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ARTICLE



The pitfalls of work placement learning: perceptions of mechanical engineering students from a South African university

Tiyamike Ngonda^a, Corrinne Shaw^b and Bruce Kloot^b 

^aDepartment of Mechanical and Mechatronic Engineering, Cape Peninsula University of Technology, Bellville, South Africa; ^bDepartment of Mechanical Engineering, University of Cape Town, Cape Town, South Africa

ABSTRACT

This article reports on a qualitative multi-case study exploring the challenges mechanical engineering students experience during work placement. The study collected data from 34 purposively selected mechanical engineering students. It found that constraining learning environments, ineffective industry mentors, low quality work affordances and negative student characteristics can compromise students' work placement learning outcomes. It suggests that the coupling of ineffective mentors and constraining learning environments tends to be associated with low quality work affordances. Industry mentors were considered ineffective if they could not perform the dual role of work supervisors and teachers. It further suggests that some student attributes can also compromise work placement learning outcomes. It found that students who are not proactive or assertive often experience low quality work affordances. To remedy these shortcomings, universities should provide pre-placement training for students and industry mentors in the form of a seminar for industry mentors and simulated work placement for students.

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1. Introduction

Work placement is credit-bearing work experience in a company or organisation designed to enable students to connect their academic learning with workplace practice. It entails exposing students to industry supervised and planned learning activities as part of their curriculum. Work placement differs from unsupervised work that students undertake to earn an income or gain work experience as it is aligned to defined student learning outcomes. The typically stated learning outcomes of work placement focus on enhancing student employability through gaining relevant work experience and developing practical knowledge and profession-specific skills, career and self-management and interpersonal skills (Luk and Chan 2020; Ngonda, Shaw, and Kloot 2022; Smith and Worsfold 2015).

Most universities consider work placement learning a viable option for developing work readiness in graduates (Patrick et al. 2008). As such, work placement is a graduation requirement for engineering undergraduates in Hong Kong, Australia, and some engineering programmes in South Africa (Luk and Chan 2020). The Engineering Council of South Africa (ECSA) requires diploma in engineering programs to include at least 30 credits of work-integrated learning in the form of work-directed theoretical learning, problem-based learning, project-based learning, work placement, or simulated workplace learning (ECSA 2019).

In addition, work placement is widely supported by government policies globally. For instance, the South African Government's White Paper for Post-School Education and Training calls for universities to seek to 'build strong partnerships with employers in order to promote the expansion of workplace training opportunities' (DHET 2014). Similarly, the United Kingdom Government, through the Wilson report, supports work placement as a mechanism for enhancing graduate employability. The Wilson report recommends that 'every full-time undergraduate student should have the opportunity to experience a structured, university-approved undergraduate internship during their period of study' (Wilson 2012).

Most engineering faculties of South African universities of technology prefer work-integrated learning in the form of a six-month-long off-campus work placement module in the second semester of the third year. This arrangement, where students only return to the university to graduate, is also preferred by industry because it allows the companies to combine work placement with their post-graduation internship programmes. This approach provides students with a structured path to employment. As a result, companies find it easier to hire work placement students because they do not have to return to the university.

2. Challenges experienced by work placement students

Notwithstanding the widely acknowledged benefits of work placement and policy-level support it enjoys from the South African government and ECSA, implementation of work placement by South African universities faces numerous and significant challenges. Most of the reported challenges are context dependent. For example, work placement students in developed countries experience different challenges from those in developing countries (Jackson 2018; Mutereko and Wedekind 2016; Reinhard et al. 2016). There is a lack of opportunity for suitable work placement environments in developing countries. Some students struggle to find a host company, and some companies are not really appropriate or geared to taking on students (Mutereko and Wedekind 2016).

Learning in the workplace is intrinsically challenging for work placement students. Workplaces are contested terrain filled with micropolitics and contradictions and are generally not structured for learning. Most learning in the workplace occurs from participating in regular work activities. This is a sharp contrast with the classroom setting that the students are familiar with, in which most activities are structured for learning. Perhaps the most significant challenge work placement students face is the difference in the required forms of knowledge needed in these two settings. For example, some studies report that students struggle to connect curriculum content with professional disciplinary knowledge (Goodwin and Mbah 2019; Immerstein, Hasleberg, and Eri 2020; Jackson 2015). This cognitive struggle hinders students' ability to complete assigned tasks and makes them feel inexperienced and unprepared (Jackson 2017b).

