JTET

http://penerbit.uthm.edu.my/ojs/index.php/jtet
ISSN 2229-8932 e-ISSN 2600-7932

Journal of Technical Education and Training

Actualisation of Practical Lessons through Assessment in Civil Technology

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DOI: https://doi.org/10.30880/jtet.2021.13.01.005
Received 15th November 2019; Accepted 15th November 2020; Available online 31st March 2021

Abstract: Learning Civil Technology at the school level is not about discovering new or unknown ideas. Rather it is about capacitating learners with hands-on practical skills that are known and needed in engineering as well as artisans' sectors. The purpose of this study is to explore how Civil Technology teachers actualise practical lessons through assessment. Purposive sampling was used to identify 5 teachers of Ekurhuleni district schools in the Gauteng Province to participate in this study. Observation, Document analysis and interview instruments were used as data-collection methods. Assessment theories were used as a conceptual framework to understand how various assessments are used to execute practical lessons of Civil Technology. The study found that only assessment for learning was used well by teachers, however, assessment as learning, as reflective, of learning and competency based assessment were used for compliance purposes and sometimes misunderstood as a tool to strengthen practical activities. It can be concluded that most Civil Technology teachers do not perceive assessment as a mechanism to strengthen hands-on practical activities. This study recommends that Civil Technology teachers should be assisted on how to appropriately use assessment strategies to cater for all learning needs associated with practical skills.

Keywords: Assessment, practical lessons, civil technology, teachers

1. Introduction

There has been an increasing demand in sub-Saharan African countries to promote Technical and Vocational Education and Training (TVET) in order to increase productivity and competitiveness in the global economy (Dasmani, 2011). This demand calls for schools, colleges and universities to strengthen practical skills training through competency-based exercises in the TVET programs. These practical skills include motor vehicle mechanics, electrical works, welding and fabrication, carpentry and joinery, block laying and concreting or masonry, plumbing, tailoring and dressmaking etc. (Uwaifo, 2010). In the South African context, these practical skills are done through Further Education and Training (FET) system under technology education, where Civil Technology is but a part. These skills are aimed at practical acquisition relevant to our everyday life and increase high technical skilled society in this competitive world (Ubong & Oguzor, 2007). As a result, the need to continually teach and assess more people to be hands-on and skilful is paramount. Presently, the role of technical education in preparation for practical skills

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development is encouraged in Africa. However, there are aspects constraining practical skills acquisition that are not fully exploited (Dempsey, 2013).

Lumadi (2013) suggests that practical skills acquisition is constrained by assessment planning, the implementation of assessment, and the use of multiple methods in the assessment practice and assessment time. This concurs with Eisenkraft's (2013) contention that to improve the teaching of practical lessons, more time should be given on teaching and assessing how learners handle and use laboratory equipment to develop skills for practical activities. Sato, Wei and Darling-Hammond (2008) note that in teaching and learning, there is nothing important than assessing learners' work and giving feedback. According to these authors, they advocate that assessment has the potential to influence the learners' careers for the rest of their lives.

Along a similar strand, curriculum assessment policy statement (CAPS) for Civil Technology provides that teachers should embrace practical skills and the application of scientific principles in their lessons to produce practical skills-competent learners who will be suitable for the industry and economic demands of the country [Department of basic education (DBE, 2011). A broader perspective has been adopted that assessment is the preferred method to uphold competency of practical skills (Richardson & Blair, 2015). However, the issue of "how" assessment affirms practical skills competency remains questionable and open for research. While assessment is inseparable from the teaching and learning of practical skills, little attention has been given to its significance in strengthening practical lessons in technical subjects. Some major issues that have been dominating this field for many years concerns educational policies, curriculum and human resources, among other things. The most significant discussions in Technology education have been evolving around policies that undermine Technology education and the infrastructure of workshops, thereby tendering little focus on assessment.

