

Strategies for Addressing Teaching Challenges Among Engineering Lecturers in a South African TVET College

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Abstract

This study explored strategies that can be used to address the teaching challenges faced by engineering lecturers in a selected Technical and Vocational Education and Training (TVET) college in Limpopo Province, South Africa. A qualitative research design was adopted, using semi-structured interviews and classroom observations to examine lecturers' experiences and practices. Purposive sampling was used to select ten (n=10) lecturers who taught in the Report 191 NATED engineering programme. Data were collected through recorded interviews and observation field notes, and were analysed thematically through familiarisation with the data, coding, theme generation, theme review, and theme definition. The Pedagogical Content Knowledge (PCK) framework was used to interpret the teaching challenges experienced by engineering lecturers and the strategies used to address them. The findings identified key strategies linked to improved teaching practice, including practical lessons, online teaching, lesson preparation, communication among colleagues, and continuing professional development. The study found that the use of these strategies was uneven across participants, with important gaps in lesson preparation and the use of teaching resources. The findings suggest that TVET colleges and the Department of Higher Education and Training (DHET) should strengthen institutional support, lecturer development, and teaching infrastructure to improve teaching effectiveness in engineering education. A limitation of the study is that the Campus Management Team was not included, and future research should incorporate broader institutional perspectives.

Keywords: Teaching Strategies; Teaching Challenges; TVET College; Engineering Lecturers; Pedagogical Content Knowledge

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INTRODUCTION

Vocational education plays an important role in economic development because it equips students with practical knowledge and skills for employment and self-employment (Mtshali, 2021). In South Africa, Technical and Vocational Education and Training (TVET) colleges are central to this mission, particularly in preparing students for technical occupations and national skills needs. Within this context, engineering lecturers are expected to support student learning in ways that connect subject content with workplace practice. However, this task becomes more complex when students enter TVET programmes with limited technical background or weak prior preparation (Altan & Koroğlu, 2019). In addition, many engineering lecturers enter the profession with strong disciplinary qualifications but limited formal pedagogical training, which

may create challenges in lesson delivery, curriculum interpretation, and student support. As Sebola (2022) notes, TVET institutions are often expected to produce a skilled workforce, but this expectation also requires lecturers to adopt effective teaching practices that support meaningful learning.

The importance of vocational education has been recognised internationally because of its contribution to workforce development, productivity, and economic growth (Dixit & Ravichandran, 2023). In many countries, vocational education is used to strengthen labour market participation and develop industry-relevant skills. Despite these benefits, the effectiveness of vocational education depends largely on the quality of teaching and the capacity of lecturers to respond to student learning needs. In the South African TVET sector, this challenge is particularly significant in engineering programmes, where teaching requires not only subject knowledge but also practical demonstration, sound lesson preparation, and the ability to translate technical concepts into accessible classroom learning. For this reason, teaching challenges experienced by engineering lecturers deserve focused scholarly attention.

Research has shown that teaching challenges are often linked to inadequate pedagogical preparation, weak induction, limited professional support, and difficulties in translating curriculum expectations into classroom practice (Kelly et al., 2019; Yılmaz & Konan, 2024). In the TVET context, these challenges may be intensified by short teaching cycles, assessment demands, and the need to cover large volumes of technical content within limited time frames. In the setting of this study, engineering lecturers are expected to prepare students for trimester examinations within ten weeks, while also completing internal continuous assessment (ICASS) tasks. Under such conditions, lecturers may struggle to cover the syllabus effectively, sequence topics appropriately, and provide meaningful practical learning opportunities. Previous studies have also shown that limited occupational experience and inadequate practical competence can weaken lecturers' ability to transfer technical knowledge and skills effectively (Van Der Bijl & Oosthuizen, 2019). These conditions point to the need for practical and pedagogical strategies that can strengthen teaching in vocational engineering classrooms.

Studies on teaching practice in TVET and higher education have identified several strategies that can improve student learning and teaching effectiveness. Sephokgole et al. (2023) found that lecturers use a range of teaching strategies to achieve lesson objectives and encourage interaction between learners and teaching technologies. Similarly, Sihotang and Sitinjak (2024) argue that instructional models can improve learning outcomes when they are supported by appropriate classroom systems and teaching responses. Inayatulloh et al. (2023) further reported that creative teaching strategies can improve student achievement and motivation, while Nonyana et al. (2024) highlighted mentorship programmes, skills competitions, and merit systems as useful interventions in TVET education. Although these studies provide valuable insights, they do not adequately address the specific strategies used by engineering lecturers to manage teaching challenges in South African TVET colleges. Existing studies by Chiloane et al. (2022) and Wedekind et al. (2024) discuss broader vocational education challenges, but limited research has focused specifically on engineering lecturers' teaching strategies in this context.

This study therefore aimed to identify strategies that can be used to address the teaching challenges faced by engineering lecturers in a selected TVET college in the

Vhembe District Municipality, Limpopo Province, South Africa. The study was guided by the following objectives:

1. to identify the teaching challenges experienced by lecturers in vocational engineering subjects;
2. to examine teaching practices that may improve students' understanding, skills acquisition, and academic performance; and
3. to explore strategies that can strengthen teaching in the engineering programmes of a selected TVET college.

Against this background, the study was guided by the following research question: What strategies can be employed to address the teaching challenges faced by engineering lecturers in a selected South African TVET college?

