Asian Journal of Social Science Research (e-ISSN: 2600-9706)
Volume 7, Issue 1, 2025
DOI: https://doi.org/10.5281/zenodo.15825553

THE UNDERLYING FACTORS OF OUT-OF-FIELD TEACHING: A SPOTLIGHT INTO MECHANICAL TECHNOLOGY SUBJECT IN THE NORTHWEST PROVINCE, SOUTH AFRICA

Nokulunga Andile Sibiya[1,*], Samuel Dumazi Khoza[2]

[1,2]Faculty of Humanities, School of Education, Tshwane University of Technology, South Africa

[*]Corresponding author, khozaSD@tut.ac.za

Received Date: 01/04/2025 Accepted Date: 30/05/2025 Published Date: 30/06/2025

ABSTRACT

This qualitative study unpacked the underlying factors of out-of-field teaching in the Mechanical Technology (MT) subject in the North West Province, South Africa. The MT subject is a specialised subject that needs deeper teaching for learners to be exposed to its practical links. However, the instructional practices of MT in the education district where this study was conducted, are hampered by the influx of out-of-field teachers, thus denying the learners greater opportunity for skills acquisition. A sample of eight MT teachers was purposefully and conveniently selected for the study. The pedagogical content knowledge (PCK) notion was used as an underpinning framework, where classroom observations and face-to-face interviews with the teachers were used as data collection tools. The findings reveal that the MT teachers are being converted to teach MT and that results in a surface content delivery. This is exacerbated by the improper selection of teaching tools and strategies because teachers are not well-conversed with the subject. The study recommends that the Department of Education should avoid absorbing teachers who are inadequately trained for MT and start a serious recruitment process. This will ensure that content mastery is enhanced which would allow teachers to select adequate teaching tools and strategies.

Keywords: Out-of-field teaching, Mechanical Technology, pedagogical content knowledge, instructional pedagogies, teacher development

Asian Journal of Social Science Research (e-ISSN: 2600-9706)
Volume 7, Issue 1, 2025
DOI: https://doi.org/10.5281/zenodo.15825553

INTRODUCTION

Teaching out-of-field is a phenomenon where teachers are assigned to teach subjects for which they have inadequate training and qualifications (Hobbs, 2020). This makes the entire instructional practice a risky affair because teaching goes hand in hand with philosophies and the 'know-how' of what is to be taught. Mechanical Technology (MT) is a technical subject that is offered in technical schools, South Africa included. It (MT) is sub-divided into three streams: Automotive repair and maintenance, Fitting and turning, and Welding and Metalwork. The fact that MT prepares learners to be well conversant in the technical 'know-how', it becomes imperative for its teacher to know what and how to teach it. The Curriculum and Assessment Policy Statement (CAPS) statement for Mechanical Technology subject (DBE, 2011), defines MT as a subject that focuses on concepts and principles in mechanical (motor, mining, shipping, rail, & power generation, etc.,) environment, and technology processes. It embraces practical skills and the application of scientific principles. It is within this premise that MT teachers need to know what and how to teach hence this study. However, in the context where this study was conducted, it was found that many MT teachers were 'converted' to teaching MT for various reasons that the study aimed to unearth. This is despite the province, being rich in mining (which is one of the main skills that emanate from MT), where one would think that teachers in the said subject would not struggle to be sought.

Since mining is the cornerstone of any economy, the quality of teachers in the production of mining skills that fall under MT needs more attention for international trade purposes which results in the economic growth of any country. According to Du Plessis (2015), teacher effectiveness and quality teaching receive international attention. Du Plessis (2015) further adds that teacher quality, effectiveness in the classroom, and quality teaching currently receive global attention and are considered complex concepts for discussion. It is said that when teaching is not of great quality, thus preparing one towards skilled labour or for employment or self-sustenance, such teaching is inappropriate and needs to be investigated and refocused (Weldon, 2016). Therefore, when one is teaching in an out-of-field position, there are dire consequences. According to Makovec (2017), the role of the teacher is never uniquely defined, and its definition is influenced by many factors. It is defined by cultural and social events and the environment, and both influence the differences that occur in the conceptions of the roles of teachers within different cultures and societies, including the geographic environment. The factors that influence the role of the teachers are internal and external. Internal factors include those that influence a teacher's perception of his or her role. This is supported by what Porsche (2020) said that in other countries, primary school teachers are trained as specialists. The external factors include the views and expectations of the role of the teacher, which arise from other stakeholders, such as pupils, parents, colleagues, school leaders, and the public. This means that if the teacher is not aware of the expectations that the stakeholders have in what they teach, teaching itself would be meaningless. Hobbs (2020) adds that teaching out-of-field occurs mainly because we do not have teachers in the system who match the subjects taught in schools. However, South Africa and all its nine Provinces do have tertiary institutions that produce MT teachers. Despite the many earning and teaching institutions in South Africa, the out-of-field teaching persists. Therefore, this study aimed to source out, the impeding factors that coerce schools in the North West Province to make use of out-of-field teachers in a scarce and important skills subject like MT. The study was driven by the following objectives:

- To ascertain the underlying factors that give rise to out-of-field teaching in the MT subject
- To come up with strategies to curb the continued use of out-of-field teaching

DOI: https://doi.org/10.5281/zenodo.15825553

The above objectives translate in the following research questions:

- What are the underlying factors to the out-of-field teaching in the MT subject in the North West schools?
- What are the strategies that need to be put in place to curb the continuing use of out-of-field teaching?

LITERATURE REVIEW

International research highlights that many teachers are required to teach out-of-field because of various reasons. In Australia, secondary school teachers are often required to teach across at least two subject specialisations, and many beginning teachers are provided with teaching loads outside their subject specialisations (Hobbs & Quinn, 2020; Weldon, 2016). This is not taboo in South Africa because when students choose major subjects in tertiary, they are required to at least choose two related major subjects. This means that students who do MT as a major, are most likely to choose either Engineering Graphics and Design, Mathematics, or Technical Science depending on the combinations of subjects in the said tertiary institution. But when someone finds themselves teaching what they did not go to tertiary for, raises eyebrows hence this study. and if that is not addressed, that would result in reduced achievement as espoused by Du Plessis (2015); and Mullis et al., 2016). This gives rise to the adaptation of inadequate teaching skills to other disciplines, which could disadvantage learners (Campbell, 2014).

Besides the fact that MT is one field that is not well-researched, it still requires its relevant philosophy for skills acquisition to be increased. According to Imants and van Veen (2009), teacher workplace learning is mostly enhanced when teachers work with students when they interact with colleagues in work that is related to students, and when teachers engage themselves in school activities. However, Atwal (2013) claims that teacher learning is promoted where both formal and informal learning opportunities are provided by the school environment. Atwal (2013) asserts that a substantial amount of teacher learning in the workplace is unintentional, that is, it is informal. The subject of MT consists of a compulsory generic core and a specialized elective in one of the above disciplines, which needs someone who is trained in it, which is not the case with many teachers in the North West Province of South Africa. In Australia for example, secondary science teachers are required to have developed science content knowledge, and professional practice, including an understanding of how science is taught, as well as an awareness of how to engage students in effective learning. There is an assumption, supported by some research by Du Plessis (2015) that out-of-field teachers have less discipline, content, and pedagogical content knowledge, hence a relevant working pedagogy. Studies have shown that subject-specific training of teachers is responsible for more effective teaching resulting in higher student proficiency (Porsch & Whannell, 2019). Thus, the phenomenon needs to be regarded as an important issue in teacher education, encompassing the phase of initial teacher education as well as the time after entering the teaching profession that provides opportunities for ongoing professional learning and formal professional development (PD) of teachers. It is within this notion that this study made use of pedagogical content knowledge (PCK) as its framework.

Asian Journal of Social Science Research (e-ISSN: 2600-9706)
Volume 7, Issue 1, 2025
DOI: https://doi.org/10.5281/zenodo.15825553