For instance, in a study by Virgy, Rashidat, Olusola and Oluboyejo (2007) it was established that technology education policies' goals and purpose were not clearly articulated and society has been led to believe that technical or technology education graduates were unsuitable for academic programmes. Another study contended that it was generally accepted that it is more costly to offer technical education programmes than to offer other academic programmes (John, Cryton, Xavier & Chiweshe, 2013). The costs associated with technical subjects included building new or renovating existing workshops, the maintenance of old machinery equipment, the high-cost of new equipment and consumable instructional materials (Ferej, Kitainge & Ooko, 2012). Most importantly, Stigler and Hiebert (2009) as well as Grollmann (2008) discovered that technical education is taught by teachers who are not prepared to update their teaching methodologies, practices and knowledge to the current economic demands.

Yet in the South African context, recent developments in technology education have led to a renewed interest in studies relating to Civil Technology. For example, firstly Isaac and Manto (2019) focusing on Civil Technology Teacher's Environmental Knowledge in Promoting Active Learning During Practical Lessons; secondly, Maeko and Makgato (2017) focusing on the transfer of the requisite Civil Technology hands-on practical skills to student teachers in South African Civil Technology teacher training universities. This included universities of technology in South Africa, and lastly, Mtshali and Ramaligela (2020) focusing Contemporary Employability Skills Needed for Learners to Succeed in the Civil Technology Field in the 4IR Era.

However, the impact of assessment in practical activities remains under researched. Hence there is a need to also verge into how assessment contribute to the development of hands-on practical skills in Civil Technology subject. It is to this end that this study widens the horizon by exploring the actualisation of practical lessons through assessment in Civil Technology, a topic that is under-researched in South Africa.

1.1 Interactive Learning and Hands-on Practical Skills Learning in Civil Technology

The quality of hands-on skills delivery is largely placed on the teacher's ability to transfer content knowledge into hands-on skills (Masha, Mboweni & Mtshali, 2021). At the cutting edge of hands-on skills learning, rest the need to employ interactive learning as a device to help learners to become more engaged on their problem solving and critical thinking skills. In essence, interactive learning assist learners with conceptual understanding (Hockicko, Krišťák, & Němec, 2015; Hake, 1998), whereas hands-on practical skills assist learners in putting those concepts into practice (Mtshali, Ramaligela & Makgato, 2020). In other words, learners who are given an activity to design and make a medicine cabinet artefact, should first understand through discussion with their peers and/ or teachers about what is a medicine cabinet, what it is used for and then discuss on the sizes and suitable designs for it. Thereafter, these learners are expected to proceed to hands-on practical where they learn the skill of cutting wood pieces that merge with their design and finally assemble them so that the medicine cabinet artefact is realized. In a nutshell, Civil Technology learners construct meaning of concepts through interactive learning and construct application of concepts through hands-on skills learning (Mtshali, 2020). Hence, this link is necessary for learners to acquirer experience and competency in the skills and techniques they need for occupational safety. Henceforth, there is a need for teachers to understand how these forms of learning can assist them in the actualisation of practical lessons through assessment in Civil Technology.

There is lack of in-depth understanding amongst teachers of how actualisation of practical lessons through assessment in Civil Technology can be manifested. Most of them know assessment as a "test", an "assignment" or an "exam" which is used as a strategy by teachers to learn about their learners' strengths and weaknesses, and identify

specific learning needs (Dueck, 2014). Yet, this description of assessment is often explained with little insight to its impact on practical lessons. Therefore it is important to continuously explore the role which assessment plays in the actualisation of practical lessons in practical-based subjects. Civil Technology operating as one of practical-based subjects has an intention to ensure that learners are in a position to "demonstrate understanding of the industry, enhance knowledge, skills, values and reasoning abilities as well as establishing connections to life outside the classroom and address real world challenges" (DBE/PAT, 2018:29). Therefore, this intention can be realised through the employment of various assessment theories by teachers when teaching practical lessons. Hence, this study makes a major contribution to research by exploring the actualisation of practical lessons through assessment in Civil Technology. This study is primarily concerned with exploring the following question, 1) How do Civil Technology teachers actualise practical lessons through assessment? and sub questions

i) How do Civil Technology teachers use assessment theories during hands-on practical lessons in class?
ii) Which assessment theories were effective during hands-on practical lessons in Civil Technology?

