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BACKGROUND KNOWLEDGE AND EPISTEMOLOGICAL ACCESS: CHALLENGES FACING BLACK WOMEN IN A SET SCHOLARSHIP PROGRAMME

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ABSTRACT

In promoting access to higher education in an unequal society there is a concern that universities may operate in a manner that values background knowledge associated with those who have access to a privileged class location. The authors focus on background knowledge, its contribution to epistemological access to

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higher education and how such background knowledge is likely to affect black women's academic success. They analyse interviews with 19 black women from socio-economically disadvantaged backgrounds who are recipients of a Science, Engineering and Technology (SET) scholarship, utilising Ryle's (1945) distinction between knowledge-how and knowledge-that, to understand their challenges in gaining epistemological access to university. Despite the scholarship programme's comprehensive support, the findings suggest that students who enter with background knowledge acquired at well-resourced high schools are academically advantaged. The authors argue that SET scholarship programmes which recruit low-income students are necessary, but insufficient interventions for enabling epistemological access. Further responsiveness is required on the part of the university.

Keywords: background knowledge, epistemological access, women in science, scholarship programme, knowledge-that, knowledge-how

INTRODUCTION

In post-apartheid South Africa, attracting and retaining more women into the Science, Engineering and Technology (SET) fields is an objective that is worthy in and of itself; is relevant to the country's socio-democratic transformation efforts; and is driven by critical skills shortages (Kraak 2008; Council on Higher Education 2009). The global economy has become increasingly dependent on information and communications technologies (ICTs), which have progressively increased the economic value of the male-dominated SET fields. Consequently, men are afforded more economic power in the labour force, whilst black women's access to scientific knowledge and economic ownership is not only gendered but also intertwined with South Africa's racialised history. Nonetheless, there are opportunities available (albeit a selected few) to black women from under-resourced backgrounds to participate in SET fields and acquire SET related knowledge. Some of these opportunities are made available through selective scholarship programmes, such as the one on which this article focuses. The participants in the study are recipients of a scholarship programme that aims to provide first generation, academically talented black women from socio-economically disadvantaged backgrounds with the necessary financial, academic and psychosocial support needed to succeed in completing a degree in a SET field. However, these opportunities exist alongside the complexities of unequally distributed types of background knowledge that are prerequisites for academic success.

We examine SET scholarship participants' reported background knowledge and argue that background knowledge or lack thereof (SET related or otherwise) influences their academic success. In order to contextualise the research, we begin by briefly outlining some of the social asymmetries apparent in schooling and higher education, from both historical and contemporary perspectives.

CONTEXTUALISING THE RESEARCH

In South Africa, the schooling system and higher education policy framework have historically been shaped along racial lines. The *Bantu Education Act of 1953* established a racially differentiated education system, which entrenched the privileged position of whites by providing black scholars with inferior education (Kallaway 1984; Gwala 1988 in Mabokela 2000), especially in mathematics and science (Mouton and Gevers 2009).

While post-apartheid South Africa has seen a growing black middle class and the rise of a small black political elite, the entrenched class and racialised structures that shaped education under apartheid continue to be apparent and manifest themselves in the persistently unequal schooling system. *De jure* school segregation is no longer the case; however, *de facto* segregation continues to be prevalent. Although public schools that were formerly reserved for whites and were well-funded by the apartheid government (former Model C schools) have been desegregated to a certain extent (De Klerk and Gough 2002; Gough 1996), it should be noted that 'white flight' has occurred at some of these schools, resulting in them now serving black students exclusively (Vandeyar 2010). While desegregation has to a certain extent taken place at former white schools, township and rural schools remain segregated as they continue to serve black students exclusively. It is also the case that former white schools continue to benefit from well trained teachers, sufficient resources, and community investment, while township schools continue to face serious problems related to a lack of resources and less qualified teachers (Bush and Heystek 2003; Hammett 2008; Nel and Müller 2010; Onwu and Stoffels 2005; Tihanyi and Du Toit 2005). Rural schools are often the most disadvantaged with some of them operating with unsuitable classrooms, no running water or electricity, and poorly trained teachers (Maforah and Schulze 2012). The schooling system thus continues to be characterised by stark inequalities and segregation, with many black children continuing to receive substandard education. It has been noted that South African school learners from historically black schools perform poorly in the areas of literacy, mathematics and sciences due to poor quality secondary schooling (see, e.g., Bloch 2009; Christie 2008). This will continue to be the case so long as schools in townships and rural areas are neglected.

