I need training on.

Mr. Kgomo said:

I do group the learners at some point, but when I get to mark the projects, I do not see any creativity in them because all of them are the same. Maybe this could be caused by the fact that I find it tiring to always act like their watchman because managing a huge class in a practical lesson is hard.

Ms. Mdluli added:

I hardly allow them to work together because I avoid noise. I rather give them a project and say they should go and do it at home and give them timelines to submit.

The expressions above illustrate that teachers lack the PK that could assist them in teaching better. The instructional practice continues to be a problem, thus affecting the progress of the learners. Because PK refers to the methods and processes of teaching and includes knowledge in classroom management, assessment, lesson plan development, and student learning (Shulman, 1987), teachers seem to struggle in that regard challenging the learners. This generic form of knowledge applies to understanding how students learn general classroom management skills, lesson planning, and student assessment, which learners do not benefit from at this stage. Pedagogical knowledge, discussed by Rollnick et al. (2008), was affected due to a lack of classroom models or classroom resources. The issue of classroom congestion because of learners' numbers and lack of teaching resources is a major problem for the teachers' PCK. They are added on as some teachers have been converted to teach technology subjects, and they could be taking time to adjust to it and the concept of graphical communication.

CONCLUSION

Our study investigated teachers' PCK teaching graphical communication in a grade 8 class in the Johannesburg Central district. The study's findings provided issues emanating from teachers' instructional practices culminating in making learners have challenges in subjects like mechanical technology and other technologies in the FET phase. Schools do not have enough teaching and learning resources. Moreover, teachers are not qualified enough to teach Technology subjects wherein Graphical Communication is a concept. Then, it exposes teachers to the CK, worsened by poor PK rendering the teachers' PCK weak. The school must work with DoE to assist in retaining qualified teachers to teach Technology subjects. Graphical communication as a concept must be contemplated with the procurement of drawing models, instruments, and enough time for learners to practice and perform well in the design process. It is a crucial aspect of technology subject. Then, as Shulman (1986) said, it requires a qualified technology teacher to display a good CK and ensure that teachers can perform the most valuable forms of representation of content, powerful analogies, illustrations, and formulating the

subject, making it understandable to others.

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