THEORETICAL FRAMEWORK

The PCK framework, which was coined by Shulman in the late 80s, was used to ascertain how the teachers teach the MT concepts and what curricular saliency they provide while teaching. Pedagogical content knowledge (PCK) has been a significant topic to be discussed in teaching quality for decades. Kultsum (2017) says that PCK is a combination of a specific subject of subject matter knowledge and pedagogical knowledge that is important for teachers to possess. These two domains are integrated. Subject matter knowledge known as content knowledge (CK) is the knowledge of the specific topic that the teacher is required to teach. For example, challenges faced by out-of-field teachers can reflect both the lack of a stronger CK and an improper use of and selection of teaching tools (PK). Mechanical Technology teachers should have the ability to understand Technology materials and be capable of delivering them to their students (Kultsum, 2017). PCK has three main concepts that are interconnected which a teacher should have. Content knowledge (CK) is the core knowledge of a teacher in a particular subject and specific content area (Kultsum, 2017, Shulman, 1987). For many years, some researchers focused on the discussion that teachers' CK impacts students' achievement. Those studies found that the lack of teachers' CK should find the difficulties of the teaching-learning process (Darling-Hammond, 2002). Pedagogical knowledge (PK) is another element inside PCK. The knowledge is related to the ability of teachers to deliver an effective teaching and learning atmosphere for all learners (the know-how). Experience in teaching would be a factor for teachers in developing the aptitude of PK (Gess-Newsome, 2016), however, we believe that experience without formal knowledge is not only questionable but could be compromised. Jones and Moreland (2015) argue that teachers require a range of pedagogical strategies (PK) to suit a range of situations. To choose the most appropriate strategy they need to know the understandings students have reached to engage in formative assessment. Underlying this is good content knowledge and good pedagogical content knowledge. They equate this blending of formative assessment, student understanding, and pedagogic strategy to Shulman's (1987) act of pedagogic reasoning. Therefore, a teacher with a good CK and who knows how to teach (PK), is considered to have a good PCK. This framework was used to interpret what the teachers said about their experiences in being out-of-field MT teachers and assisted in verifying if the teachers used relevant instructional practices to the learners. The framework was relevant in that it has concepts that are the pillars to teaching which are the CK and the PK. This is so because when one possesses a stronger CK and use relevant and latest instructional resources (PK), their PCK becomes good, hence the adoption of the PCK notion by Shulman.

DOI: https://doi.org/10.5281/zenodo.15825553

METHOD

The study made use of a qualitative research approach to ascertain the underlying issues of being out-of-field MT teachers. The research approach is a plan and procedure that consists of the steps of broad assumptions to detailed methods of data collection, analysis, and interpretation (Yin, 2014). It is, therefore, based on the nature of the research problem being addressed. Grover (2015) defines research approaches as the plans and procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation. The research design of this study is a case study. Yin (2014) argues that a case study deals with the investigation of a present-day phenomenon occurring in a bounded, real-world situation and that understanding that phenomenon is largely determined by the contextual factors within which that phenomenon takes place. The case in this instance was the one Province in the North West of South Africa, which boasts itself with platinum mining among others. Mining is a programme that is related to MT and that comes as a boost to the schools in the region where this study was conducted, particularly in MT. To have mining in an area where MT is big, puts learners in a good position because excursions can be held where learners get exposed by visiting the mine. Paradigms are essential for directing researchers' understanding of key aspects of reality, the nature of knowledge, and the methodologies utilised to acquire that knowledge. These paradigms consist of four elements, namely ontology, epistemology, methodology, and axiology, each of which significantly affects research design and is vital for upholding the integrity of a study (Jackson, 2022). According to Kivunja and Kuyini (2017) and Moon and Blackman (2017), these three components of paradigms can be described and applied in the context of a study, to the case of this study, as follows:

-**Ontology** refers to the nature of reality and what is considered to exist. In the context of this study, the integration of relevant instructional practices (PK) in the teaching of MT needs to be authentic. We focused on evaluating the effectiveness of tools, methods, and approaches in real-world contexts to ensure they address the practical needs of MT concepts.

-**Epistemology** "focuses on the nature of human knowledge and comprehension that you, as the researcher, can acquire to be able to extend, broaden and deepen understanding in your field of research" (Kivunja & Kuyini, 2017). In this study, we adopted an interpretive epistemological stance by emphasising practical knowledge and real-world solutions, which emanated from the MT teachers' CK.

-Axiology refers to the issues related to ethics that need to be considered when planning research, with special reference to dealing with participants and data. Four principles highlighted by Kivunja and Kuyini (2017) relate to privacy, accuracy, property, and accessibility. This integrative approach to the four elements of paradigms highlights the significance of understanding how different paradigms shape both the theoretical and practical dimensions of research and influence outcomes and interpretations across diverse fields of study.

