COPING IN PANDEMIC TIMES: *BRICOLAGE* EMPLOYED BY FIRST-GENERATION ENGINEERING STUDENTS

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ABSTRACT

First-generation students have been a focus in higher education research over the past ten years. However, limited attention has been paid to engineering students who are the first in their generation to enter university. The paper reports on data collected as part of a longitudinal study of first-generation engineering students at a South African university during the early stages of the pandemic. First-generation students, who already face multiple difficulties in their educational journey, were confronted with a juxtaposition during the lockdown. As engineering students, they are inducted into technical approaches to problem-solving via systematic and analytical exploration. Levi-Srauss contrasts this notion of the ingenieur, grounded in the Enlightenment belief in the superiority of rational scientific reasoning, with the bricoleur, who finds solutions by “doing things with whatever is at hand”. With the lockdown period being less amenable to structured problem-solving, students often had to resort to more improvised approaches to accommodate their studies and their shifted precarious everyday routines. The study not only adds to literature on first-generation engineering students, but also provides insight into the ways in which these students cope with obstacles over which they have little control. In the process

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a picture of resilient agency emerges that challenges a narrow deficit view of students with limited resources.

1 INTRODUCTION

Much has been published over the past two years about students' experiences during the period of online and blended learning enforced by the COVID-19 pandemic. In this paper our focus is on how a specific group of first-generation students negotiated their engineering studies during this time.

1.1 First-generation students

The concept of first-generation students is useful to identify students who experience multiple intersecting disadvantages in their educational journey [1]. Challenges often include a lack of role models and pressure from communities of origin to succeed. Many students are unfamiliar with "what counts" in higher education. These students frequently face financial challenges, and for some, their prior educational trajectories did not prepare them adequately for higher education. Although attention to first-generation student experiences has increased in various higher education fields over the past 10 years, less attention has been paid to experiences from the global South, and specifically experiences of engineering students. It is also important to extend research foci beyond notions of deficiency and scarcity [2]. It is thus worthwhile to conduct research that sheds light on learning experiences in ways that avoid simply conflating accounts of first-generation students with those of poverty [3].

1.2 Precarity

In discussing these challenges, we adopt Butler's [4] distinction between 'precarity' and 'precariousnessas'. Precariousness describes the vulnerable human condition of innate interdependency we all share, whereas precarity refers to the politically induced condition in which certain populations suffer from failing social and economic networks of support and thereby become differently exposed to threats.

The events unfolding as a result of the global pandemic constitute an appropriate moment to reconsider what we think we know about vulnerability, precariousness and precarity. In a radically unequal society, such as South Africa, widely diverging social experiences are concerning realities, and first-generation students become disproportionately vulnerable as precarity accelerates..

1.3 *Ingenieur* vs *bricoleur*

In his influential publication, The Savage Mind [5], Levi-Srauss distinguishes two ways to relate to the world, that of the *ingenieur* and that of the *bricoleur*. These two figures approach problems differently: the *ingenieur* is rooted in the Enlightenment tradition of the historical French engineer – a belief in the superiority of the rational scientific reasoning process. *Bricolage* is a French loanword that refers to the creation of an artefact or solution to a problem, using a diverse range of objects or options that are readily available, "doing things with whatever is at hand" [5].

How do first-generation engineering students make sense of precarious changes in physical space? How do they navigate restricted identities back home where being a student intersects with being a child, a sibling, a caretaker? How do they manage challenging engineering studies online, often faced with almost intractable digital

access problems? How do they make meaning out of digital sources to assemble technical knowledge and skills?

2 METHODOLOGY

2.1 The study

A group of 17 first-generation engineering students from four departments (chemical, civil and electrical engineering) at the university of Cape Town is participating in a longitudinal study to track their educational journey and path into initial employment. Students are interviewed annually in semi-structured interviews that are transcribed. This paper reports on the 2020 anonymised interviews that took place 3 months into the initial hard lockdown period at the start of the pandemic, an environment of accelerated precarity for these already vulnerable students.

2.2 Conceptual framework for analysis

Transcribed interviews were coded according to a set of categories developed from scholarly literature on the characteristics of *bricolage*: *bricolage* involves "making-do" [6] with whatever is at hand. It represents an "integration of conceptualisation and realisation" [7]. In *bricolage*, *repertoires* are independent elements that take on different meaning in association with other elements [7]. Coutu [8] argues that the *bricoleur's* familiarity with their own environment helps to orient them to draw on that which is recognisable, using a way of practical reasoning or "science of the concrete" [5]. Finally, *bricoleurs* are marked by resourceful resilience [8].

3 RESULTS

3.1 Making do with what is at hand

The bricoleur takes stock of the context, the problem faced and then uses what is at hand to make do. Velani's physical circumstances are less precarious than some of his peers, but he too faces resource challenges that impact greatly on his ability to work at his engineering studies: for him, internet access. He has to initiate requests that rely on the goodwill of distant family members. This leaves him feeling conflicted, and yet he acts: "If I have a test or an assignment… anything that is online, I have to go to another space... I have relatives around the area, even though it's not close relatives, but I do go to them and ask them for some space so that I can just do my tests, because they do have network… But the disadvantage of that is that … I have to go there and use their space. I don't know how they feel about that…. They still say they are okay with that but you can't really know… I think I'm disruptive to them and their living space."