Literature Review and Theoretical Framework

Success in TVET colleges depends strongly on the quality of teaching provided by competent and skilled lecturers. Effective vocational teaching supports student progression, skills development, and readiness for industry (Ismail et al., 2018; Mesuwini & Mokoena, 2023). In this context, lecturers are expected to demonstrate professionalism, sound subject knowledge, practical competence, and the ability to build supportive learning relationships with students and colleagues (Gamble & Hewlett, 2023). The literature reviewed in this section highlights the main challenges associated with teaching vocational subjects and identifies practices that may help engineering lecturers address those challenges in TVET colleges.

Identified Challenges of Teaching Vocational Subjects

Previous studies show that teaching vocational subjects is shaped by structural and pedagogical challenges. Mbah and Azubike (2015) identified inadequate facilities, limited lecturer training, and weak curriculum implementation as persistent barriers to effective vocational teaching. These concerns are especially relevant in Report 191 NATED engineering programmes, where the curriculum has often been criticised for limited practical provision and insufficient opportunities for demonstrable skill development (Mbah & Azubike, 2015). In vocational education, this gap is important because practical engagement is central to the development of technical competence. When programmes do not adequately support practical learning, they undermine broader national goals related to skills development and employability.

Effective Teaching Practices in Vocational Education

The literature suggests that effective teaching in TVET depends not only on lecturer qualifications, but also on instructional competence, preparation, and ongoing support. Muremela et al. (2020) argue that qualified and competent teachers are central to meaningful educational outcomes. In engineering education, however, many lecturers enter the profession with technical backgrounds rather than formal teacher education, which may create challenges in classroom practice. For this reason, recruitment alone is not sufficient. Institutions also need systems that identify teaching potential and support lecturers in developing effective pedagogical practice (Mngomezulu et al., 2021).

Induction is one of the key forms of support for newly appointed lecturers. Cleaver et al. (2020) note that graduates from teacher training may still enter the profession without being fully prepared for classroom realities. Bernadine (2019) similarly observes that novice teachers often receive insufficient emotional and technical support during their first year of work. In the TVET context, structured

induction is important because it helps lecturers understand institutional expectations, build confidence, and adapt their technical knowledge to teaching practice. Teacher quality remains a significant factor in students' academic achievement and collective learning outcomes (Cochran-Smith, 2021; Sanfo & Malgoubri, 2023).

Lesson planning is another important dimension of effective teaching. Novice lecturers may experience difficulty when preparing and sequencing lessons, especially when they are still developing classroom confidence (Sawyer & Myers, 2018). Bin-Hady and Abdulsafi (2018) therefore recommend that teacher preparation should include explicit support in lesson planning from the early stages of professional development. Ranawat et al. (2021) further caution that problems in lesson planning and classroom application can affect the coherence of teaching. A well-structured lesson plan can guide teaching, reduce uncertainty, and improve student engagement. The following Figure 1 highlights the structure of a successful lesson plan, integrating three key components: learning objectives, teaching activities, and checks for student understanding.

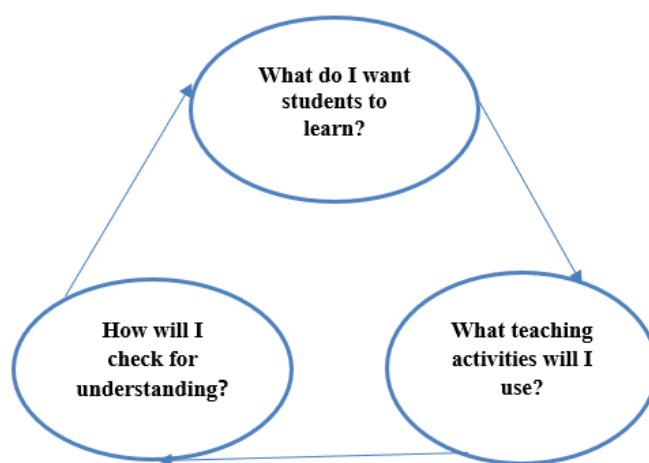


Figure 1. Key components of integrated structure of a successful lesson plan

Key Components of Lesson Plan Design Adopted from Fink (2005)

Lesson planning provides a practical guide for implementing teaching methods and managing content delivery effectively. A well-prepared lecturer is better positioned to maintain student attention, provide clear instruction, and create a structured learning environment (Katyal et al., 2024). It also supports classroom management by helping lecturers sequence activities, monitor participation, and align teaching with lesson objectives. In vocational classrooms, where concepts often need to be demonstrated and applied, such preparation becomes even more important.

Professional Development and Collaborative Support

The improvement of teaching quality requires ongoing professional development. Continuous Professional Development (CPD) refers to the continuation of a teacher's professional learning beyond initial training, qualification, and induction (Abakah, 2023). Darling-Hammond et al. (2017) explain that professional development can influence classroom practice, reshape attitudes and beliefs, and strengthen teaching effectiveness. Mitchell (2013) further argues that lecturer learning should be understood in relation to the conditions in which professionals develop their practice. In the TVET context, CPD is particularly valuable because it helps

lecturers update their pedagogical knowledge, strengthen assessment practice, and respond to changing instructional demands.

Collaborative support among staff also contributes to improved teaching. Donohoo (2017) describes collective efficacy as the shared belief that educators, through joint effort, can positively influence student outcomes. Anderson et al. (2023) further suggest that collective efficacy can have a strong influence on student achievement. In vocational education, collaboration among lecturers, administrators, and managers can support instructional planning, student monitoring, and assessment processes. Such collaboration is especially important in settings where lecturers work under curriculum pressure and institutional constraints.