A population is defined as the total group of people or entities from whom information is required (Du Plooy-Cilliers, Davis & Bezuidenhout, 2014). The population of the study was made of MT teachers teaching the subject from Grades 8-12 in one district in the North-West Province, some of them are out-of-field teachers. This district has an estimation of 23 MT teachers. Purposive sampling was used in this study. Purposive sampling is the type of sampling that was used to

deliberately select participants relevant to the study (Yin, 2018). Eight (8) out-of-field MT teachers, from eight (8) different schools, participated in this study. There were four (4) female and four (4) male teachers. There was no intention to choose an equal number of males, and females. The intention was to get participants who would provide me with as much data as possible. Purposive sampling was based on the judgment of the researchers, in that the sample is chosen based on the participants' characteristics or representative attributes, which purposefully inform an understanding of the research question and serve the purpose of the study (Leavy, 2022; Staller, 2021). The reason for selecting only 8 MT teachers was because MT normally has one class per level in a school and that results in having a maximum of three teachers per school and the school heads, often refuse to release all teachers to participate in research studies. Data was collected through face-to-face interviews and one lesson each of classroom observation. The interviews lasted not more than 25 minutes, and they were based on the concepts of PCK, and the classroom observations were conducted to see how and what teachers teach in line with the confines of CK and PK. The lessons were 1 hour long, and the observation was non-participatory. The participants were referred to as T1, T2, etc and consent forms were sent on time. Information letters were also sent and discussed with the participants in emphasizing issues of anonymity and voluntary participation. Both data were analysed thematically, whereas the interview ones had verbatim quotes. According to Braun and Clarke (2006), thematic content analysis is used to identify, analyse and report themes within the data about participants' experiences and realities. This is a multi-layered and iterative process, which involves reading the transcript, coding, deriving themes, and presenting those themes as findings (Creswell & Creswell, 2018). A simplified visual representation of this process, as used in this study, is shown in the Figure below.

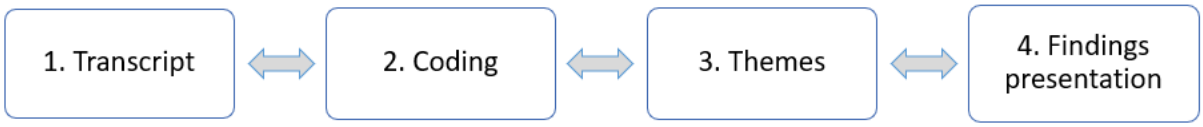


Figure 1: Thematic analysis process. (Source (Creswell & Creswell, 2018))

While listening to the audio recordings and writing the transcripts, impressions about the participants' tone and views developed and were recorded in a journal. Next, the coding process started. This was characterised by the production of several codes from the transcripts (Braun & Clarke, 2006). Coding, as defined by Nieuwenhuis (2016), "is the process of reading carefully through your transcribed data, line by line, and dividing it into meaningful analytical units". It involves assigning codes (tags or labels) to meaning units, such as words, phrases, sentences, or sections of the transcript (Nieuwenhuis, 2016). Issues of trustworthiness were enhanced where participants were ensured that data will be used mainly for the publication of the manuscript and before any further steps in publishing of the study, the researchers will share and verify the data with them to ensure that no false reporting is done. This was more of confirmability of the study. The issues of validity were enhanced where senior experts were brought in to ratify the instruments which were developed in line with the study's framework. Much as this was a case study, issues of transferability were not possible because other districts have schools of a different quintiles where resources, staffing and recruitment are done differently.

Asian Journal of Social Science Research (e-ISSN: 2600-9706)
Volume 7, Issue 1, 2025
DOI: https://doi.org/10.5281/zenodo.15825553

RESULTS

CLASSROOM OBSERVATIONS (THE UNDERLYING FACTORS TO THE OUT-OF-FIELD TEACHING)

The non-participant classroom observation sought to ascertain the level of CK that the teachers possess and how they teach it (PK). This was assisted by the definition of the two concepts where the researchers observed the way the out-of-field teachers link what they teach to the broader expectation of the MT subject. The first concept that was observed was the level of content mastery. During this process, teachers were not obliged to specifically teach any concept, but anything that they taught in MT. What was observed is that the MT teachers did teach in line with what the Annual Teaching Plan (ATP) entails but the issue that cut across was the lack of deep teaching that involved practical links and curricular saliency. The concept of CK produced one theme, that of the lack of deep teaching in the MT concept.