To respond to the above questions, the study used document analyses, observation and semi-structured interview data collection instruments.

2. Study Framework

2.1 Assessment Theories

To understand how Civil Technology teachers actualise practical lessons through assessment, this study employed the concept of competence-based assessment, which emphasises the aims and objectives of the Civil Technology subject. Competence-based assessment refers to systems of instruction, assessment, grading, and academic reporting that are based on learners demonstrating that they have learned practical knowledge and skills they are expected to learn (Frank, Mungroo, Ahmad, Wang, De Rossi & Horsley, 2012). To understand how teachers assess learners throughout their instructional practice this study adapted four more assessment theories: assessment for learning, assessment as learning, assessment as reflective, and assessment of learning.

This study used various assessment theories to explore different strategies that are to be used effectively to assess learners' performance of Civil Technology hands-on practical lessons. The assessment theories refer to the amalgamation of teaching and learning strategies or approaches as well as the gathering, interpretation and use of information to inform the teachers' decision-making, strengths and room for improvement in the teaching and learning process (McMillan, 2008; Meyer, Lombard, Warnich & Wolhuter, 2010). By contrast, assessment strategies refer to the teachers' use of a variety of formative and summative assessment strategies to measure learner progress, to inform instructional content and delivery methods, and to provide timely and constructive feedback to both learners and parents (Schuwirth & Van der Vleuten, 2011).

However, this study focused on the practical component. Teaching and learning is a complicated exercise as it centres assessment on different dimensions (Poth, 2013). Until now, there are various assessment theories that can be used in teaching and learning and assist teachers to identify relevant instructional content-delivery modes that can also measure the learners' performance in various dimensions. Yet, this study sought to explore effective assessment strategies that can be used to measure the learners' performance with reference to content and skills knowledge. Assessment for learning, assessment as learning, assessment as reflective, assessment of learning and competency-based assessment are explained in the following way:

i) *Assessment for learning* refers to the extent to which learners are provided with an opportunity to be actively involved in continuous assessment for a teacher to understand how well the learners know the content and reflect on his/her own teaching (William, 2010; Schuwirth & Van der Vleuten, 2011). In this assessment theory, the researcher explored continuous assessment tasks given to learners; which assessment activities do teachers give learners to assess hands-on practical skills; and how teachers engage learners in explaining and correcting misconceptions.

ii) Assessment as learning refers to learners monitoring their learning through self- and peer-assessment and using feedback from this monitoring to make adjustments to what they understand (Yavich & Gerkerova, 2013; Dann, 2014). Learners are generally honest and reliable in assessing both themselves and one another such that in some instances; they can be too hard on themselves. However, the challenge tends to be when they do not have a sufficiently clear picture of the objectives their learning is meant to attain (Black & William, 2009). In this assessment, the researcher explored how the teacher creates opportunities for learners to self and peer assess their work.

iii) Assessment as reflective refers to the process used by teachers to attain frequent and ongoing feedback on the learners' performance to gain insight into how to improve instruction and maximise teaching and learning. The data attained from this assessment is then used by teachers to verify learners' progress and as an indicator to introduce interventions when insufficient progress has been made (Dean, Amelia, Sykes, Agostinho & Clements,

2012). In this assessment, the researcher explored reflective assessment tools used by teachers to establish how well the learners know what has been taught.

iv) Assessment of learning refers to the process whereby teachers use evidence of learners' knowledge to judge their achievement of goals and standards (Pattalitan, 2016). It is typically formal and frequently occurs at the end of a chapter or term when it sums up the learners' achievements (Black, 2009; Harlen, 2007; Miller, Linn & Gronlund, 2013). In this assessment, the researcher explores various assessment tools that a teacher uses to assess the learners' performance and understanding of a theory and practical lessons; the impact of such assessment tools determines the learners' knowledge and acquired skills.

iv) Competency-based assessment refers to systems of instruction, assessment, grading and academic reporting that are based on the learners demonstrating that they have learned the practical knowledge and skills they are expected to learn (Frank, Mungroo, Ahmad, Wang, De Rossi & Horsley, 2012; Watkins & Moran, 2004).