Research on effective teaching also shows that lecturers need to use active and engaging teaching approaches. Kapranos (2013) recommends that lecturers modify their teaching to include more active techniques and collaborative learning opportunities. These approaches may help students participate more meaningfully in class and develop stronger understanding of technical concepts. In vocational engineering education, such practices are especially useful because students are expected not only to remember information, but also to apply it in practical and problem-solving contexts.

Teaching Methods that Minimize Challenges

Teaching is a complex process that extends beyond content transmission. Ayua (2017) argues that effective teaching includes objectives, content, methodology, assessment, lecturer disposition, and learner characteristics. This broader understanding is important in TVET settings, where students' prior knowledge may vary and where lecturer effectiveness can strongly shape classroom learning. Cherechi (2018) similarly argues that the quality of education cannot rise above the quality of its teachers. For this reason, teaching strategies should be selected carefully to support understanding, participation, and content application.

The OECD (2016) identifies classroom strategies such as cognitive activation and teacher-directed instruction as useful for improving instructional quality. Cognitive activation encourages students to explain their thinking, solve problems collaboratively, and connect subject concepts to real-world situations. Nissen (2023) emphasizes that students need more than the reproduction of knowledge if they are to solve complex problems effectively. In vocational education, this means that lecturers should design opportunities for explanation, discussion, and application.

Teacher-directed instruction also remains important, particularly when lecturers explain scientific ideas, demonstrate applications, and clarify the relevance of technical concepts (Cairns & Areepattamannil, 2022). Denoël et al. (2017) support this view by arguing that teacher-directed instruction can serve as a foundation for successful learning. In vocational classrooms, these approaches should not be treated as opposites. Rather, they can complement one another when lecturers explain key concepts clearly while also engaging students in practice, questioning, and guided problem-solving.

Advocacy for Online Teaching

Online teaching has increasingly been recognised as a useful mode of instruction in higher and vocational education. Mbongo et al. (2021) report that online teaching offers flexibility and allows lecturers to teach from different locations. Andrews-Graham (2019) further notes that the use of online teaching can encourage institutions

to rethink their teaching culture and expand access to learning. However, the effectiveness of online teaching depends on institutional resources, lecturer preparation, and student discipline. ElSayary et al. (2024) caution that online teaching also requires substantial preparation time, including the selection and organisation of digital learning content. In the TVET context, this suggests that online teaching can support learning, but only when institutions provide sufficient infrastructure, time, and technical support.

Workshops for Teaching Practice and Practical Instruction

Practical instruction remains central to vocational and engineering education. Zhang (2009) argues that vocational-technical education should not overemphasize theory at the expense of practice, because the strength of such education lies in its applicability and workplace relevance. In Report 191 engineering programmes, the limited practical component raises concerns about whether students are sufficiently prepared for technical work and entrepreneurship. Practical workshops can therefore play an important role in helping lecturers strengthen their own competence and improve their ability to teach applied skills (W. Zhang, 2009).

The literature also shows that practical teaching depends on sound content knowledge. Ball et al. (2008) emphasize the importance of content knowledge for teaching, while Kilpatrick et al. (2009) note that teaching requires careful management of the amount and pacing of content. In engineering classrooms, lecturers need to understand both what to teach and how to make that content meaningful within limited time frames. Students, in turn, often need additional time outside class to consolidate what was introduced during teaching. These observations reinforce the importance of strong content knowledge, practical teaching support, and realistic instructional planning in vocational education.

Theoretical Framework

This study is guided by Pedagogical Content Knowledge (PCK), a concept introduced by Shulman (1987) to describe the relationship between subject matter knowledge and the knowledge required to teach that subject effectively. In the context of vocational and engineering education, PCK is relevant because lecturers are expected not only to understand technical content, but also to present it in ways that are meaningful, understandable, and applicable to students. The framework is therefore useful for examining how lecturers explain concepts, plan lessons, choose teaching strategies, and support student understanding in vocational classrooms.

The use of PCK in this study helps to interpret the teaching challenges experienced by engineering lecturers in relation to both pedagogy and content delivery. Rather than viewing teaching as the simple transfer of information, PCK highlights the ways in which lecturers transform subject knowledge into forms that students can engage with and understand. This includes lesson planning, classroom explanation, practical demonstration, questioning, assessment, and the selection of appropriate teaching resources. In this regard, the framework is well aligned with the focus of this study on online teaching, practical instruction, content knowledge, lesson preparation, communication, and professional development.

Hashweh (2013) extends this understanding by explaining that PCK reflects a personal and context-specific form of teacher knowledge that develops through planning, classroom interaction, and reflection on teaching practice. This view is useful in the present study because it helps to explain why teaching effectiveness

cannot be reduced to disciplinary expertise alone. Engineering lecturers may have strong technical qualifications, but still require pedagogical support to teach effectively in vocational settings.

Jones and Moreland (2015) further show that PCK is relevant to the management of subject-related teaching resources, equipment, and technical processes. This is especially important in engineering education, where teaching often involves demonstrations, workshop activities, and the use of discipline-specific materials. For these reasons, PCK provides an appropriate theoretical lens for understanding the teaching challenges faced by engineering lecturers and for interpreting the strategies that may help address those challenges in a TVET college context.

METHOD

Research design

This study adopted a qualitative research design to investigate the strategies used by engineering lecturers to address teaching challenges in a TVET college. A qualitative approach was considered appropriate because it allows for an in-depth exploration of lecturers' experiences, practices, and perceptions, which could not be adequately captured through quantitative methods alone (Creswell, 2013). The study focused on understanding the teaching difficulties experienced by lecturers in the engineering faculty and identifying strategies that could help improve teaching practice in vocational subjects.