THEME 1: A LACK OF DEEP TEACHING IN AN MT CONCEPT

In ***T1's*** class, when she was teaching Bending Moments which involved forces, the content was of a satisfactory level but since the Bending Moment is about balancing members and forces, the teacher just explained the clockwise and anticlockwise moments and calculated the two reactions. The explanations were not related to any practical scenarios despite MT, being a practical subject. This prepared learners on only calculations and not the impact of the results or balancing of forces in the real world

T3 was teaching the Shear force diagrams which he started from the calculations of the bending moments section. He drew the beams and explained the forces and the reactions, and that what was needed was to check if the system was in equilibrium or not. By so doing, he did not explain the terminologies like equilibrium, equilibrant, and even forces. Even though the calculations went well and all reactions and supports counted to the system to be in equilibrium, the phenomenon of it all was not explained.

In the ***T5*** class, who was also teaching forces and power in belt drives, he put the formulae on the green board and explained how each formula can be used. On the formula of power $P= (T_1-T_2) \times v$, the teacher did not explain why one side of the belt is tight and why the slack side of the belt is slackened and the results of that. This, even though the calculations were correctly done, lacked the specifics and the practicality of power in belt drives.

T6 was teaching safety issues because the learners were about to start a Practical Assessment Task (PAT). A PAT is a systematic practical task that learners need to start by unpacking a scenario identifying a problem and technically developing a solution. The PAT that the learners were working on was to tune the idling of a car engine, thus ensuring that the timing of the engine is on cue with how it is supposed to be. What the teacher did is that she failed to explain the causes of a misfiring of an engine which could have assisted the learners in knowing why the engine must be tuned. The teacher just explained the problem and suggested ways how to begin without delving deep into the problem and what needs to be done. The flaws in her lesson were dampened by the fact that learners had to share four engines and only two of them had batteries.

This was observed in the rest of the teachers who demonstrated that what they know in MT, is merely what is said in the textbook.

On the issue of instructional practices (PK), the observations showed that teachers cannot choose the relevant teaching tools for the concept. Much as many of them used the chalkboard and smartboard during teaching, there was a lack of practical and demonstration in their teaching.

THEME: A LACK OF PRACTICAL KNOWLEDGE DEMONSTRATION

In **T1** class, when the bending moments' concepts were taught. It could have been great had practical examples of perhaps bridges and how they are supported be shown to the learners and how they withstand the fall. However, the teacher only concentrated on the explanation of how to calculate the reactions and not why the beam needs support. A textbook and a chalkboard were the only resources used. This was the case with the teacher who taught the shear force diagram and the one who was teaching safety in the workshop concepts. The instructional practices were more of a preparation on how to tackle a question and produce a solution and not exposing the learners to the deeper content through innovative methods that the MT subject needs. Much as the use of technology is a contentious issue, it has been verified through research that technology integration comes in handy in ensuring deep learning and understanding. However, none of the teachers used it because their schools did not have Wi-Fi and some it was because teachers could not use technology for something that they did not understand.

FACE-TO-FACE INTERVIEW (THE UNDERLYING FACTORS TO THE OUT-OF-FIELD TEACHING)

After observing how the out-of-field teachers taught the MT concepts, face-to-face interviews were needed to verify the challenges and experiences that the teachers had. When asked about their teaching experience and their confidence in teaching MT subject, one theme emerged, and below is how the teachers responded:

THEME: LACK OF TEACHING EXPERIENCE

> **T1** said: "*If you are going to teach MT whether it's General and Education Training (GET) or the Further and Education and Training (FET) band you need to be experienced with the subject knowledge and the teaching as an overall so that you can stand still in front of the learners. As for myself I only have 1 year 6 months in this teaching industry, which makes things difficult sometimes and sometimes I am not confident enough to stand and teach*".
>
> **T3** added and said: "*On my side, I think experience is necessary to become a better or a good teacher.* He further said: "*I was hired as a substitute educator. The main subject teacher was going on a five-month maternity leave. I was required to take over in the automotive stream, which was extremely difficult because it was different from what I had learned from the University. I never slept for the whole of term three (3) preparing, but I was never confident in standing in front of the kids and teaching. I would give them classwork and corrections only, which led to the kids performing badly. A content gap was created. I went to the Head of the Department (HoD) to express my feeling that I was failing content-wise. When the teacher came back then things got better because she knew the content and was confident about teaching the subject. This year I'm allocated to Grades 8 & 9 and allowed to study the streams. As of this year, I have an experience of 1 year and*

6 months, but I am still learning. Experience is an important factor, if you are experienced you become confident in doing your work".