In this section, the researcher has explored how a teacher evaluates files and prepares them to be amended by subject supervisors as well as how the teacher keeps records for quality assurance and evidence for work done in a classroom/workshop?

3. Research Methodology

3.1 Research Design

This study used an exploratory case study research design. An exploratory case study is used when a problem has not been studied particularly closely. It is intended to establish priorities, develop operational definitions and improve the final research design (Shields & Rangarajan, 2013). This study was premised on the fact that the issue of how Civil Technology teachers actualise practical lessons through assessment has not been thoroughly researched. In particular, scholars have failed to establish assessment theories that strengthen the skills priorities for the Civil Technology space, which has contributed to a lacklustre approach to building responsive industrial skills among Civil Technology learners at Schools, TVET colleges and Universities.

The study supports the view of Stake (1995) that a case study is an investigation of natural or juristic persons, events, programmes or occurrences designed to understand complex issues for the ultimate benefit of programmes and people, using a combination of data-collection techniques. This study was underpinned by constructivist approach, hence it employed a qualitative research method. The purpose of using qualitative method was to obtain in-depth understanding of the description of events, human behaviour and habits (Creswell, 2013; Henning, van Rensburg & Smit, 2009; Ramaligela, Mji & Ogbonnaya, 2015).

3.2 Sample

Purposive sampling was used to identify five teachers of Civil Technology in the Ekurhuleni District, in the Gauteng Province of South Africa. The researcher identified teachers who have expertise and experience in the Civil Technology field, and who understood the need to undertake this research study because the problem was established while working with some of the teachers in the sampled schools (Büthe, 2015; Creswell, 2013; De Vos, 2001). Confidentiality of participants was protected by giving them pseudonyms. Contribution to this research was taken from public schools offering Civil Technology because private schools does not attend district meetings. Furthermore, the researcher wanted to explore in schools that has high number of learners hence most of the schools in the district have low enrolments in Civil Technology.

3.3 Data Collection and Analysis

Data collection instruments used included document analysis, classroom observation during practical lessons and interviews with the teachers. Documents used were obtained from the schools from which data was collected. The documents that were analysed were practical assessment tasks (PAT); that is learners PAT portfolio *(assessment for learning)* and assessment tools which were used to assess learners' performance *(assessment of learning)*. During observations, a schedule, field notes and photographs were taken. Instead of just using photographs to supplement field notes, the researcher believed that showing informants images of their own behaviours was an effective way to generate ideas and understanding into explanations and reasons behind those behaviours (Basil, 2011). Furthermore, an observation schedule was developed in line with Stronge's (2007) qualities of effective teachers. Observations helped to analyse how teachers engage learners in explaining and correcting misconceptions *(assessment for learning)*, how teachers create opportunities for learners to self and peer assess their work *(assessment as learning)* and which reflective tools do teachers use to determine how well learners know hands-on practical work *(assessment as reflective)*.

The interviews were audio taped with the permission of participants, to allow adequate transcription and coding. The interviews assisted in analysing assessment activities that are given to learners (*assessment for learning)* and why

did teachers follow PAT guidelines in doing practical assessment tasks *(assessment of learning)*. Non-participatory observations were made in the classroom at each of the five teachers' schools involved. Prolonged engagements were made to build trust with teachers and learners before conducting practical lessons in Civil Technology workshops. As indicated earlier, the writing of the field notes was guided by the observation schedule for each lesson observation. Data analysis was done by proper structuring of narratives of the lesson observations, through which participants were given an opportunity to verify the true reflection of a data input. This was done to ensure credibility of the study (Kelly, 2006). The results and discussion are presented according to the research questions. As indicated earlier, the study used assessment theories as themes to analyse the data. Confirmability involves the neutrality of research interpretations, which can be enhanced by triangulation (Cresswell, 2013).