Another significant challenge is the poor quality of mentorship available to work placement students (Ha 2022). University departments often select industry mentors who are in management positions. These industry mentors struggle to find time to support and guide the work placement students because they tend to prioritise their official work (Ha 2022; Jackson 2017b). This problem is exacerbated because universities do not often train industry mentors on modern teaching and learning methods (Jackson 2018). In addition, industry mentors often lack formal training in assessing work placement learning. As a result, industry mentors tend to evaluate work placement students more favourably than they deserve (Jackson 2018). A further challenge, inadequate support by university coordinators, is rooted in the massification of higher education. In their study of Vietnamese universities, Ha (2022) associates inadequate support with the heavy workload of the work placement coordinators.

International students experience additional challenges (Goodwin and Mbah 2019; Jackson 2017a). They struggle to adapt to expected conduct, behaviours, values, and norms prevalent in their host companies. Their struggles are sometimes perceived as disengagement and disinterest, and host companies prefer to recruit local students who are easier to recruit permanently. The limitation of the number of hours per week that international students are allowed to work in some countries such as the United Kingdom and South Africa is a disincentive for companies. This challenge influences international students to accept underemployment and suboptimal work placement opportunities (Wall, Tran, and Soejatminah 2017).

Peters, Sattler, and Kelland (2014) warn that token placements, poorly structured or inadequately supervised work placements do more harm than good. They indicate that such placements undermine learning, hinder the development of employability skills and damage the students' employment prospects. Considering the potential harm of poor-quality work placement, the diversity of work placement contexts, and the articulated challenges of work placement, a better understanding of features that would compromise work placement learning outcomes is needed.

This study sought to enhance this understanding by addressing the following research questions:

- (1) What are the features of work placements that could compromise student learning outcomes if present in a particular context?
- (2) How do these work placement features compromise student learning outcomes?

The answers to the research questions are intended to contribute to the understanding of the factors that can undermine the learning experienced by work placement students and would enable universities to recognise and develop interventions to address them.

3. Research methods

The study followed a qualitative multi-case study approach to uncover the challenges that mechanical engineering students face during work placement. This approach is appropriate for studies that focus on outcomes of intrinsically-bounded activities (Yin 2018). In addition to this, Stake (2005) advises that multiple case study methodology is preferable in instances that focus on the developing 'insight into an issue', with the cases being of secondary interest.

3.1. Participants

The study recruited the participants through an email invitation sent to a 2017 cohort of mechanical engineering students from a South African university of

Table 1. Industry sectors and the number of students placed.

Industry sector	Number of participants
Aquaponics farming	1
Automobile component manufacturer	6
Non-alcoholic beverage manufacturer	5
Engineering consulting firm	4
Higher education engineering workshop	4
Mechanical component fabrication	9
Commercial engineering material testing laboratory	1
Gold mining	2
National research institute	1
Oil industry construction	1

technology. This cohort had 302 students who were placed in 150 host companies; of these, 106 students responded to the invitation. The study used maximum purposeful variation sampling to select 34 participants from the respondents (Patton 2015). They were chosen to reflect variation in the industry sector in which they were placed, age, gender, ethnicity, nationality, and quality of work placement as perceived from field observations. The participants ranged from 21 to 37 years old with a mean age of 21.7 years, 12 self-identified as female and 22 as male, 30 were South African and 4 were international students. The selected respondents had been placed in the industrial sectors outlined in Table 1, which generally reflects the industry sector distribution in the region where the university is located.

3.2. Data collection

After obtaining institutional ethics approval, qualitative data were collected from the participants using semi-structured interviews. The actual interview questions are reported in Ngonda, Shaw, and Kloot (2022). They were open-ended and structured to uncover aspects of the students' experiences that might have contributed to the achievement of or compromised their learning outcomes. The interview duration ranged from about twenty minutes to almost an hour. The interviews were conducted in the latter half of the students' placement periods. The study also collected data from student logbooks and their evidence portfolios. These data comprised a record of work assigned to the students, their supervisors' comments and reflections, and drawings and pictures of artefacts that they made.

