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The Transfer of Requisite Civil Technology Hands-on Practical Skills to Student Teachers in South African Civil Technology Teacher Training Universities

M.S.A. Maeko[1] and M. Makgato[2]

[1]School of Education, Durban University of Technology, South Africa
[2]Department of Technology and Vocational Education, Tshwane University of Technology, South Africa
E-mail: [1]<maekos@dut.ac.za>, [2]<makgatom@tut.ac.za>

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ABSTRACT The aim of this study was to investigate the transfer of the requisite Civil Technology hands-on practical skills to student teachers in South African teacher training universities. Purposive sampling identified four universities from which 79 third-year B.Ed. Civil Technology student teachers, together with three of their lecturing staff, were selected as participants. Questionnaires, semi-structured focus group interviews and classroom observation were used to collect data. The study found that student teachers exit the Civil Technology course without essential practical hands-on skills. Civil Technology practical activities were found to be offered inadequately in the four sampled universities. It is recommended that educators be well-trained by higher education institutions in practical activities so they may subsequently impart those requisite skills to learners in schools. It is also recommended that the entire B.Ed. program be reviewed to foster the infusion of practical into the Civil Technology course.

INTRODUCTION

Skills training for Civil Technology learners is essential in producing skilled personnel for a sustainable economy. In South Africa, this idea is entrenched in the Civil Technology policy document for schools, which prescribes practical activities, through the Practical Assessment Task (PAT), as national requirements for all practical-based subjects from grades 10–12. PAT is a series of practical activities wherein learners collect information at different stages in order to complete a feasible project. In such a way, immediately after obtaining the National Senior Certificate, learners should be ready to enter learnership or apprenticeship programs that would prepare them for a trade test (Department of Basic Education (DBE) 2014).

Apprenticeship is a process of transmitting knowledge and skills in the context of real work. The apprenticeship learning program is seen as one way of helping the unemployed to obtain a qualification that would enable them to work as artisans (Department of Labour (DoL) 2013). So, the teaching and learning of the practical component in Civil Technology should be inherent in Civil Technology teacher training courses offered by Higher Education Institutions (HEIs). This is because when those teachers graduate they will be employed in schools, where the nature of the subject and demands of the curriculum require the integration of both practical and theoretical aspects.

The Civil Technology course in South African Higher Education Institutions (HEIs) is offered during the first three years of a Bachelor of Education (B.Ed.) four-year degree program; wherein student teachers should be exposed to both the theoretical and practical aspects of the course. In their fourth year, students go for School Based Experience (SBE) for 6 months. During their SBE students are expected to teach two major subjects from the B.Ed. program, which besides Civil Technology could be Mathematics, Mathematics Literacy or Engineering Graphics and Design (EGD). In essence, during SBE students are expected to practice how to teach their subjects, and in Civil Technology

Address for correspondence:
Maeko Mogale Simon Albert
12 Sandra Cresc,
Pelham, Pietermaritzburg,
3201, South Africa
E-mail: maekos@dut.ac.za

they would need to demonstrate the requisite practical skills acquired in their training. In Civil Technology, such practical skills are necessary to meet the Civil Technology learning goals which includes operating machinery and using hand tools safely.

This expectation of practical skills can only be realistic if essential practical equipment, such as machinery and hand tools, is provided for student teachers to manipulate during their training. As Boateng (2012) argued, the preparation of technology education teachers in Ghana has been inhibited by poor infrastructure and training facilities at training institutions, and outdated training content, resulting in incompetent graduates who are unable to teach the subject's practical component. Skills training is learning designed to acquire an area of competence that can be put into practice at work (Akinseinde 2004). Ayonmike (2016) indicated that acquiring a skill necessitates adequate and functioning training facilities, suitable infrastructure, sufficient technology teachers and appropriate delivery methods. Sadly, she concludes that in Nigerian universities skills training represents a situation of unavailability or inadequacy of training equipment (materials and tools) and infrastructure (workshop and laboratory) with inappropriate delivery methods. Therefore, without suitable workshop spaces, classrooms and laboratories, program implementation and structuring is very difficult, if not impossible.

In order to infuse theory into the practical component, Kirlbrink and Bjurulf (2012) suggested that teaching and learning for the two aspects could take place in different learning arenas; that is, universities and workplaces. In this model, theoretical classes take place in universities, which are then partnered with a factory nearby where students can undertake the practical component.