Therefore, in this study, the interpretations of observation were checked by the participants as well as Civil Technology teachers at Sasol's 2nd Annual Technical Teachers' Conference 2017, who confirmed them as a true reflection. Similarly, the credibility was emphasised through triangulating the data from observations, document analysis and interviews.

3.4 Ethical Clearance

Ethical clearance was issued and approved by the University affiliated to the author at the time, prior to the conducting of the study to protect the participants and the researcher from scientific misconduct (Badiee et al., 2012; Wassenaar, 2006).

4. Results and Discussions

A total of 5 respondents were involved in this study. A total of 4 respondents (80%) were males and 1 respondent (20%) was a female. In relation to teaching experience for Civil Technology subject, 2 respondents (40%) had 1 to 5 years' experience, 1 respondent (20%) had 6 to 10 years' experience and two respondents (40%) had over 10 years of experience. For the professional qualification item, 3 respondents (60%) had a Bachelor of Education degree, while two respondents (40%) had Diplomas in Education plus they were the ones with more teaching experience. Correspondingly, respondent's demographic information is shown in Table 1.

Table 1 - Respondent's demographic information

Demography Aspects	Frequency	Percentage (%)
Gender		
Male	4	80
Female	1	20
Teaching experience (Civil Technology)		
1-5 years	2	40
6-10 years	1	20
10 and beyond	2	40
Professional qualification		
Diploma	2	40
Bachelor Degree	3	60

The results are presented in terms of sub-research questions where data is organised according to themes from the assessment theories.

4.1 Teachers Use Assessment Theories during Hands-on Practical Lessons in Class

For the purpose of answering the sub-research question one, the researcher had to explore the assessment tasks given to learners through document analysis and to explore how the teachers engage the learners in explaining and correcting misconceptions during practical lessons.

4.1.1 Assessment for Learning

Under this theme, teachers were explored on the kind of activities that they give learners to assess hands-on practical skills. The findings were that all the teachers used a similar practical assessment task document which was standardised by the Department of Basic Education (DBE) across the country. The focus of this standardised formative task was to design and make a breakfast nook artefact. Only one PAT was given to learners by the DBE for the whole year in Civil Technology. A confirmation to this finding was drawn from the DBE/PAT (2017) document which stated

that that only one PAT is to be administered the whole year by learners. Thus, according to these findings, assessment for learning was executed by teachers by means of compliance in giving hands-on practical lessons that are national standards.

On the other hand, a worrisome observation from Sutarto and Jaedun (2018) is that often teachers use techniques in practical assessment tasks that are not relevant to the envisaged skills. Echoing this observation is Isaac and Manto (2019) that Civil Technology artefacts are done using boxes instead of proper equipment and consumables. As a result, Gulikers, Bastiaens and Kirschner (2004) avers that there are existing misconceptions between teachers and learners on what is essential in and about practical tasks, even when teachers do their best in executing the task. By drawing on Gulikers et al. (2004) assertions, it can therefore be appropriated that the way in which teachers assess learners during hands-on practical lessons is relatively an unfair practice on the side of the learners.

4.1.2 Assessment as Learning

Given that Civil Technology Grade 12 PATs are designed and standardised by the DBE, one may assume that the department has gone some way in assisting teachers on lesson delivery techniques relevant to the tasks. However, when this study explored how Civil Technology teachers created opportunities for learners to self- and peer-assess their work, this study discovered that none of the teachers were able to create such opportunities. According to Meako and Makgato (2017) these situation is likely to be caused by limited time available to do PAT. These authors note that schools do not allocate enough time for practical subjects and this limit so many activities from happening during these practical lessons which include lack of opportunities to self and peer assess work before final submission is made.