T4 said: "*We understand that experience is important, but one needs to have a starting point in gaining experience, we also know that confidence mostly comes from experience.*"

T6 added: "*Yes, I think knowledge of the subject is more important because you cannot teach something that you do not know. So, experience is important because it's the main factor in getting you to be confident about your work*".

T7 added: "*Experience is very important, if you do not have experience, you lose self-trust if you do not trust yourself as a teacher your work will not be done, you lose confidence and automatically your learners are going to fail. So yes, experience in teaching Mechanical Technology is very much needed.*

When asked about the experience that the out-of-field teachers get when they start teaching MT, an overarching theme that emerged was that of shallow training that the department exposes teachers to, and below is what the participants said:

THEME: EXPOSURE TO SHALLOW MT TRAINING

T1 said: "*Firstly if you want to teach both streams of the MT subject the teacher needs to be consistent with the reading of the book and the constant use of YouTube videos to better understand the practical's better. Secondly, you need to attend the training workshops to assist you with a better understanding of the subject otherwise, you will resign with immediate effect because MT is a complicated subject that needs an experienced person*".

T3 added: "*With me the use of YouTube videos is essential, and it helps a lot. I also make sure that I attend all the teacher developmental workshops so that we can discuss the content as teachers that make us understand better because Mechanical Technology is a challenging subject*".

T5 further stated: "*Mechanical Technology is a challenging subject; it consists of both theory-based learning and practical-based learning, so you need to constantly read the prescribed book, watch videos, and make a connection with the subject advisors to help you update your knowledge.*

T8 said: "*When they implemented the Technical Subjects in 2016, the department of education here in the North West Province organised a two-week workshop to develop teachers so that is how I gained knowledge about the subject of Mechanical Technology and I also produced the first Matric in Automotive 2018*".

When the teachers were asked about the necessary teaching resources for MT theory, below is what they said:

THEME: LACK OF TECHNOLOGICAL INNOVATION

T2 said: "*As a Welding and Metalworks teacher, in terms of resources I use the textbook for chapter content allocation but to fully understand and elaborate on learners I prefer YouTube videos, they explain better plus everything is shown. Learners seem to enjoy the lesson where videos and posters are used. I also make use of the previous question papers; they help the learners see the questioning standard of the subject*".

T3 added: "*Textbooks are the greatest resource I have as an automotive teacher however laptops, projectors, and other screen models assist in better portraying the subject. Automotive repair and maintenance are full of theory which learners sometimes claim not to understand but with the use of charts demonstration and videos things do get better*".

T4 further said: "*I use the textbook as a primary resource; I then make use of the previous question paper. The use of previous question papers is a little bit tricky because not all the answers come from the textbook. I also make use of the old charts for demonstration and the old phased-out textbooks as well as the chalkboard for further demonstrations*".

DISCUSSION

The classroom observation proved that the out-of-field teachers are ill-prepared to teach MT subjects. Hattie (2009) reasoned that teachers remain the core and most significant resource in education. Teacher quality is often indicated by their academic preparation, certification type, and length of service, among others (Goldhaber & Anthony, 2003). Darling-Hammond (2010) argued that teachers who are deemed effective in classrooms and produce students with high achievements are those with sufficient academic preparation. Jones and Moreland (2015) say that a good teacher's knowledge of subject content was found to have a positive effect on decision-making related to changing pedagogical strategies for creating better learning opportunities. The level of teachers' CK was a testament that they could not plan properly nor choose the relevant tools to teach. Studies have shown that subject-specific training of teachers is responsible for more effective teaching resulting in higher student proficiency (Porsch & Whannell, 2019). Du Plessis (2017) recognised this when she suggested a 'Needs analyses should be conducted by school leaders so that they appreciate the nuances of the effects of teaching out-of-field and the individualised needs of teachers in these situations. Experience in out-of-field teachers can have both positive and negative effects. Within the framework of professional development, teachers change, improve in the professional field, as well as change, improve, and complement their pedagogical competencies and behavior, and change as a person. However, MT is a practical subject that needs serious knowledge that should go deeper than the training that teachers get exposed to.