3.3. Data analysis

The qualitative data analysis used a six-stage generic thematic analysis (Bryman 2012) which focused on uncovering aspects of students' work placement experiences consistent with compromised learning outcomes. The analysis was undertaken in the following stages outlined in Table 2.

Table 2. The qualitative data analysis process that was followed in the study.

Stages of Analysis	Description
One	The primary researcher checked the transcripts while listening to the audio recordings of the interviews. After becoming familiar with the data and with each participant's context, 12 cases were selected for initial coding
Two	An iterative and heuristic coding process was undertaken; it resulted in initial codes that were primarily descriptive.
Three	These codes were refined during analysis stage 3 into preliminary themes. In the second cycle of coding, categorisation, pattern-seeking, and reduction of the first-cycle codes into higher-order theoretical constructs were used to develop themes and subthemes.
Four	An iterative revision of the second-cycle codes was undertaken. The codes were renamed for clarity and categorised into themes and sub-themes.
Five	In analysis stage 5, data visualisation facilitated the discovery of associations among the sub-themes.
Six	The purpose of this stage was to determine inductive thematic saturation. New cases were added and coded, one at a time. This stage made use of the descriptive codes from analysis stage 2. The new codes that emerged aligned with identified subthemes, indicating a stable theme and subtheme structure. The emergence of new codes showed that inductive thematic saturation had not been reached with the 12 initial cases. After coding seventeen cases in total (five additional cases), no other new codes emerged from the coding. This indicated that thematic saturation was reached with the seventeen cases.

4. Findings

The analysis identified six overarching themes associated with features of students' work placement experiences that might compromise their learning outcomes. Each theme had several constituent sub-themes, representing its various attributes. The themes and their constituent subthemes are shown in Table 3.

4.1. Theme 1: constraining learning environments

According to the students' recollections, their experienced environments covered some but not all aspects of their work environments, indicating that their learning environments were a subset of their work environments. As shown in Table 3, the students perceived their environments to be constraining if they

Table 3. Themes and subthemes relating to negative aspects of students' work placement experiences.

Overarching theme	Subthemes
Constraining learning environment	Limited access to guidance Limited access to work Low tolerance for work errors Student filled an actual position
Ineffective industry mentor	Mentor as teacher Mentor as supervisor
Low quality of work affordances	Token or inappropriate work Work of limited scope
Negative student characteristics	Low self-efficacy Low agency Negative feelings and emotions Low proactivity and assertiveness

were allocated actual job positions that limited learning opportunities (e.g. routine, repetitive work), had limited access to meaningful work, had limited access to guidance, and their settings had a low tolerance for work errors. These attributes signalled that students' work affordances were more likely structured to meet organisational goals rather than to facilitate student learning in these environments. The students interpreted this as an indication that their placement companies did not care about their learning. For example, Arsenio believed that his placement company cared more about production than his learning needs. He shared that:

The only thing they care about is production, their production. They do not care about us. It is like they do not know why we are there. For them, it is just for us to be exposed to industry. I think we are there for the money. (Arsenio)

Code clustering suggests that when *students filled actual job positions*, it severely constrained their learning and curtailed their exposure to task diversity. The students filled actual positions only when the position was a low-skill, low-risk position. This was because of their lack of work experience. These low-skill, low-risk positions offered little theory-practice integration. For example, Marianne attributed her lack of diversity in work participation to her position as a laboratory assistant. She corroborated this by indicating that she rotated among various assignments before the appointment.

I was doing an actual job. I was not just an intern going from section to section, learning by each section, doing little projects here and there like they do in the workshop. I had a job description, my job was a lab assistant, and that is what I did. (Marianne)

The students attributed their filling of actual positions to staff shortages at placement companies due to either resignations or seasonal fluctuations of their sponsor's labour demands. For example, Magda explained that she filled an actual position due to the incumbent's resignation after parental leave:

I am doing an actual job now. I replaced the lady who went on maternity leave. Unfortunately, she got a job somewhere else; now she has left. So, I do that job for good ... now no one tells me what to do. (Magda)