Training of Civil Technology Teacher Trainees in Higher Education Institutions

To reduce poverty and unemployment, technology teacher education depends on training of the necessary teachers (Lilly and Efajemue 2011). According to Amedorme and Fiagbe (2013), Higher Education Institutions offering technology education enable individuals to acquire practical knowledge and skills suitable for the job market or immediate self-employment. One of the most important objectives of these institutions should be to provide technically orientated graduates with good technical skills (Al-Nasra 2013).

Some of the courses in technology education offered at universities in Ghana include automotive repair and maintenance, electrical works, welding and fabrication, tailoring and dressmaking in particular. Within the Civil Technology curriculum, carpentry and joinery, plumbing, brick laying and concreting or masonry are offered (Amedorme and Fiagbe 2013). According to Groenewald (2007), teaching and learning in such subjects should be performed in a laboratory, with on campus practical being facilitated by lecturers and supported by laboratory technicians or assistants. However, Dempsey (2013) argued that in Australia there is no uniformity in the training of Technology Education teachers. Ohize and Ahmad (2014) argued that training of technical teachers is a process of guiding the teacher in learning the skills necessary to carry out any workshop practice as required by technology education school curricula. Practical skills in any technology teacher training, including Civil Technology, have always been embedded within the curriculum. The theory cannot exist without the practical skills and, moreover, it is practical skills that define a quality Civil Technology teacher. It is for this reason that in training Civil Technology teachers, the practical component should never be compromised. In this regard, Ohize and Ahmad (2014) advised that in technical teacher training, more emphasis should be given to practical experience than theoretical experience, since the training of technical teachers with highly developed skills is an essential step for industrial growth**.** Practical projects along with lectures and laboratory work have proven to be very effective in the learning of practical skills (Al–Nasra 2012).

The Teaching and Learning of Civil Technology in South African Schools

Learners in South African schools study Civil Technology, with a prescribed practical component from grades 10 to 12. Four contact hours per week are recommended for the subject, to be split equally between the two aspects, practical work and theory (DBE 2014). It is very clear that one aspect cannot exist without the other. More-

over, from this time allocation, it is evident that the curriculum promotes weekly practical lessons. All learners who graduate from high schools should have acquired economically relevant skills needed for sustainable employment, as well as skills required for further education (Makgato 2011). In this regard, the South African Department of Basic Education (DBE), when revising the Civil Technology program for schools, discovered the need to articulate skills training at school with that in the world of work (Nkosi 2013). This program, according to Nkosi (2013) will assist learners to master Civil Technology hands-on technical skills while at school. This hands-on approach, according to Gwembire and Katsaruware (2013), would then enable learners to lead a productive life after school. Thus it can be argued that a Civil Technology teacher should be well grounded in the practical aspect of the subject in order to transfer practical skills to learners. Imparting and upgrading technical skills to learners is a way of enhancing employability and promoting self-employment (Inyiagu 2014).

The stated aims and objectives of Civil Technology education in South Africa promote practical skills acquisition for learners, so upon exiting Grade 12 they would be ready for learnerships or apprenticeships, which prepare them for a trade test (DBE 2014). These aims are similar to the situation in Scotland and France, where, according to Speake (2007), practical skills training courses are mainly for learners in secondary school and are intended to provide pathways to employment without further training. For many young people, an early chance to work on practical, job-related skills provides real benefits (Speake 2007). However, the reality of the South African technology education system is that currently Civil Technology learners are not afforded such opportunities. In this regard, Maeko and Makgato (2014) argued that the education system in South African technical schools does not prepare learners for a career after school, but merely for a grade 12 certificate. The DBE (2011) clearly indicates that in order to accommodate the practical nature of the Civil Technology Grade 10-12 curriculum, a Civil Technology teacher, apart from being a trained subject specialist, should possess industrial experience, workshop skills and a tertiary technical teaching qualification. For that reason, the training of Civil Technology teachers by HEIs with respect to the practical component cannot be overemphasized.

This study makes a significant contribution to documenting the state of hands-on practical activities in the Civil Technology course offered to Civil Technology teacher trainees. The objectives and research questions below guide the investigation in order to understand the nature of this problem.