Nevertheless, during observation, Teacher B used one male learner to help others with cutting wood pieces as he was busy with his personal projects' work during a practical lesson. Teacher B's practice was consistent with claims by Schiller, Joseph and Konecki (2004) that during practical lessons, some teachers delegate few learners to help them with practical demonstration to other learners. Fitting to the notion that teachers still need mentoring on how to create opportunities for their learners to self and peer- assess their practical activities. Stegmann and Malan (2016) suggest that part of the challenges of learners being rarely offered opportunities to self and peer assess their work is that learners might not have the necessary skills to perform such assessments. According to Ting-Chia Hsu (2016) learners in vocational education have relatively low academic achievement and less positive attitudes toward learning, resulting in a lack of higher-order thinking. Yet, Lorente-Catalán and Kirk (2016) orders that peer assessment is one of the higher-order thinking learning activities. While Chang and Tseng (2011) postulate that it could be difficult for learners to assess and compare peers' work and summarize their findings without boundaries. Civil Technology teachers, collectively need mentoring in creating opportunities for learners to self and peer-assess their work.

4.1.3 Assessment as Reflective

In the midst of self and peer assessment challenges, this study investigated if teachers had any reflective assessment tools that they use to determine how well learners know hands-on practical work. This study discovered that, during interviews, teachers indicated that learners get to know how well they have done when portfolios and artefacts has been marked against the rubric supplied by DBE. As a result, all teachers did not have a specific assessment reflective tool that assessed each and every hands-on practical skill that the learners received. In a study by Mtshali (2020) on Critical thinking skills for Civil Technology practical assessment tasks, he indicated that the current PAT document supplied by DBE does not assist teachers to reflect on all procedural skills that learners engaged on, but only on final product.

It is the position of this study that all stages that leads to the end-product of assessment task needs a reflective tool that assesses competence. However, learners were assessed after the completion of the artefacts PAT projects. Even though the practical task requires the use of machines, Teacher A and learners from school D used only one machine (a circular saw) to cut boards, whilst others cut boxes and used glue to make the breakfast nook. As a result of insufficient time to finish hands-on practical activities pressure mounts high and render teachers to compromise on the quality of practical work during assessment.

4.1.4 Assessment of Learning

In a case of investigating assessment tools that were used to assess the learners' performance, this study found that teachers used rubrics supplied by the DBE for PATs. However, learners were given marks for work that was not done or incorrectly done. For example, Teacher E had given marks on a section on quantities in the Phase 1 rubric of a PAT, although there was no evidence that the learners had done the work. This results connects with the observation made under assessment as learning where Teacher B used a learner to help others with PAT. It is clear from this finding that teachers have a tendency to assume that all work is done and completed as long as their trusted learners indicate as such without proofing the claims.

During observation, teachers seemed not to care what the learners wrote on those files. One learner commented by saying, "Sir only looks at the headings of the PAT, and if you have written more on that topic, he can give you very

good marks". Another learner from school D further said, *"Meneer [Sir] does not care what we write but will only subtract marks if your drawing is not correct. Some of us do not understand what is needed for the drawing, so we copy from our friends."* In addition, on the learner's portfolios, teachers' could not comment on the rubric to indicate how learners can improve, a challenge observed during assessment as reflective.

Even after marking the first phase of the PAT, all the teachers could not give learners an opportunity to re-work on their design process, a challenge that with assessment for learning. Disturbingly, the subject advisor did not check why learners were given marks of what they did not do including how they can improve, but he stamped the files and approved the marks as accurate for Term 1. This phenomenon led the researcher to interview teachers on aspects of the PAT. So, the researcher wanted to understand if teachers follow the PAT guidelines during practical assessment task. These teacher had the following responses:

Teacher A: Yes. Because the project needs to be appropriate.

Teacher B: Yes, I only give selected page numbers to learners so they can do what is required of them.

Teacher C: Yes, as the PAT must be done in co-operation with the theory and is part of the work schedule. It must not be treated in isolation.