CONCLUSION

The study found that many teachers in the education district of the North West Province find themselves in an out-of-field teaching position, particularly in the MT subject. Much as the districts and the schools do not seem to have any choice because of the slow pace of the recruitment process, out-of-field teaching has dire consequences. The out-of-field phenomenon arises because of systemic teacher shortages, unequal distribution of teachers, scheduling issues in schools, and the teacher education system in several countries where teachers are trained as specialists and not as generalists. In some countries, schools are essentially constrained by funding according to the ratio between teachers and students, therefore it is not always possible to have the right mix of teachers to cover the full spectrum of classes needed, especially in small schools. Teaching out-of-field occurs mainly because we do not have teachers in the system that matches the subjects taught in schools. The first response to this must be to increase the supply of the teachers we need and ensure they are distributed fairly. However, this will take time (Prince and O'Connor, 2018), so the teachers in the system need support and substantial learning opportunities. However, teaching out-of-field presents a challenge for teachers because of the need for them to learn new content, which requires not only time and effort during their teaching requirements but also a profound knowledge of learning strategies. Ultimately the locus of change tends to fall on teachers to learn to teach a new subject. Teachers can approach this with flexibility, resilience, openness, and diligence, and they can often (out of necessity) devote a lot of time and energy to this process. Teachers are often required to learn 'on the job' and often without support structures. The focus of teacher learning varies from teacher to teacher depending on the out-of-field and in-field subjects of a teacher; the stability of the teaching load; their teaching experience; the type of support teachers receives, leadership attitudes, and decision-making practices; and the dispositions of the teacher as a learner. Therefore, the study argues that when teachers are trained adequately and be allowed to teach what they have studied for, their CK will be relevant and stronger and if the teachers' CK is stronger, with the usage of relevant tools to teach (PK), then their PCK will be stronger and out-of-field teaching will be avoided.

ACKNOWLEDGEMENT

The main author would like to thank the Tshwane University of Technology and the North West Province district education schools for the studying and data collection opportunities respectively.

CONFLICT OF INTEREST

The authors do not have any conflict of interest in this manuscript.

CONTRIBUTION OF AUTHORS

The first author conceptualized the study, problematized it, and collected data, whereas the second author was the study supervisor at Masters level and assisted with the putting together of the manuscript.

REFERENCES

Atwal, K. (2013). Theories of workplace learning in relation to teacher professional learning in UK primary schools. *Research in Teacher Education.* 3(2), 22-27. https://doi.org/10.15123/uel.85w1x

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*,*3*(2),77-101. https://doi.org/https://doi.org/https://doi.org/10.1191/1478088706qp063oa

Campbell, C. (2014). Community Mobilisation in the 21st Century: Updating Our Theory of Social Change? *Journal of Health Psychology*, 19, 46-59. http://dx.doi.org/10.1177/1359105313500262

Creswell, J. W., & Creswell, D. J. (2018). *Research design: qualitative, quantitative, and mixed methods approaches* (5, ed.). SAGE.

Darling-Hammond, L. (2002). Research and rhetoric on teacher certification: A response to "teacher certification reconsidered". *Education Policy Analysis Archives, 10*(36). Retrieved from http://epaa.asu.edu/ojs/article/view/315/441

Darling-Hammond, L. (2010). *The flat world and education: How America's commitment to equity will determine our future.* New York: Teachers College Press.

Department of Education, South Africa. (2011). *Mechanical Technology: Grade 12. Government Printers.* Pretoria

Du Plessis, A. E. (2017). *Out-of-Field Teaching Practices: What Educational Leaders Need to Know*. Sense Publishers. doi: https://doi.org/10.1007/978-94-6300-953-9(open in a new window).

Du Plessis, A.E. (2015). Effective education: Conceptualising the meaning of out-of-field teaching practices for teachers, teacher quality, and school leaders. *International Journal of Educational Research, 72 (2015) 89–102. http://dx.doi.org/10.1016/j.ijer.2015.05.005*

Du Plooy-Cilliers, F. (2014). Research paradigms and traditions. In F. du Plooy-Cilliers, C. Davis, & R.-M. Bezuidenhout (Eds.), *Research Matters* (pp. 18-35). Juta and Company Ltd.

Gess-Newsome, J. (2016). Pedagogical content knowledge: An introduction and orientation. In J. Gess-Newsome & N. G. Lederman (Eds.), *Examining pedagogical content knowledge* (pp. 3–17). Dordrecht: Kluwer.

Goldhaber, D., & Anthony, E. (2003). *Teacher Quality and Student Achievement*. Urban Diversity Series.