Objectives

The objectives of this paper are to:

- Describe the fundamental role of Civil Technology practical skills in the training of Civil Technology teachers.
- Discover any barriers that may inhibit Civil Technology skills transfer to students.
- Provide recommendations for the effective practical skills transfer to student teachers.

Research Questions

RQ 1: What are fundamental reasons for including practical skills in the training of Civil Technology teachers?

RQ 2: What factors hamper the effective acquisition of practical hands-on skills in the training of Civil Technology teachers?

METHODOLOGY

Purposive sampling was used to identify 79 Civil Technology third year student teachers together with three of their lecturing staff from four Higher Education Institutions in South Africa. Data were collected through questionnaires, semi-structured focus group interviews and classroom observation.

In responding to research question 2, a questionnaire was used, with five Likert scaled items. All items required students to give a closed response to a statement by choosing one of the following options: (1) Strongly agree, (2) Agree, (3) Disagree, (4) Strongly disagree or (5) I don't know. The statements are given in Table 1 of this paper. Out of the 79 questionnaires that were distributed to student teachers, 57 were returned; that is, a seventy-two percent response rate.

Semi-structured interviews were conducted with both student teachers and lecturing staff, in responding to research questions 1 and 2.

Focus group interviews with student teachers were intended to glean more information than could be provided through questionnaires. This method permits researchers to uncover aspects of understanding that often remain hidden in the more conventional in-depth interviewing method (Gill et al. 2008). The study also involved one-on-one interviews with the Civil Technology lecturing staff to get first-hand information on the teaching strategies they use to ensure that the theoretical and practical aspects are integrated in the teaching and learning of the Civil Technology course.

In responding to research question 2, classroom observation, based on the differentiated classroom observation protocol instrument (Popp et al. 2011), was also a valuable data collection tool in this study. Zohrabi (2013) described observation as a preplanned research tool that is carried out purposefully to serve research questions and objectives. In this regard, Khoza (2004) pointed out that certain research questions can best be answered through observations during normal daily activities. This was relevant for the researchers in their quest to establish whether or not the HEIs in the study had material and equipment suitable for practical teaching.

Quantitative data from questionnaires were presented and analyzed statistically, using the SPSS software; with responses being represented as percentages. The interviews were transcribed after each interview, with typed text showing respondents' answers to each question. Transcripts are fundamental for qualitative research. Each transcript was first analyzed to identify key issues. Descriptions of themes were then formulated from the key issues identified as relevant to the study, and they were coded. Themes, which are a pattern of answers emerging consistently and more often to highlight common issues, were created from student teachers' focus group interviews, and then categorized into headings and constructively narrated with the support of verbatim quotations. Like one-on-one interviews, the results of focus-group interviews can be presented in uncomplicated ways using lay terminology, supported by quotations from the participants (Rabiee 2004).

Data derived from classroom observation was analyzed descriptively, according to each item on the schedule used during observations. These items were also analyzed for each sampled HEI, in order to identify any connections between activities in Civil Technology practical teaching and learning.

RESULTS

The results of the study are presented in three categories namely, questionnaire, interview and observation data.

Questionnaire Responses from Students

In responding to research question 2, Table 1 shows the distribution of responses from student teachers regarding their learning of the practical aspects of Civil Technology displayed as frequency distributions.

Responding to the statement about use of practical equipment during practical lessons, the largest percentage of the respondents (36.8%) fell in the strongly disagree group, with a similarly high percentage (33.8%) disagreeing. The number who agreed followed (17.5%) and the strongly agree group comprised 12.3 percent of responses. These responses indicate that the majority of students have no opportunity to manipulate equipment in practical classes. However, manipulating equipment underlies skills acquisition.

In the second item, regarding practical lessons being timetabled, students were almost equally divided. Equal numbers of respondents agreed or disagreed (29.8%). There were also similar numbers of respondents who strongly agreed (21.1%) or strongly disagreed (19.3%).

On whether students have enough time for practical lessons, the distribution of respondents is as follows. The largest percentage of the respondents fell in the disagree group (38.6%), then, with equal numbers (24.6%) followed in the agree and strongly disagree groups, the strongly agree group comprised seven percent and only 5.3 percent were undecided.