Teacher D: Yes, it is the best way to reach the target.

Teacher E: Always …. Always.

Even though the majority of participants seemed not to fully understand why it was necessary to follow PAT guidelines, they all agreed to have used them. Their reasons pointed that teachers are not aware of the inferences behind the guidelines. According to DBE (2011:104)

> *"PAT accounts for the skills the learner has mastered. This is assessed at intervals and requires the learner to engage in multiple practical sessions. During these weekly sessions, skills such as simulation, experimentation, hand skills, tool skills, machine skills and workshop practice are honed and perfected to the point where the learner may engage in the tasks set out for that particular term. The PAT accounts for 25% of the learner's promotion mark."*

Furthermore, the findings established that teachers do omit and add some content in the PAT; however, reasons for which they do that were not clear.

4.1.5 Competency-based Assessment

As per the finding of document analysis that the subject advisor did not check why learners were given marks of what they did not do including how they can improve, the research sought to find how teachers prepare formal assessment activities to be moderated and corrected by subject advisors. This study discovered that Teacher A had a composite file in which he put all formal assessment tasks including the PAT task and the non-PAT task. However, learners had files only for the PAT task. All learners' files were kept by the teacher after the learners had written an assessment task. This was also applicable for the other teachers. Yet, Civil Technology teachers had evidence of their formal activities. During Teacher E's visit, the researcher found that the teacher had files and were checked by the subject advisor during the time. As reported earlier, there were no constructive comments on the learner files that had been checked and stamped by the subject advisor.

Gipps, Hargreaves and Mccallum (2015) suggest that commenting on the learner's book when giving feedback provide a learner with a chance to self-correct on other misconceptions that teachers and curriculum alone may find it difficult to address. Therefore, there are existing assumptions by subject advisors moreover in technical subjects that teachers explain the design process well and that learners are doing the correct thing. As a result, these assumptions affect the practical assessment tasks negatively because even subjects advisors occasionally evaluate thoroughly the design portfolio, working drawings and model manufacturing phases of PAT.

On the same purpose, the research was concerned in understanding how teachers keep records of formal activities in practical lessons. The study determined that all teachers kept records in electronic mark sheets. However, Teachers A, B, D and E still had only a test recorded on their electronic mark sheets during the second visit. They were supposed to even have the practical Phase 1 mark recorded there. Teacher E even said, "There is no use for me to punch those marks now because they are not considered for term marks …. Only the test for Term 1, June examination for Term 2 and the preliminary exam for Term 3 …. They only consider those practical marks at the end of the year." Through these words, he seemed to be regarding the practical assessment task marks as useless. He added by saying, "These things are only used to help the lazy learner to pass … That is why we can never get less than 100%, because if a learner fails an exam, he/she will consider the PAT marks (laughing) … What can we say? We do these PATs to look

like good teachers and get certificates in January." This was a pure indication that practical activities are not taken seriously by teachers, and this gave a notion that they are there to ensure a 100% pass rate rather than practical skills development. Surprisingly, this practice from the teachers was contradicting with the findings by Mokhothu, Maimane and Rankhumise (2015) in South Africa where they found that teachers regard FET technology education subjects as the subject designed only for intelligent learners especially since it is a practical based subject in nature.

4.2 Effective Theories Applied during Hands-on Practical Lessons

Based on the findings discussed above, this study discovered that only one (assessment for learning) of the five assessment theories were well executed by teachers. This study found that most of the teachers use various assessment theories for compliance purposes and not to strengthen practical activities. Based on these findings, teachers had a challenge in selecting and using appropriate assessment theories when presenting hands-on lessons in Civil Technology. This study found that teachers depended heavily on the rubric supplied by DBE to execute tasks. They could not build connections between tasks at hand and time needed to execute them. Their reliance to learners' help on some aspects of the PAT resulted in awarding marks to learner for the work they did not do.