Most students believed that they derived little benefit from being assigned work of limited scope. Despite their inexperience, they believed that low-skilled work such as drafting or other work not requiring university-level knowledge did not add to their existing knowledge or skills. Many of them believed that they were already capable of performing this type of work. Therefore, this made them question the value of their work placements. The challenge with low-skill work was that it would not provide the students with

opportunities for developing their self-efficacy through mastery experiences. Instead, the low-skill work was associated with despondency and low self-efficacy, suggesting that limited scope and low-skill work adversely influenced students' self-efficacy. For instance, Mantso, who was a machine operator for his entire placement period, mapped the association between limited scope and low-skill work, and low self-efficacy:

I can say that I am an operator there, more or less. I operate the palletiser machine ... I did not have specific training to operate the machine. They just put me with an operator, and that operator just walked me through how to operate that thing, with no specific training whatsoever ... I will graduate, but without knowing anything. I did not get much exposure to real work. After a year, I'm supposed to claim to be able to work any place, but I do not have that confidence. I still feel like I need to get another chance of training somewhere else. (Mantso)

According to the students, the constraining environments presented barriers to engagement and collaboration. In most cases, the barriers were not intentionally created. The common reason for inadequate student engagement was that the mentors, students, and co-workers were too busy to have meaningful engagement. For example, Mugisha reported that he was too busy to participate in training programmes offered by his placement company, highlighting the tension that likely exists between the demands of learning through participation and the demands of the job. He explained:

There was this other training that they said that people could go to, but because the line was very busy, they could not send people there. Everything there depends on what is happening on the line; if the line is busy, you have to be there. (Mugisha)

In constraining environments, the students felt they were there to render service (transactional) rather than learn through work (developmental). Instead, they complained that deliberate provisions to integrate them into the workplace were absent. The socialisation opportunities mainly were limited to people within their immediate vicinities, such as their supervisor and close co-workers. In some cases, they were actively prevented from communicating with people outside their sections.

4.2. Theme 2: ineffective industry mentor

To the students, their industry mentors' actions were the most significant in terms of influencing their experience of the environments as supporting learning. Hence, the mentors' perceived character and actions were interpreted as conveying the stance that the students believed that their placement companies had adopted towards their

learning. Most participants spoke of their mentors as either taking the role of teachers or just their work supervisors. These two postures reflect the tension between competing demands evident in workplaces. Students' recollections of the placement experiences suggested a continuous contestation between learning and working, which presented itself in the mentor-to-student interactions. The students believed that productivity was prioritised over learning when the mentor was positioned as a supervisor. In contrast, they believed that when the mentor was positioned as a teacher, their learning was considered in addition to operational needs.

When mentors positioned themselves as supervisors, their actions were seen by students to be directed at either ensuring that they became productive as quickly as possible or ensuring that they contributed to some organisational goals. Once students had attained acceptable work proficiency, the mentor ensured that they met some operational demands, such as replacing staff who had resigned or filling positions due to increased work demands. For example, Mantso believed that economic pressures at his placement company forced mentors to ignore his learning needs:

The company knows what we were supposed to be doing because that Operations Manager is a former University X mechanical student. So, he knows what students are supposed to be doing there. But it has more to do with economics for them because when it is a busy time, they must take in temporary workers. They pay them more money compared to the stipends they are giving students who are doing the same job as those people. So, they are winning by taking students. (Mantso)

The perception of mentor posture was not static. It was seen as responsive to the prevailing environment within the workplace. In some cases, a change in workplace conditions influenced mentor posture. In this study, the most common change in workplace conditions was staff shortages due to resignations. For example, when a laboratory assistant working in the welding bay at Marianne's workplace resigned, the mentor appointed her to replace him. As a result, her experience shifted from adequate to inadequate. She described the influence of this shift:

What happened was that one of the staff members had left and he needed someone to fill his position. So [the mentor] approached me and asked whether I could fill in . . . I had a job description, and my job was a lab assistant, and that is what I did . . . Because of my job description as a lab assistant, I never had the opportunity to work on a CNC machine and the plasma cutter. (Marianne)

It was only when the work environments where the students were placed allowed the mentors to operate both as teachers and as supervisors that they were able to facilitate rich learning through activities that were

both authentic and structured for learning. Some mentors resolved this paradox by first assigning tasks to students as they did with any other employee and providing guidance and support only if the students required it. Andrew recounted how this arrangement worked in his case:

When he first sent me to supervise, it was very difficult for me. The challenge was that I was supervising people who were more knowledgeable about the job than me. So, when they came to me and told me we had a problem with this, I had no idea what to do. The job was delayed because I did not know the job. So, I went and reported this to him, and I went back to the people with him. He then told me that this is what you must look for, especially on bending. He helped me, but it took me two more weeks to master supervising these people. (Andrew)

The findings showed that successful work placement required that the provision of work tasks to students be structured to derive student learning goals without changing the original objectives of the work tasks. This structuring produced tensions, which, if not effectively managed, had the potential to compromise student learning.

4.3. Theme 3: low quality of work affordances

Work available to students during work placement varied in scope and meaningfulness. For example, some students reported being exposed to diverse work assignments that technicians or engineers would ordinarily perform. Other students reported being exposed to non-technical work, such as interacting with contractors and clients. Some students reported being afforded monotonous and low-responsibility work such as operating various production equipment, inspecting the quality of products, doing administrative work, and performing artisan-level tasks. The students considered these tasks to be token assignments that were not aligned with their future roles as technicians. They reported that this caused them to worry about their work readiness. For example, Katleho became despondent after operating a bottle-blowing machine for his entire placement period. He articulated his thoughts about his placement:

You think of studying for three years and spending sleepless nights, but you end up pushing buttons. It is sad, really, sad. I have even reached the point that I am thinking of changing my career next year for something else because I felt like I am not going to make it as a technician. (Katleho)

The analysis suggested that it was not the monotony alone that was associated with students' low self-efficacy; lack of meaningfulness was an additional influencing factor. In some cases, repetition of work tasks was beneficial in that it facilitated task

proficiency. For example, some students who were placed in a single department for the entire placement period developed high self-efficacy. These students had performed work of value to their placement company and aligned to their perceived identity as future engineering practitioners. For example, Tabelo was satisfied with working as a maintenance technician for the whole duration of his placement. He explained that he was satisfied with his experiences:

In the company, I was employed to be under maintenance, and I have been doing that ever since. We study machine issues and try to make them efficient as they were when first bought . . . Right now, we are in the period that he trusts everything . . . He doesn't follow me around. If we discuss in the morning, the whole day I will just do my job as we discussed . . . I feel my in-service was very good because it gave me the platform to learn. (Tabelo)

The findings showed that the quality of work affordances substantially influenced the students' satisfaction with their work placement experiences. If the students were afforded meaningful work, they felt that this boosted their confidence about their future career prospects and improved self-efficacy.

4.4. Theme 4: negative student characteristics

Code associations suggest a link between work of limited scope and low self-efficacy, between low self-efficacy and low agency, and between low agency and work of limited scope. The students who believed they were exposed only to limited scope work reported that they feared for their future careers. This anxiety had a negative influence on work self-efficacy. Furthermore, low self-efficacy tended to lead to low agency. Moyenda illustrated how inappropriate work experiences contributed to negative emotions that may lead to passive dispositions. He explained what happened:

I worked July, August, and September. Then at the end of September, I quit. When the first company interviewed me, it was okay; it was great . . . But when I got there, for the whole month, I was filing a block of metal, carrying a file, and filing for the whole day from eight in the morning until quarter to five in the afternoon. I realised I did not study for that. Maybe, I would have understood if we had done it for a week or, you know, a few days but for the whole month? I sometimes remember in the morning when I woke up to go to work, and I would not have any motivation to go to work. I was not motivated. I felt it was slavery, modern-day slavery, so I could not continue to do that, given that they dealt with hydraulics and pneumatics. They did maintenance on things like pneumatics and hydraulic cylinders, and they repaired hydraulic motors too. They also worked with rigs, and they did maintenance on ships. I was not exposed to that, so I quit. (Moyenda)

However, students were not just recipients of what their learning environments offered. Their agentic deportment contributed to the meaningfulness and the scope of the work afforded to them. The students took two contrasting postures concerning work and guidance; some were proactive, but others were passive. The students' agentic deportment was the pathway through which their agency influenced the meaningfulness and scope of their work and resulting learning trajectories. Some students passively expected their mentors to come and give them work or guidance. If the mentors were not forthcoming, they continued with what they were assigned to do, even when they thought it would not benefit them. This passive deportment was associated with stagnation in their learning trajectory. For example, Mugisha mentioned that he expected his mentor to come to him to give him work assignments like those he was given at a university:

I expected to work daily with the engineers and the fitters, fixing stuff or asking them questions. I expected to be getting some assignments where they tell me what they need to know. Let us say, ask me to find out how this machine works. Then at the end of a week or two, come and ask me to explain to them how the machine works. (Mugisha)

Mugisha was timid in his approach to resolving the challenges he faced. Although he complained about the lack of meaningfulness in the work tasks that he was assigned, he did not attempt to change his placement company. His only response was to request his line manager for meaningful work, and when the line manager refused, he did not proceed with the matter. His excuse was, 'We have to pass through the line manager, and the line manager is telling us that this is what you have to do. There is nothing else'. Moreover, he explained that he was hoping to learn just enough to be able to pass the WIL module and graduate.

5. Discussion

The previous section highlighted negative work placement experiences and identified contributing factors. This negative aspect of work placement has led some researchers to question the benefit of work placement to students, particularly in developing countries such as South Africa (Mutereko and Wedekind 2016; Reinhard et al. 2016). These researchers assert that some workplaces are not suitable sites for work placement. While this might be the case, this study clarifies that the attributes of the learning environments within those workplaces, the sociocultural and sociohistorical context, make them unsuitable. The findings show that when a constraining learning environment was created in a particular workplace, then student

learning was compromised. This constraining environment is distinguished from the broader workplace environment. The findings show that a constraining environment was created if the students had limited access to guidance, limited access to work, filled actual positions, and if there was a low tolerance for work errors. These factors suggest that a constraining learning environment is a product of the actions of the various role-players within the work placement environment. Therefore, to improve the work placement outcomes for their students, work placement coordinators need to limit the actions of role-players that facilitate the formation of the above factors and promote those that prevent the formation.

The findings suggest that the actions of industry mentors are crucial to the formation of the constraining factors. For example, if an industrial mentor was unable to adopt the dual work supervisor-teacher role, a cascade of constraining factors formed and sustained the constraining learning environment. Furthermore, the sustenance of the constraining environment led to low quality work affordances for the students. The performance of the dual role was necessary to provide authenticity to the student's experiences while retaining the possibility of giving help to the students if needed. Kramer-Simpson (2018) referred to this as contingent scaffolding, guiding the students only when they seem to need it.

If the industry mentor focused on their role as teachers, which often was the case for students who were assigned to a dedicated internship programme, the authenticity of the experience was lost. It seems that demanding schedules, tight deadlines, and the challenging work often associated with professional practice were crucial for the authenticity and meaningfulness of work placement experiences. The challenges and demands of the workplace are inextricably linked with a 'real workplace'. This finding reflects research that indicates the materiality of learning knowledge (Johri and Olds 2011). The negative outcome of the *mentor as a teacher* highlights the difficulty in using simulated activities and interactions to develop students' professional skills and identity. Thus, simulated work placement might not adequately replace actual work placement.

On the other hand, if the mentors focused on the role of work supervisors and treated the students as any other employee, the students either got overwhelmed or were assigned work of limited scope. The latter negative outcome was prevalent for students who were passively waiting for work or guidance. Most of the students reported that their mentors were busy with their primary responsibilities. This would suggest that the mentors did not have time to determine their students' learning needs. Instead, they expected their students to approach them to discuss their learning needs and challenges. This finding is

consistent with Tovey's (2001) and Sapp and Zhang's (2009) findings that suggest that mentors expect their students to be proactive, seek clarification if they do not understand something, and take charge of their learning. Proactiveness is often considered to be an indication of initiative. This attribute is valued in workplaces as a sign of commitment, whether inexperienced workers or new entrants to a work community (Eraut 2004).