Grover, J.K. (2015). Research approach: an overview. *Golden Research Thoughts*. Volume 4 | Issue 8 | Feb 2015 | Online & Print

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses related to achievement. London: Routledge.*

Hobbs, L. (2020). "Learning to Teach Science Out-of-field: A Spatial-temporal Experience." *Journal of Science Teacher Education* ,31 (7) 725–745. doi:https://doi.org/10.1080/1046560X.2020.1718315(open in a new window).

Hobbs, L., & Quinn, F. (2020). Out-of-field teachers as learners: Influences on teacher perceived capacity and enjoyment over time. *European Journal of Teacher Education*, *44*(5), 627–651. https://doi.org/10.1080/02619768.2020.1806230

Imants, J., & van Veen, K. (2009). *Teacher Learning as Workplace Learning. In P. Peterson, E. Baker, & B. McGaw (Eds.), International Encyclopedia of Education (Third Edition)* (3 ed., . 569-574). Elsevier. https://doi.org/10.1016/B978-0-08-044894-7.00657-6

Jackson, M. R. (2022). *Resistance to qual/quant parity: Why the "paradigm" discussion can't be avoided.* Qualitative Psychology.

Jones, A., & Moreland, J. (2015). Considering pedagogical content knowledge in the context of research on teaching: An example from technology. *Waikato Journal of Education 9: (77- 89)*

Kivunja, C., & Kuyini, A. B. (2017). Understanding and applying research paradigms in educational contexts. *International Journal of Higher Education*, 6(5), 26–41. https://files.eric.ed.gov/fulltext/EJ1154775.pdf

Kultsum, U. (2017). The Concept of Pedagogical Content Knowledge (PCK): Recognizing the English Teachers' Competences in Indonesia. *Advances in Social Science, Education, and Humanities Research*. 2nd International Conference on Innovative Research Across Disciplines (ICIRAD 2017), 134 (55-59)

Leavy, P. (2022). *Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*. Guilford Publications.

Makovec, R. D. (2017). Pojmovanja vloge učitelja v procesih načrtovanja in izvajanja pouka v srednješolskem izobraževanju. *Doctoral dissertation*. [Conception of the role of the teacher in the process of planning and conducting instruction in secondary education. PhD Dissertation]. Univerza v Ljubljani, Filozof- ska fakulteta, Oddelek za pedagogiko in andra- gogiko.

Moon, K., & Blackman, D. (2017, May 2). *A guide to ontology, epistemology, and philosophical perspectives for interdisciplinary researchers.* Integration and Implementation Insights. https://i2insights.org/2017/05/02/philosophy-for-interdisciplinarity/

Mullis, I.V.S., M.O. Martin, P. Foy and M. Hooper (2016). TIMSS 2015 International Results in Mathematics. Boston College: Chestnut Hill

Nieuwenhuis, J. (2016). Qualitative research designs and data gathering techniques. In K. Maree (Ed.), *First Steps in Research* (2 ed., 71-102). Van Schaik.

Porsch, R., and R. Whannell. (2019). "Out-of-Field Teaching Affecting Students and Learning: What Is Known and Unknown." *In Examining the Phenomenon of "Teaching Out-of-Field": International Perspectives on Teaching as a Non-Specialist, edited by L. Hobbs and G. Törner, 179–191. Singapore: Springer*

Porsche, R. (2020). "Fachfremdes Unterrichten in Deutschland: Welche Rolle spielt die Lehrerbildung?" In *Professionelles Handeln im fachfremd erteilten athematikunterricht: Empirische Befunde und Fortbildungskonzepte*, edited by R. Porsch and B. Rösken-Winter, 29–47. Wiesbaden: Springer Spektrum.

Prince, G., and M. O'Connor. (2018). "Crunching the Numbers on Out-of-field Teaching. Occasional Paper 1. Carlton: AMSI." Accessed September 1, 2021.

Shulman, L. (1987). *Knowledge and teaching: Foundations of the new reform.* Harvard Educational Review, 57(1), 1–22.

Staller, K. M. (2021). Big enough? Sampling in qualitative inquiry. *Qualitative Social Work*, *20*(4), 897-904. https://doi.org/10.1177/14733250211024516

Weldon, P. R. (2016). Out-of-field teaching in Australian secondary schools (Policy Insights, Vol. 6). *Melbourne: Australian Council for Educational Research (ACER). Retrieved from http://research.acer.edu.au/policyinsights/6/*

Yin, R. K. (2018). *Case study research and applications* (6). Sage Thousand Oaks, CA.

Yin, R.K. (2014). *Qualitative research from start to finish*. London: Guilford Press.