On the subject of whether there is enough material for practical lessons in the workshop, the majority of respondents revealed that there was not enough material for practical lessons in the workshop. The largest percentage of the respondents disagreed (57.9%), the strongly disagree group followed (29.8%), agree followed at 10.5 percent and the strongly agree group comprised only 1.8 percent. This distribution corroborates Woyo's (2013) statement that the most critical impediment to the effective learning of

Table 1: Frequency distribution table on the practical aspect in the learning of Civil Technology

Statement/Indicators	*Frequency distribution*											
	Strongly agree		*Agree*		*Disagree*		*Strongly disagree*		*I do not know*		*Total*	
	F	%	*F*	%	*F*	%	*F*	%	*'F*	%	*F*	%
Students do use requisite practical equipment during practical lessons	7	12.3	10	17.5	19	33.5	21	36.8	0	0	57	100
Practical lessons are timetabled	12	21.1	17	29.8	17	29.8	11	19.3	0	0	57	100
Practical lessons are scheduled enough time	4	7.0	14	24.6	22	38.6	14	24.6	3	5.3	57	100
There is enough material for practical lessons in the workshop	1	1.8	6	10.5	33	57.9	17	29.8	0	0	57	100
All students get the opportunity to practice the requisite skills during practical lessons simultaneously	2	3.5	10	17.5	28	49.1	16	28.1	1	1.8	57	100
There is adequate supply of basic hand tools for practical lessons	4	7.0	9	15.8	34	59.6	9	15.8	1	1.8	57	100
I am confident in teaching the practical component during my teaching practice	5	8.8	5	8.8	31	54.4	15	26.3	1	1.8	57	100
There is appropriate equipment in the workshop	6	10.5	7	12.3	32	56.1	12	21.1	0	0	57	100
We incorporate fieldtrips to enhance practical skills	3	5.3	8	14.0	15	26.3	31	54.4	0	0	57	100

Strongly Agree (1); Agree (2); Strongly Disagree (3); Disagree (4); I do not know (5)

technology skills was rampant lack of materials for teacher training. The responses summarized above indicate that the majority of the students have little opportunity to work on practical projects because of lack of material. This will unfortunately affect the learners in schools where these under-skilled graduates will later be employed.

When responding to the statement of: *'All students get the opportunity to practice the requisite skills during practical simultaneously'*, 44 students (77.2%) disagreed or strongly disagreed with the statement. It can be construed from the respondent's interpretation that they have to share resources which is not an ideal situation for acquiring individual practical skills.

Those who agreed that they had the opportunity to work simultaneously were 17.5 percent, followed by the strongly agree group at 3.5 percent totaling twenty-one percent, with only 1.8 percent being undecided.

On whether students felt confident about teaching the practical component during their teaching practice, 31 (54.4%) of the students disagreed followed by 15 (26.3%) who strongly disagreed. That was followed by the strongly agree group (8.9%) and the unanswered group (1. 8%). This was mainly because students had been exposed to few practical classes during their university course. The students' responses corroborate Boateng's (2012) view that technology education student teachers are poorly prepared due to poor infrastructure and training facilities, and they are therefore unable to teach the practical component. It might be alarming that the respondents in this study were 3rd year Civil Technology students, who would be graduating shortly, to enter the labour market where their task would be to teach such skills in schools.

For the item concerning appropriate equipment in the workshop, 77.2 percent of the students disagreed with the statement. In this case, most of them disagreed (56.1%) and 21.1 percent disagreed strongly. The agree group followed at 12.3 percent, with the strongly agree group at 10.5 percent. This indicates that more

than three quarters of the students thought that they did not have appropriate equipment for skills acquisition.

When asked if fieldtrips were being incorporated to enhance practical skills, again many students disagreed with the statement. A high percentage of respondents fell in the strongly disagree group (54.4%), the disagree group followed at 26.3 percent, totaling an overwhelming 80.7 percent. That was followed by agree group at fourteen percent and the strongly agree group at 5.3 percent. From these responses, it is clear that over eighty percent of the students were not being taken to visit industries where they could get first-hand experience of practical processes. In this regard, Kennedy (2011) points out that field-trips allow student teachers to be involved in demonstrations and workplace practice, thereby building their practical skills.

Students' Focus Group Interview Results

Semi-structured focus group interviews with students provided qualitative data that gave richer information than could be obtained through a questionnaire. The interviews were first transcribed and then key issues identified around recurring themes. The following theme emerged from student's teachers' focus group interviews in responding to Research Question 1.