The sole purpose of practical based subjects is to prepare learners for jobs after school completion and increase productivity and competitiveness in the global economy (Dasmani, 2011; Jakubowski, Patrinos, Porta & Jerzy, 2010). Therefore, the knowledge of correctly applying all assessment theories comes handy and assist in identifying areas where competency is lacking. Based on these findings, it is clear that the stated assessment theories have potential to assist teachers to actualise practical lessons through assessment in Civil Technology. Theory and practical lessons of any subject require specialised preparation (Moore, 2014). Even the manner in which their assessment is done cannot be the same. While it is evident that teachers in technology education lack techniques of preparing for practical lessons, Kennedy (2011) suggest that it is because they tend to focus more on what will not challenge them.

For example, firstly, assessment for learning, where teachers explore on the accuracy of giving practical activities that are in line with DBE standards. Secondly, Assessment as learning, where teachers explore on how and when should they create opportunities for learners to self-and peer-assess their work. Thirdly, Assessment as reflective, where teachers realise the importance of understanding reflective assessment tools where necessary and correctly interpret assessment tools given by DBE. Fourthly, Assessment of learning, where teachers understands the use of assessment tools for its purpose. Lastly, competency-based assessment, where teachers take note of how to keep assessment records and moderation processes.

4. Conclusions and Implications for Practice

From the above discussions, it can be concluded that most Civil Technology teachers do not perceive assessment as a mechanism to strengthen hands-on practical activities. It is also clear that DBE does not provide with guidelines on how teachers can assess learners' tacit and procedural knowledge. The only official document available for teachers is PAT document that assess end product of the practical activities rather than hands-on skills process. Therefore, various concepts of assessment theories were not correctly executed. For instance, in *assessment as learning*, the results established that teachers struggle in creating opportunities for learners to self-and-peer assess their work. This study suggest a need for Civil Technology teacher development in this aspect since it align its views with that of Lorente-Catalán and Kirk (2016) that peer assessment is one of the higher-order thinking learning activities and should be emphasised even in Civil Technology.

With regards *to assessment as reflective*, the study found that teachers do not have a tool for assessing the hands-on skills whilst learners are busy, but the assessment tool available is for assessing the end-product. This study recommends a review of current assessment tools in order to feature aspects of procedural knowledge when assessing practical tasks. *Assessment of learning*, this study noted a link from *assessment as reflective* in a sense that some of the teachers allocated marks on things learners did not do. It is a view this study holds that based on the results, most teachers are not properly trained to correctly interpret assessment tools given to them.

Therefore, this study calls upon Stuarts and experts of Civil Technology to facilitate this assessment process as it has potential to negatively affect the development of practical skills if not correctly handled. As for *competency-based assessment*, this study noted a good practice in teachers preparing all practical lessons evidence to be amended by subject advisors. Therefore, this study based on findings, commends the practice of competency-based assessment by Civil Technology teachers. In order to embrace practical skills and the application of scientific principles in producing practical skill-competent learners who will be suitable for the industry and for meeting economic demands, this study recommends simultaneous use of assessment theories by teachers as a strategy to actualise practical lessons through assessment in Civil Technology. These theories will assist in meeting the increasing demand in sub-Saharan African countries to promote technical and vocational education and training (TVET) in order to increase productivity and competitiveness in the global economy.

5. Limitations and Future Research

This study used five Technical schools of Ekurhuleni district, Gauteng province, South Africa. Only Technical public schools were used in this study given the fact that private schools do not attend public schools cluster meetings. In addition, comprehensive schools offering Civil Technology were in the verge of phasing out the subject upon introduction of CAPS 2, hence they were not used. Future research; similar research focusing on specialisations like electrical and mechanical technology should be done on how assessment can strengthen hands-on practical activities. This will serve as a room for improvement for teachers especially in schools where lack tools and equipment, learner overcrowding and poor workshop infrastructure are not in practice.

Acknowledgement

The authors would like to thank all teachers and learners who participated in this study. A special thanks to Daniel, Fikile, Nonkululeko and Khwezi Mtshali for supporting this research project.

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