3.2 Practical reasoning: "science of the concrete"

At the start of the lockdown Mlungisi relocates from a campus residence to an informal settlement just outside Cape Town sharing a small shack with his two brothers. The single room dwelling is divided in two: his older brother has his own space with a small section where they can prepare food. The other two brothers share the second partition; this is where Mlungisi also has to study. He needs to

improvise: “At the beginning, I thought there was no workspace since it’s … very small … there is a table which is very small, but at least I can study on top of it… I tried to move some things… against the walls of the shack. So yes, I tried to make some space for me to study, just to study…” Mlungisi’s improvised study consists of assembling elements from his environment according to simple rules (a small table in a limited shared space). Improvisation makes adaptation to challenges possible, often in a way that integrates thought and action – moments of conception and realisation become indistinguishable in disordered or unpredictable environments [7].

Mlungisi explains that they have electricity in their shack, and qualifies “and it is legal” (illegal electricity connections are common in the informal settlements where extension cables are run from the few legal provisions). They also have running water, possibly an irregular connection – Mlungisi’s brother “made a plan to have some water… he had pipes, so we do have water… I think it’s good water. I hope so.” However, for sanitation they have to rely on shared community facilities: “… around the area there are loos … some like municipal kind of things that are outside… so that’s where we can go… many people go there and it’s poor hygiene, but we have to because there is no other option”.

3.3 Repertoires: independent elements that take on different characteristics

Students have to repurpose resources they are familiar with and use these in new ways. An example is the way students adapt the use of WhatsApp groups during the early part of the hard lockdown. Classmates were displaced and sent home from campus that provided at least a modicum of equity in the WiFi access students shared in residences and on campus. WhatsApp, that once served exclusively as a means of social contact with friends, becomes a *repertoire* [7] to facilitate tutoring and contact with lecturers. Far from being a perfect replacement, the social media platform is reimagined to allow tutors to respond and clarify student queries. Matteo describes the way he has to go about getting feedback on a mathematics query: “…[with classroom] learning, you can kind of ask a direct question, you know, as the lecturer’s going through the notes, you can just point to a specific section on the page. Whereas if you [now] need to ask a lecturer [for clarification], you need to… take a screenshot, draw on it, indicate what, and then try and ask your question…”

3.4 Familiarity with own environment, drawing on what is recognisable

A rapidly changing environment can lead to feelings of being overwhelmed, resulting in paralysis or inaction, but Coutu [8] argues that the *bricoleur’s* familiarity with their own environment helps to orient them as they draw on that which is recognisable, using a way of practical reasoning or “science of the concrete” [5]. Students find various ways to try and impose structure on their days after being thrust into almost feature-less days. For Mlungisi, this means trying to stay warm during the cold rainy Cape Town winter nights and sticking to a similar timetable that he used before: “… during the evenings it’s very cold. During the mornings, it’s also really cold. So, I usually study during the day… I try to wake up at six o’clock … then try to study… I try… to make my learning as close as possible to the way I did at [university], to

motivate myself".

For other students it makes more sense to use the night hours to work: Jerome works "… mostly during the night when it's really quiet because during the day it's really [noisy] in the house. The kids are running around and making noise". For others, like Luyanda, nights are used for study because data costs are slightly lower in off-peak hours: "I'm just using the data that [the university] gave us… it's not really enough… when the day data is finished, I tend to work in the night. But then, in the night there are not a lot of hours to work, because it's from midnight to 5AM and then it [the data] stops working".

3.5 Resilience, self-efficacy: "I am always an optimist"

In spite of challenging circumstances faced by these first-generation students, they respond in ways that demonstrate the remarkable resilience of the *bricoleur* [8]. Zinhle draws on past experience that saw her succeed through her school years: "…it's really a tight space and there's a lot of us [11 people in a small home], and during the day we are all awake and busy. I don't have a special place where I study… I just cope because this is where I lived when I was in high school, so some[how] I've found a way to make things work".

Mia draws on inner resources and a sense of self-sufficiency: "… many times, I would be like, I can't do this… Why did I decided to study this? And then it was always a case of, I can do this. If other people can do it, why can't I do it? And that always got me through it… And I am always an optimist. That's one thing. Even through this coronavirus… I am like, no, it's okay… at the end of the day… you have to realise whatever decision you make, you're going to have to deal with it.

Bakari even manages to keep thinking and planning a small business venture (temporarily on hold during the lockdown): "It's an agricultural-based project… we managed to get funding. We did a pilot phase of the project… last year. Now, we want to… start growing and selling microgreens in Kenya".

4 SUMMARY

Students enter engineering studies from a diversity of backgrounds. Our study contributes to the limited literature on first-generation engineering students with insights into ways in which these students cope with the stark realities of accelerated precarity brought about by a pandemic raging in a developing country context. Scholars emphasise that there is no such thing as pure *bricolage*, and that in real-life individuals function somewhere between the ends of the *bricoleur* and *ingenieur* [7] as context demands. Faced with situations over which they have limited control, and where their engineering training cannot provide neat, systematic solutions, these students nevertheless act as *bricoleurs*, exercise agency and draw on resilience to continue to study. Mlungisi explains: "I try by all means… to be very, very creative… One of the reasons why I don't give up is because I have a family. I have myself, I'm thinking ahead. What about my community in the future? If I give up, many things will fall down in my life... So, I don't give up; I try to endure".

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