Theme 1: Practical is Significant for the Course

On the variable concerning whether the practical component is vital for the Civil Technology course, all students confirmed that it was a key component. One student said: *"The practical component is essential in Civil Technology teacher training since we will be expected to impart practical skills to learners in schools where we will be working. Besides, Civil Technology is quite practical as a subject and you cannot divorce that from the subject."* A student from another HEI said: *"It is quite important for us to acquire practical skills since we will be the ones expected to implement the subject policy in schools which require us to be vested in both theory and practical. Civil Technology Practical is very important in our teacher training as it help us understand theory even more and also to be able to impart practical skills to learners in schools where we will be teaching."*

Theme 2: Lack of Time, Material and Equipment

In responding Research Question 2, for the variable concerning the challenges student teachers face in acquiring practical skills in the workshop, the above theme emerged.

Students were asked if they experienced challenges in their acquisition of practical skills. A group member (Kopano) from HEI A said: *"The workshop we use belong to general technology course which causes clashes. We share that workshop and this creates problems for us because we cannot access the workshop anytime we are free to polish our skills."* This viewpoint echoes that of Gwembire and Katsaruware (2013), who indicated that all Technology Education subjects require specialized workshops and equipment in promoting effective transfer of skills. A fellow classmate (Thabiso) from a different focus group also indicated that: *"Besides the workshop issue, the machines in that workshop are not relevant to Civil Technology teacher training. They are meant for engineering and that work against us."* A student (Xaba) indicated similar frustrations at HEI B: *"The challenge which I have identified is that we do only woodwork practical which moreover I cannot say we have been exposed to holistically. We are not even exposed to basics for Civil Services and Construction practical which we do theoretically. Some of us are even scared of machinery as we have no enough time to manipulate and get used to it."*

Theme 3: That Depends on the School One is Doing Practical to Tell

Theme 3 on whether the practical skills acquired at university are compatible with those needed in the school environment, emerged in answering to Research Question 2.

Students were asked if they could relate the type of training to which they had been exposed during their training to their school experiences during their teaching practice. Notably, the respondents are 3rd year students and have been to schools for their work integrated learning (Teaching Practice) and should have been exposed to how the Civil Technology practical classes are handled in schools. Student A from one group at HEI A said: *"I would say yes and no, the yes being that with smaller machinery*

is not a problem. Some technical schools are advanced and are equipped with the machinery we do not have in our university. That exposes our limited knowledge in front of the learners when we have to operate that equipment we are seeing for the first time." Another student from another group at HEI B said: *"At the university, most of the practical tasks we do are very small projects. You go to schools and we come across big projects like building walls with real material. I will say mostly the practical tasks the university exposes us doesn't resonate with tasks we find in some technical schools."*

Theme 4: Irregular Scheduling of Practical Classes

In addressing Research Question 2, when students were asked how often they attend practical a theme irregular scheduling of such classes emerged.

Student (Kunene) from a group in HEI A said: *"We do practical lessons twice a year because of time constraints, this is for the second time since the beginning of this academic year and it is towards the end of the year. The problem is we take too much time on SBE which eats into our time which I think was supposed to be used for enhancing our practical skills at the university since we do not have time for practical during the normal academic calendar."* A fellow student (Sipho) from the same group added: *"I feel that instead of us spending 6 months in schools for SBE, we were supposed to use that time to enhance our practical skills since that is the only time the workshop will be available as the rest of the technology students will be away on SBE. Our subject is not like Mathematics or Economic and Management Sciences, it requires intense practical. So we were supposed to at least spend 1 month on SBE then use the rest 5 months at the University for Practical Lessons since most technical schools we go to does not even have workshops or equipment."* It should be noted that these students are in their 3rd year of the B.Ed. program, and have already been to teaching practice in their 2nd year, and will shortly be expected to go for a further 6 months teaching practice.

On whether lecturers or laboratory technicians are equipped to offer practical in the workshop, two distinct themes emerged in response to Research Question 2, as are discussed next.