Sampling and Participants

Participants were selected through purposive sampling, which involves the deliberate selection of individuals based on their relevance to the research problem (Etikan, 2016). The sample consisted of ten ($n=10$) lecturers drawn from a population of twelve ($n=12$) in the engineering faculty of a selected TVET college campus. Two individuals, namely the Senior Lecturer and the Head of Division, were excluded because their roles involved substantial administrative responsibilities and less direct daily classroom engagement. The inclusion of lecturers from different engineering disciplines was intended to provide a broader perspective on the teaching challenges experienced in vocational education.

The participants taught in the Mechanical Engineering and Civil Engineering programmes. Lecturers in the Mechanical Engineering programme taught Mechanical Drawing and Design, Mechanotechnics, Power Machines, and Mathematics. Lecturers in the Civil Engineering programme taught Building and Structural Construction, Building Administration, Building and Structural Surveying, and Quantity Surveying. Four ($n=4$) of the lecturers were appointed in 2017, while the remaining six ($n=6$) were appointed in 2019. At the time of the study, those appointed in 2017 had accumulated seven years of teaching experience, while those appointed in 2019 had accumulated five years of experience.

Data Collection

Data were collected through semi-structured interviews ($n=10$) and lesson observations ($n=10$) conducted in vocational classroom settings. Semi-structured interviews were appropriate because they allowed participants to respond to guiding questions while also giving the researcher an opportunity to probe for clarification and deeper explanation (Robinson, 2023). Each interview was audio-recorded and lasted approximately forty-five (45) to sixty (60) minutes. Participants were asked

about the pedagogical challenges they experienced when teaching vocational subjects, the benefits of good instructional practices, and the strategies that could be used to improve teaching outcomes. Classroom observation was used to complement the interview data by capturing lecturers' teaching practices in their natural instructional setting. Observation enabled the researcher to document how teaching activities were carried out in practice and to compare these practices with participants' reported experiences (Uibu et al., 2023). An observation instrument adopted from the Namibia University of Science and Technology for evaluating lesson planning, classroom management, lesson presentation, and assessment practices in educational settings guided the observation process and supported the systematic recording of classroom events and lecturer practices (Loughland, 2019). Field notes were taken during each observation. Figure 2 illustrates the research procedure followed in this study, from participant selection and data collection to thematic analysis and interpretation following Braun and Clarke's (2006) approach.

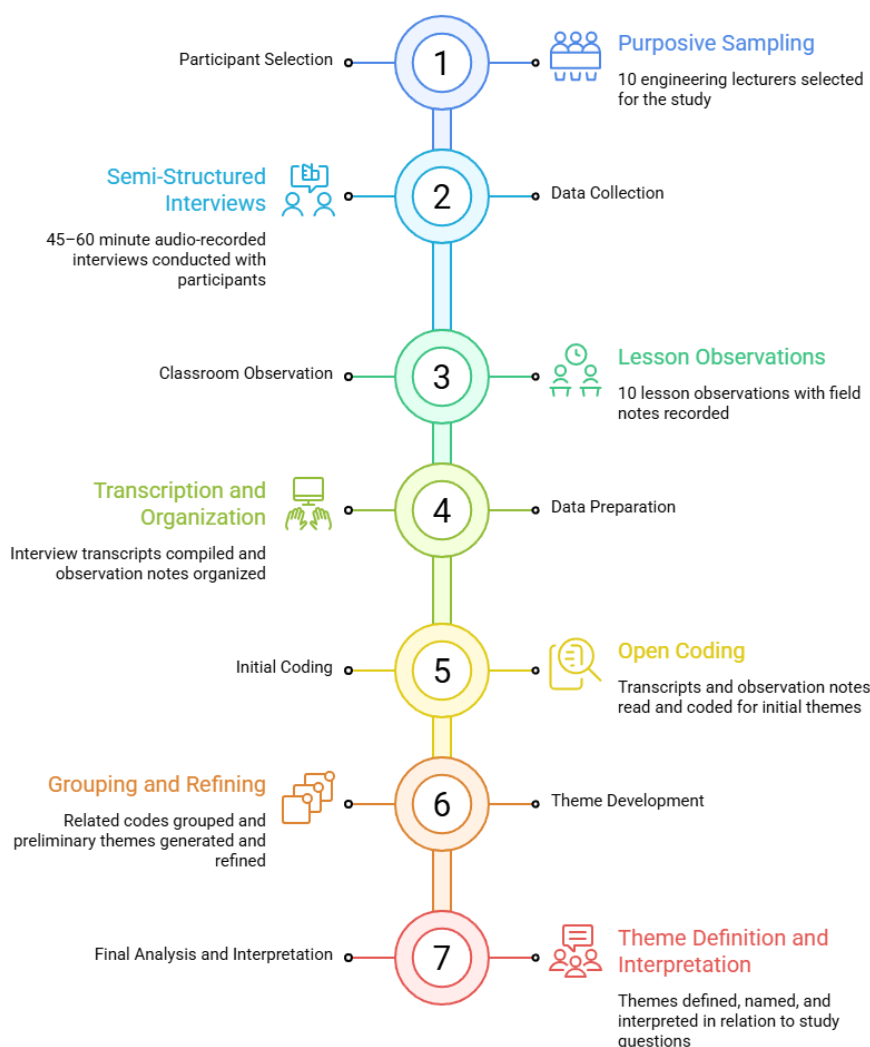


Figure 2. Research procedure for data collection and analysis

Data Analysis

The data were analysed using thematic analysis. Interview recordings were transcribed, and the transcripts, together with observation notes, were organised and analysed with the support of NVivo software. The analysis followed the six steps proposed by Braun and Clarke (2006): familiarisation with the data, coding,

generating themes, reviewing themes, defining and naming themes, and writing up the findings. Initial open coding was conducted to identify meaningful segments of the data, after which related codes were grouped into broader thematic categories. This process enabled the researcher to identify recurring patterns related to teaching challenges and the strategies used by lecturers to address them.