This finding underscores the importance of assisting students in preparing for work placement students, particularly in helping them develop skills to deal with exploitation and deskilling in the workplace (Wall, Tran, and Soejatminah 2017). In addition, the students should also be assisted in developing their proactive behaviours such as information and feedback-seeking, general socialising, cultivating a relationship with their mentors and networking (Ashforth, Sluss, and Saks 2007). In their study of medical internships, Laack et al. (2010) and (Kalet et al. 2017) suggest that a simulated work placement could be used to prepare students for actual placement. Although this approach has not been tried outside medicine, it would be a viable avenue for assisting students in developing the skills they need for their work placement. Thus, instead of replacing actual work placement with simulated work placement, it could be used to prepare students, thereby shortening the time they need to be socialised in a real workplace community.

It would also be beneficial if, before placement, universities offered industry mentors some training, a sort of supervisor development programme that prepares them for their role in work placement. The development program would also clarify the university's expectations of how the industry mentors should manage their dual role. An additional benefit of this is that the industry mentors could also clarify any misunderstanding that they might have about what is expected from them. For example, universities would offer a seminar, allowing interaction between the universities and the industry mentors. Supervisor development programs are not offered by South African universities with work placement programs as a curriculum component. However, its importance was recognised by the Australian Cooperative Education Society, which realised that industry mentors are often not adequately prepared for their roles (Jancauskas et al. 1999). Their solution to this problem is similar to what this paper proposes. They suggest that industry mentors should be provided training on how to perform their functions during work placement effectively.

Although the study was limited to the experiences of mechanical engineering students in South Africa, the findings are consistent with other studies that suggest that ineffective industry mentors, passive students and

some environments compromise student learning during work placement (Deketelaere et al. 2006; Jackson 2015, 2018; Jancauskas et al. 1999). Therefore, the findings and recommendations from this study learnt might be transferable to non-South African universities that offer work placement to their engineering students.

6. Conclusions

This article shows that constraining learning environments, ineffective industry mentors, low quality work affordances and student characteristics often compromise students' learning outcomes during work placement. Students often experience ineffective work affordances if they are in a constraining learning environment and have an ineffective industry mentor. However, the agentic deportment that students adopt often contributes to these negative outcomes, passive and unassertive students are often afforded low quality work than proactive and assertive students.

To remedy these challenges, universities should provide students with pre-placement training to assist them in developing skills and attributes that would enable them to negotiate the complexities of workplaces in a manner that facilitates their integration and maximises their learning. The pre-placement training could be in the form of simulated work placement.

This article contributes additional evidence of the importance of the influence of industry mentors on the quality of work affordances during work placement. Ineffective industry mentors can compromise student learning outcomes during work placement. The findings suggest that industry mentors' ineffectiveness arises from their failure to adopt a dual role as work supervisor and teacher. Universities would assist industry mentors in managing their functions within work placement by providing them with pre-placement training in the form of a seminar that clarifies each stakeholder's roles and expectations.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributors

Dr TiyaMike Ngonda works for the Cape Peninsula University of Technology as a Senior Lecturer in Thermofluids. TiyaMike is also a practising engineer, registered as a Professional Engineer with the Engineering Council of South Africa. He obtained his PhD from the University of Cape Town in 2020. His research interests include vibrations of machine elements, thermodynamics and engineering education. His engineering education research focuses on placements and employability.

Dr Corrinne Shaw is based at the University of Cape Town in the Department of Mechanical Engineering and the Centre for Research in Engineering Education (CREE). In

her role as Deputy Director of CREE, she manages the postgraduate portfolio. Dr Shaw completed her PhD degree at the University of Cape Town and is currently researching transitions in engineering education. Work placement represents a transition from an academic environment to a different socio-technical system, the workplace. The role and influence of different stakeholders and variables underlying the transition process are explored in this context.

Dr Bruce Kloot is an Academic Development Lecturer in the Department of Mechanical Engineering at the University of Cape Town (UCT). He is a member of UCT's Centre for Research in Engineering Education (CREE), a board member of the South African Society of Engineering Education (SASEE) and the Editor-in-Chief of the Southern Journal of Engineering Education (SJEE). Dr Kloot obtained his PhD in engineering education from UCT in 2015 and has authored various publications in higher education and engineering education. His work is influenced by the French sociologist Pierre Bourdieu and he is currently focused on exploring the relationship between engineering and society, a research thread that weaves itself through a third-year course that he teaches called 'Engineer in Society'.

ORCID

Bruce Kloot  <http://orcid.org/0000-0001-8644-3248>

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