Theme 5: Well Equipped to Handle the Practical

The student from HEI A in one group said: *"Our lecturer is well knowledgeable with regard to Civil Technology practical. What I also picked up is that, he is also strong on all Civil Technology practical areas like Woodworking, Civil Services and construction. He is always prepared but just lack of resources let us down."* A fellow HEI A student from another group said: *"Our lecturer's practical skills is unquestionable. He understands all Civil Technology practical areas and replace small things like machine blades when they are broken."*

Theme 6: Partially Equipped to Handle the Practical

Student (Philisiwe) from group A in HEI B said: *"Our lecturer is stronger on woodworking. We find ourselves being exposed to woodworking practical lessons often to the detriment of other areas like Civil Services and Construction. Besides, we do not even have enough material for woodworking and nothing for Civil Services and Construction which requires us to build brick walls."* On the other hand, a student (Ayola) from HEI C in group A said: *"The lecturer's knowledge is excellent especially with woodworking. He is well prepared in that aspect of the practical. But he doesn't seem to be strong on Civil Services and Construction."*

Lecturers' Interview Results

The interviews were conducted one-on-one with three Civil Technology lecturers. In responding to Research Question 1 on the significance of the practical part of the Civil Technology course, the following were typical responses.

Lecturer A said: *"Indeed, according to me students were supposed to have a day per week for site or industrial visit to connect theory to practice in a real world on a weekly basis."* Lecturer B from another HEI said: *"Certainly, there must be practical lessons as the syllabus is both theoretical and practical."*

In addressing the variable of whether the lecturing staff had frequent practical lessons with the student teachers in the workshop, the following was lecturer's responses in answering to Research Question 2.

Lecturer A said: *"For the 1st and 2nd year students we mostly do simulations and theory as there is just no time. In 3rd year that is when we concentrate on demonstration as it is time tabled though that is not enough. So I will say, generally we do not do practical often as I would like."* However, Lecturer B from another HEI said: *"Honestly since we don't have time allocated on out timetable for practical, I cannot say we do practical often. I try to squeeze time for practical but it is not as it should be under normal circumstances."*

Responding to Research Question 2 for the variable of whether lecturers or laboratory technicians were well trained to teach Civil Technology practical, the following responses were obtained from the lecturing staff.

Lecturer A said: *"I consider myself skilled in this area with regard to both theory and practical. Besides being trained as a Civil Technology teacher from a Higher Education Institution, I also underwent further training at Gold Fields Mining and Tabiso to enhance my practical skills in woodwork, construction and plumbing."* By contrast, Lecturer B from HEI B said: *"Well, I have a certificate which means I am qualified to teach the practical. But, I will say it is challenge as I feel like I was not holistically exposed to other aspects of practical now that I am in the field. The training I received from Higher Education Civil Technology teacher training lacked something."*

In determining the ideal situation in which student teachers could acquire practical skills, the following emerged as responses to address Research Question 1.

Lecturer A said: *"I would like to see my students being taken to site visits and industries to learn some new technology in a real world. For example, when we talk of reinforcement we still use the first method we know off but nowadays the world is experiencing earthquakes and there is new technology in the real world, in the form of plastics used to reinforce structures to cope under such conditions. Unfortunately, that's real world exposure which the university cannot afford to take the students to because of budget constraints. Also time is a factor, as the way practical was allocated on the timetable does not give time for such"*. Lecturer C from HEI C said: *"The ideal situation is to have theory and practical time set aside for the benefit of students and with a trained artisan. Well, that is not the case."*

In responding to Research Question 1, on the issue of whether universities have established relationships with industry to expose student teachers first-hand to practical skills, the following responses came up:

Lecturer A said: *"That I think is impossible under the current circumstances. Unless the question of time and budget is addressed."* Lecture C said: *"We do not have links with industry, which is another factor hampering student acquisition of practical skills. Our Institution is in the middle of nowhere, in a rural setup and industry is far to have links with."*

Observation Data Results

As stated in the methodology for this paper, unobtrusive classroom observation was used to establish how the teaching and learning of the Civil Technology practical occur in the practical workshop. The following are some of the observations:

Integration of Theory with Practice

On the aspect of linking theory and practice, the researcher observed that the lack of material or equipment and, in some cases, time are challenges to the integration of theoretical and practical aspects. Although students from HEI B had adequate time scheduled for the workshop (one day of 8½ hours weekly), lack of material, workshop space and equipment were observed to be major challenges to infusing practice into theory. At HEI A, besides the challenge of less time (7 hours per week) being allocated for practical classes, material, equipment and infrastructure were a huge problem: there was no workshop exclusively for Civil Technology. This challenge corroborates Woyo's (2013) view that rampant lack of training materials and workshops for teacher training is hampering the effective learning of practical skills in technology. At HEI D, time constraints were the main challenge, because the Civil Technology classes were allocated a total of only 6 hours per week, for both theoretical and practical aspects. Ironically, at

this HEI, there was a well-equipped workshop with new high-technology apparatus and material. Yet there was no time allocated specifically for the workshop. The evidence shown here echoes Uwaifo's (2010) assertion that for most practically based subjects the education sector in Nigeria, from primary to tertiary, lacked the propensity to execute and teach practical skills effectively. Consequently, teaching and learning of the subject was primarily theoretical, even when provision was made for tools, equipment, facilities and workshops.

Coordination of Activities

In this research, it was important to investigate the coordination between theoretical and practical classes. In other words, how was the movement of student teachers from theoretical lessons to practical classes managed? On this variable, a challenge was observed at all HEIs in moving directly from theory lessons to practical lessons. This was because students had to follow the B.Ed. timetable, which included other subjects such as Education Skills, Life Orientation, and Mathematics etc. This marginalizes the practical aspect of Civil Technology; meaning that it often had to be caught up later. It was observed that only students from HEI B and C had the luxury of weekly workshop classes. Students at HEI A and D only went to the workshop once or twice in a year. At all the HEIs however, it was common for theoretical and practical aspects to be out of synchronization. A lapse of time between theory and practice in a topic means that it is impossible to infuse one aspect into the other. This lack of proper co-ordination between theoretical and practical activities supports the argument of Behbahami (2011), who claims that in Iranian technology teacher training institutions, when planning courses, there is no coordination between, on the one hand, workshop plans and laboratory schedules and, on the other hand, the theoretical content.

DISCUSSION

This study has explored the teaching and learning of Civil Technology practical skills required for B.Ed. Civil Technology student teachers. It is important to enhance these skills because the nature of the subject requires integration of both the theoretical and practical aspects of the subject. Because the graduates of this program will be teaching the subject in schools, they have to be well versed in both components. In Civil Technology, theory cannot exist without practice, and practice cannot exist without theory. Therefore, time should be allocated to strike a balance for both types of activities. Both students and lecturing staff indicated that practical activities are essential and should therefore be central in the teaching and learning of the course. This parallels the assertion by Ohize and Ahmad (2014) that in technical teacher training, more emphasis has to be given to practical experience than theoretical experience. This study has however, established that such is not the case in the sampled South African universities. Instead, both students and lecturing staff revealed that their universities do not have enough material and equipment or time for practical lessons. Furthermore, it was discovered that some Civil Technology lecturing staff have themselves been poorly trained and are therefore unable to teach practical aspects holistically. These challenges, coupled with lack of proper coordination between theoretical and practical activities, lead to a mismatch, which impedes students acquiring the necessary practical skills. This mismatch then points to university practice not being compatible with the competencies that will be expected from students upon graduation. As graduates, they would be expected to teach both theory and practice in schools. This finding corroborates Boateng's (2012) assertion that in Ghana the preparation of technology education teachers has suffered from poor conditions and infrastructure at training facilities which result in institutions churning out graduates who are unable to teach the practical component of their subject.

Partnership with industry is another factor respondents revealed as fundamental in the teaching and learning of the Civil Technology course. The study described the fundamental role of Civil Technology practical skills in the training of Civil Technology teachers and also established the barriers to Civil Technology skills transfer to students. These findings lead to recommendations for the effective transfer of practical skills to student teachers.

CONCLUSION

In conclusion, it was clear that at almost all of the sampled South African HEIs offering the Civil Technology teacher training B.Ed. program

the teaching and learning of Civil Technology has become very theoretical. This was due to factors including time constrains, lack of material or equipment, and exacerbated by poorly trained lecturing staff. This theoretical bias negatively impacts on the quality of teachers regarding the practical aspect of the subject when they graduate from the universities.

RECOMMENDATIONS

The study recommended that educators be well-trained by higher education institutions so they could then conduct practical activities in order to impart the requisite skills to learners in schools. Students recommended that the B.Ed. program be reviewed so that they do not have to spend six months on teaching practice. They would prefer this time to be used for more practical classes at the HEIs. Both students and lecturers recommended that HEIs establish partnerships with industry for practical skills exposure. It was further recommended that HEIs timetables allow more time for practical work.

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