Trustworthiness and Ethics

Ethical considerations were observed throughout the study. Research ethics are important because they guide researchers in conducting studies in ways that are responsible, respectful, and appropriate (Bos, 2020). Permission to conduct the study was granted by the TVET College Principal, who served as the Accounting Officer. Informed consent was obtained from all participants prior to data collection, and participation was voluntary. Participants were assured of confidentiality, and pseudonyms were used to protect their identities in the reporting of the findings.

RESULTS AND DISCUSSION

This section presents the findings from the semi-structured interviews and classroom observations. The findings are organized into seven themes: online teaching, practical lessons, content knowledge, lesson preparation, communication with colleagues, continuing professional development, and induction of lecturers.

Table 1. Lecturers' indication of whether selected practices were supported or not supported.

Themes	Mo	So	Lo	Do	Lu	Sh	Th	Co	Ne	Ma
Online Teaching	N.S.	S	N.S.	N.S.	S	N.S.	S	S	S	S
Practical Lessons	S	S	N.S.	N.S.	S	S	S	N.S.	N.S.	S
Understand Content	S	N.S.	S	S	S	N.S.	S	N.S.	S	S
Lesson Plans	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Communique	S	S	S	S	S	S	S	S	S	S
Monitoring & Evaluation	S	S	S	N.S.	S	S	S	N.S.	S	S
Induction	S	S	S	S	N.S.	S	N.S.	S	S	N.S.

Note. S = Supported; N.S. = Not supported; Mo=Moods; So=Soosse; Lo=Louds; Do=Downs; Lu=Lungs; Sh=Shrine; Th=Thighs; Co=Combs; Ne=Nexts; Ma=Madams

Table 1 provides a descriptive summary of lecturers' responses across these themes. In the table, "S" indicates that a lecturer supported or reported engagement with a particular practice, while "NS" indicates that the lecturer did not support or report engagement with that practice. Overall, the table shows mixed support for online teaching and practical lessons, limited evidence of lesson preparation, strong reported communication among colleagues, and uneven participation in monitoring, evaluation, and induction. The thematic findings are presented below.

Online Teaching

The findings show that online teaching was recognized by several lecturers as a useful instructional strategy, although its implementation remained limited. During the COVID-19 period, only three (n=3) lecturers were reported to have actively used Moodle and Microsoft Teams to teach students, while the others mainly uploaded question papers and related materials to the Moodle system. The institution had provided basic resources such as laptops, routers, and 2GB of monthly data for appointed lecturers. However, participants indicated that additional teaching

resources, such as projectors, were still needed to support more effective online delivery. One participant stated:

"We need resources, like projectors that would enable us to use slide shows. Pictures used for virtual objectives, are easy to make lessons comprehensible for students." [Participant 1]

The data also show that students faced barriers to participating in online teaching. These barriers included limited access to digital resources, insufficient personal data, and difficulty connecting to the internet outside the TVET college Wi-Fi environment. As a result, participation in online learning appeared to be easier for students with better access to resources. Observation data further suggested that online teaching had been introduced in the TVET sector, but that its use was still uneven across lecturers.

Practical Lessons

Practical lessons emerged as an important theme in the findings. Although participants were not always asked directly about practical teaching in daily classroom practice, several responses highlighted the value of workshop-based learning in helping students understand vocational content. Lecturers described practical lessons as useful for connecting theoretical instruction with hands-on application. One participant explained:

"Workshops are required to supplement information taught to students for students to align theory learning into practice. Students need to engage in practical duties because what they see and do stays in their minds. Students learn technical terminologies which they cannot see at home when they do practicals." [Participant 6]

This response indicates that lecturers associated practical teaching with improved understanding, retention, and familiarity with technical language. Observation data also suggested that practical teaching was viewed as a meaningful component of engineering education, although the extent of its implementation appeared to vary.

Content Knowledge

The findings also point to the importance of content knowledge in teaching vocational subjects. Participants generally expressed confidence in their understanding of the subjects they taught and indicated that strong theoretical understanding was necessary to support student performance. One participant stated:

"Marks accrued to my diploma do not affect any of my teaching duties. I got a distinction in the same subject I'm currently teaching but it was level N4. For a lecturer to help students pass he needs to understand the content, theory. Practical assists with aligning content to practice." [Participant 1]

The findings suggest that lecturers saw content knowledge as necessary for teaching effectively and for helping students connect theory with practice. Classroom observations further showed that some lecturers relied heavily on textbooks during teaching, with limited visible use of other explanatory strategies such as board work or extended illustrations.

Lesson Preparation

Lesson preparation emerged as a major concern in the findings. Across participants, there was little evidence of consistent use of lesson plans during

teaching. Some lecturers indicated that because they had taught the same subjects for many years, they no longer considered it necessary to prepare or carry lesson plans to class. Participants explained:

"I have been teaching the subject for a longer period and the lesson plan end up not necessary to bring to class. You end up reaching the point where you cannot even open the textbook and just teach from the head." [Participant 1]

"Lesson preparation, it shows one thing. It shows that on this day this is what you are going to teach. The mere fact that you have been teaching the subject for a longer period, it is unforgivably unnecessary to make lesson plans unless you are not sure of new materials, it is then that you can revise and do lesson plans." [Participant 3]

"I have been teaching Quantity Survey throughout. I know what is required and how to work. The subject normally involves calculations and there are no changes." [Participant 6]

These responses show that lecturers often associated teaching experience with reduced need for formal preparation. Observation data also indicated that lesson plans were generally not visible during classroom teaching.

Communication with Colleagues

Communication with colleagues was reported positively by most participants. Lecturers described communication as part of their effort to improve teaching, share experiences, and address common challenges. Participants referred to sectional meetings, discussions about teaching strategies, and occasional arrangements for group teaching or lecturer exchange when topics were considered difficult. Their responses included the following:

"As lecturers, we do communicate amongst themselves. It is about ways and means to improve teaching." [Participant 1]

"We meet via sectional meetings. We share some teaching experience. At times, it is advised that we do group teaching or swop lecturers to teach challenging topics." [Participant 2]

"We communicate, inquire about how other lecturers deal with students' attendance. Also to deal with some students who write exam only." [Participant 7]

These findings indicate that lecturers viewed communication with colleagues as a useful part of teaching practice and problem-solving within the department.

Continuing Professional Development (CPD)

Continuing Professional Development was identified as another theme in the findings. Participants described CPD as a strategy used to train and upskill lecturers in different aspects of their work. One participant summarized this as follows:

"The CPD programs conducted in the context of the vocational institution includes the Occupational Health and Safety (OHS), Assessment, Moderation, Monitoring and Evaluation. Activities of CPD involve programs that teach proper ways of setting quality question papers, monitoring of students' work, planning of remedial action and helps with understanding safety measures at construction site." [Participant 2]

The findings show that participants associated CPD with assessment practice, student monitoring, remedial planning, and workplace safety. These activities were described as part of lecturer support and improvement within the institution.

Induction of Lecturers

Induction experiences varied among participants. Although most lecturers reported some form of induction, a number of responses indicated that induction was not always sufficient, especially for lecturers entering teaching from the private sector or returning after a period away from the institution. Participants described these experiences in the following ways:

"The participant was recruited from the private sector which is a different environment to teaching. At most, it feels like you are lost because you don't know how to teach in the first place." [Participant 10]

"I picked up most of the things myself. It should be noted though that I struggled a bit and tried my best to catch up." [Participant 7]

"Some time ago, I once worked for the same vocational institution, I just returned here from the private sector. On return, I realized there were so many changes unlike before where there was no focus on ICASS, Files like Portfolio of Assessment (POA) and Subject File." [Participant 5]

These findings show that induction experiences were uneven and that some lecturers had to rely on self-adjustment to understand institutional expectations, teaching procedures, and assessment requirements. Overall, the findings show that lecturers identified several practices that could support teaching in vocational engineering education. Online teaching and practical lessons were viewed as useful, but their implementation was uneven. Content knowledge was considered important, while lesson preparation emerged as the weakest area across participants. Communication with colleagues was generally reported positively, and both CPD and induction were seen as relevant forms of lecturer support, although induction was not consistently experienced across all participants.

Discussion

The findings of this study show that improving teaching in a South African TVET engineering context depends on more than subject expertise alone. The results indicate that lecturers recognized the value of online teaching, practical lessons, communication with colleagues, continuing professional development, and induction. However, the implementation of these strategies was uneven, and lesson preparation emerged as the weakest area across participants. Taken together, these patterns suggest that teaching challenges in TVET colleges are shaped by the interaction between lecturer capability, institutional support, and the material conditions under which teaching takes place.

Pedagogical Challenges in Vocational Engineering Teaching

The findings confirm that vocational engineering teaching is pedagogically demanding because it requires lecturers to combine technical content with effective instructional practice. This challenge is especially significant in TVET contexts, where lecturers may enter teaching with strong disciplinary backgrounds but limited formal preparation for classroom pedagogy. The present findings support South Africa-focused evidence showing that TVET lecturers face multiple pedagogical pressures, including heavy workloads, resource shortages, and the need for stronger professional support (Papier, 2021). Related higher education studies in South Africa have similarly reported readiness gaps for emergency remote and multimodal teaching, especially in relation to internet access, ICT infrastructure, and lecturer

preparedness (Legg-Jack & Ndebele, 2022; Ugwuanyi et al., 2023). In the current study, these challenges were reflected not only in the uneven use of online teaching, but also in the broader pattern showing that instructional quality depended on more than lecturer willingness.

The study also adds to the limited literature on the transition from industry or technical expertise into TVET teaching. Although direct South African evidence on this transition remains limited, broader scholarship suggests that sustained professional development and stronger alignment between industry knowledge and pedagogy are essential for lecturer effectiveness (Papier, 2021; Thunqvist et al., 2023). This helps explain why some lecturers in the present study appeared confident in their content knowledge but still experienced challenges in teaching practice, especially where instructional planning, practical demonstration, or adaptation to student needs were weak. Recent research also indicates that lecturer readiness in vocational and technical education is multidimensional, involving self-efficacy, technological competence, and pedagogical adaptability (Awodiji & Katjiteo, 2023; Shagataeva et al., 2021; Yang et al., 2024). The present findings are consistent with this view, as they show that teaching effectiveness in vocational settings depends on a wider set of professional capacities than technical knowledge alone.

Lesson Preparation and the Transformation of Content Into Teaching

One of the clearest findings in this study was the weak use of lesson preparation. Although lecturers often justified the absence of lesson plans by referring to long teaching experience, this pattern raises an important pedagogical concern. Teaching experience may support confidence, but it does not remove the need for structured planning, especially in subjects that require sequencing, explanation, and the connection of theory to practice. Recent literature from South African and African TVET contexts links well-designed lesson planning to teaching quality, particularly where theory and practice must be integrated across face-to-face, workshop-based, and blended teaching environments (Manditereza & Chamboko-Mpotaringa, 2024; Mesuwini & Mokoena, 2024; Nkwadipo & Rabaza, 2021; Papier, 2022). In this study, the limited use of lesson plans suggests that an important part of teaching preparation was underdeveloped.

Lesson preparation is not only an administrative task; it is also a central process through which lecturers transform content into teachable forms. Research on TPACK and related approaches shows that deliberate lesson preparation can improve content transformation and student understanding in technical and online teaching contexts (Mesuwini & Mokoena, 2024; Nakar & Trevarthen, 2024; Sedek & Nuraini, 2024). The findings of the present study support this view. Where lesson preparation was weak, the risk of relying on routine delivery, textbook dependence, and unstructured pacing appeared to increase. This issue is particularly important in TVET engineering education, where students often need carefully mediated explanations, practical examples, and coherent progression through technical concepts.

Practical Teaching and the Vocational Purpose of TVET

The findings also highlight the central role of practical instruction in engineering education. Participants consistently viewed practical lessons as important for helping students connect theory with application, remember technical concepts, and build familiarity with workplace-related tasks. This is consistent with a wider body of TVET literature, which treats hands-on and workshop-based learning as essential to skill

formation and industry alignment (Azmi & Zakaria, 2023; Calabit & Paglinawan, 2024; Tao et al., 2024). Related African studies have likewise emphasized the need to strengthen practical activities, workshops, and experiential learning in order to produce work-ready graduates (Christina et al., 2023; Ngubane et al., 2024).

The present findings also speak to an ongoing concern in vocational education: the overemphasis on theory at the expense of workshop-based teaching. Although direct comparative studies remain limited, research from Ghana and Nigeria has shown that theory-heavy approaches can weaken the practical orientation needed in TVET and that stronger workshop-based pedagogy is required to meet industry expectations (Christina et al., 2023; Nkwanyane, 2023; Teke, 2022). In the current study, the lecturers' emphasis on practical lessons reinforces the idea that vocational teaching is most effective when students are given opportunities to engage directly with applied tasks. This matters not only for technical competence, but also for employability, because practical teaching and work-based learning are linked to stronger skill attainment, workplace readiness, and entrepreneurial development in TVET systems (Azmi & Zakaria, 2023; Calabit & Paglinawan, 2024, 2024; Ngubane et al., 2024; Tao et al., 2024).

Online Teaching, Access, and Digital Inequality

Online teaching was recognized by participants as a potentially valuable strategy, but the findings show that its implementation was constrained by both institutional and student-level barriers. The uneven use of Moodle and Teams, combined with participants' calls for more resources, indicates that lecturer readiness for digital teaching was incomplete. This is consistent with South African evidence showing that TVET lecturers experienced anxiety, high data costs, limited resources, and heavy workloads during the shift to remote teaching (Papier, 2021). It is also consistent with broader African and Asian TVET literature, which documents the effects of digital inequality, including unequal access to data, devices, and connectivity in low-resource educational settings (Achuodho & Pikó, 2024; Aina & Ogegbo, 2022; Masina & Mawonedzo, 2022; Mhlanga et al., 2022).

In the present study, these barriers were particularly visible in the difficulty students faced when accessing online learning outside the college Wi-Fi environment. This suggests that digital teaching in TVET cannot be treated simply as a matter of lecturer adoption. Instead, it depends on an ecosystem of resources, access, and instructional design. Recent studies recommend blended, HyFlex, and online-augmented practical models as ways of responding to these challenges while preserving hands-on learning where possible (Asghar et al., 2022; Dukhi et al., 2024; Shakeel et al., 2023). For the current study, this implies that digital teaching strategies should be supported not only by equipment and connectivity, but also by lecturer development in designing technical lessons for blended or flexible delivery.

Collaboration, Continuing Professional Development, and Induction as Support Structures

The findings on communication with colleagues, CPD, and induction suggest that lecturer development in TVET is strongly shaped by institutional support structures. Participants described communication with colleagues as a means of sharing teaching experiences, addressing difficult topics, and solving common classroom problems. This aligns with literature showing that peer collaboration, mentoring, and team-based approaches can strengthen TVET teaching through shared

practice and collective problem-solving (Chan & Suraya, 2024; Gamble & Hewlett, 2023). In the context of the present study, such collaboration appears to function as an informal support mechanism that may partly compensate for other weaknesses in teaching preparation.

The findings on CPD also reinforce the importance of sustained lecturer development. Participants associated CPD with assessment practice, monitoring, moderation, remedial planning, and safety procedures. This is consistent with recent literature showing that structured CPD and professional development programmes can improve lecturer readiness, digital competence, pedagogical practice, and leadership capacity in TVET contexts (Brändle & Zinn, 2023; Lee et al., 2021; Njenga, 2023; Smit & Bester, 2022). In the current study, CPD appears to play an important role in strengthening the institutional and instructional capacity of lecturers, particularly where formal teacher education may be limited.

Induction is especially important for lecturers entering TVET teaching from industry or returning after time away from the institution. The present findings show that induction experiences were uneven and that some lecturers had to rely heavily on self-adjustment. This supports literature emphasizing structured onboarding, mentoring, and professionally designed development programmes for novice lecturers and industry-to-teaching entrants (Lee et al., 2021; Mesuwini & Mokoena, 2023; Njenga, 2023). For lecturers moving from industry into education, the literature further highlights the value of work-integrated immersion and industry-directed mentoring as ways of helping them adapt to teaching roles and institutional expectations (Mesuwini & Mokoena, 2023; Njenga, 2023). The current study therefore suggests that induction should not be treated as a brief orientation process, but as a sustained component of lecturer development.

Implications for Pedagogical Content Knowledge in TVET Engineering Education

The findings of this study can be interpreted meaningfully through the Pedagogical Content Knowledge framework. PCK is useful here because it explains that effective teaching depends on the transformation of subject knowledge into forms that are understandable and meaningful for learners. The current findings show that lecturers' technical knowledge alone was not enough to guarantee strong teaching practice. Rather, effective teaching appeared to depend on how lecturers combined content knowledge with lesson preparation, practical demonstration, explanation, communication, and responsiveness to student needs. This interpretation is supported by literature that applies PCK and TPACK in TVET, science, and technical education to explain the relationship between content knowledge, teaching practice, and student understanding (Adipat et al., 2023; Costa & Domingos, 2023; Dudu et al., 2022; Mesuwini & Mokoena, 2023).

Recent scholarship further shows that PCK is not static; it is strengthened through professional development, collaborative design, and technology-integrated teaching practice (Adipat et al., 2023; Deng et al., 2024; Goes & Fernández, 2023). Studies in applied disciplines have shown that as teachers develop stronger connections between content knowledge and pedagogy, they are better able to select effective teaching strategies and improve student comprehension of complex concepts (Powell, 2023; Sæleset & Friedrichsen, 2021; M. Zhang & Guo, 2024). This helps explain the present findings, where areas such as lesson preparation, practical teaching, and online instruction can be understood not merely as isolated practices, but as dimensions of how lecturers enact PCK in vocational classrooms. The implication is

that TVET colleges should support lecturer development in ways that strengthen both pedagogical reasoning and the practical translation of engineering content into student learning.

Practical Implications for TVET Colleges

Overall, the discussion suggests that improving teaching in TVET engineering programmes requires coordinated institutional action. Colleges should strengthen lecturer induction, expand CPD opportunities, encourage more systematic lesson preparation, and create stronger structures for peer collaboration. They should also improve access to practical teaching resources and support more realistic blended or flexible teaching models that address digital inequality. In this way, the improvement of teaching outcomes in TVET colleges depends not only on individual lecturer effort, but also on institutional systems that support the development and enactment of effective pedagogical practice.

CONCLUSION

This study examined the strategies that engineering lecturers can use to address teaching challenges in a selected TVET college. The findings show that improving teaching outcomes in vocational engineering education depends on a combination of online teaching support, practical lessons, content knowledge, lesson preparation, communication among colleagues, continuing professional development, and lecturer induction. These strategies were not implemented with the same level of consistency across participants, and lesson preparation emerged as one of the weakest areas.

The study further shows that effective teaching in TVET engineering education requires more than subject expertise alone. Lecturers need to transform technical knowledge into meaningful learning experiences through clear explanation, practical demonstration, structured planning, and responsive teaching strategies. In this regard, online teaching was viewed as a useful strategy when supported by appropriate resources, while practical lessons were seen as essential for linking theory to hands-on application and employability. Communication, CPD, and induction also emerged as important forms of institutional and professional support for teaching improvement.

Overall, the study contributes to understanding the instructional realities faced by engineering lecturers in South African TVET colleges. It highlights that the improvement of teaching outcomes depends not only on individual lecturer effort, but also on institutional systems that support pedagogical development, resource availability, and collaborative practice. A limitation of the study is that it focused primarily on lecturers' perspectives and did not include students, who are the direct beneficiaries of teaching in TVET colleges.

RECOMMENDATION

Based on the findings of this study, several recommendations are proposed. First, TVET colleges should strengthen lesson preparation by providing workshops and internal support on lesson planning, content sequencing, and classroom delivery. Second, colleges should expand opportunities for Continuing Professional Development and structured induction, especially for lecturers entering teaching from industry or returning after time away from the institution. Third, institutions should improve access to practical teaching resources and collaborate with industry partners to provide workshop-based training and hands-on exposure for lecturers.

In addition, TVET colleges and relevant government agencies, including the Department of Higher Education and Training, should increase support for digital infrastructure, teaching resources, and blended learning models that can improve access to online teaching. Colleges should also encourage peer collaboration, team teaching, and regular communication among lecturers as part of teaching improvement strategies.

Future research should extend this study to multiple TVET campuses and include institutions from other provinces in order to identify broader patterns, systemic challenges, and best practices in lecturer development. Further studies should also include students' perspectives to provide a more comprehensive understanding of how teaching challenges and instructional strategies affect learning outcomes in TVET colleges.

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Data Availability

Data availability is not applicable to this article because no new data were created or analyzed in this study.

Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Nduvazi Mabunda	✓				✓	✓		✓	✓					
Moses Makgato	✓	✓			✓					✓	✓			
Jerald Hondonga		✓		✓					✓	✓		✓		
Daniel Sephokgole				✓	✓									✓

C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

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