While the problems faced by schools persist, the higher education system faces a different set of problems, some of these associated with the schooling system. Intention to transform the higher education system is apparent in the various policy documents that aim to promote a more equitable system with access for those who had been previously excluded, and that denounces racism, sexism and other forms of discrimination (see, e.g., DoE 1997; 2001; 2008). While the higher education system has to a certain extent been transformed with respect to open access to students from a range of backgrounds, problems persist. For instance, high levels of racial and gender inequality at university still need to be addressed. In terms of field of

study, graduates are disproportionately white in SET fields, and African students in particular are underrepresented (Council on Higher Education 2009). Gender imbalances also exist by field of study, with a greater proportion of men enrolling in SET fields (Teferra and Altbachl 2004; Council on Higher Education 2009).

BACKGROUND KNOWLEDGE AND EPISTEMOLOGICAL ACCESS

The literature on students' experiences of transitioning to university in relation to their background knowledge flags issues, such as: the distinction between phronesis (practical reasoning) and episteme (established academic knowledge) (Eisner 2002); the relationship between theory and practice in teaching (Kessels and Korthagen 1996); and the distinction between knowing-how and knowing-that[1] (Brown and Duguid 2002; Ryle 1945).

Ryle (1945) develops a philosophical argument concerning the difference between knowledge-how and knowledge-that, concluding that knowledge-that presupposes knowledge-how. This distinction finds its roots in Aristotelian thought, where differentiation is made between phronesis and episteme (Eisner 2002). Episteme refers to 'true and certain knowledge' (Eisner 2002, 375), in other words factual knowledge, rules and such, which Ryle (1945) designates as knowledge-that. Knowledge-that can be taught and learnt in a relatively straightforward manner. Phronesis, however, refers to practical reasoning (Eisner 2002) or practical wisdom. Here deliberation is seen as practical in that it is directed toward an end (Crisp 2000), a set of 'particular circumstances' (Eisner 2002, 375), and as such it can be conceived of as knowledge-how.

Ryle (1945, 15) states that mathematics and philosophy (to give just two examples) are *disciplines* and not just bodies of factual knowledge, which 'cannot be imparted but only inculcated'. This means they are not primarily concerned with knowledge-that but rather with knowledge-how. The purpose of university education is to help induct new students into an academic discipline so that they can develop their knowledge-how, allowing them to be able to set up their own sets of questions about the world, and to produce their own knowledge-that. However, underprepared students often enter university with the idea that being proficient in a discipline primarily involves knowledge-that (Brenner, this volume; Ryle 1945). This assumption, if not addressed, could be detrimental to their academic success, since the focus would be on merely accumulating facts, as opposed to developing an academic practice.

For the purposes of the article we will use the distinction between knowledge-how and knowledge-that and demonstrate how this is relevant for investigating scholarship programme participants' academic success. The distinction between

knowledge-how and knowledge-that is different from a theory/practice distinction in that 'there is no gap between intelligence and practice corresponding to the familiar gap between theory and practice' (Ryle 1945, 2). Rather, students require practical intelligence, or knowledge-how, for efficacious academic work. Practical reason (phronesis) and technical skill here represent one action (knowledge-how), not the joining of two disparate acts, namely, doing and thinking.

In conceptualising background knowledge for the students in the scholarship programme, we look at the distinction between 'knowing that something is the case' and 'knowing how to do things' (internally, as in reasoning or deliberating in one's mind, but also externally, as in doing a task in the observable world) (Ryle 1945, 4). As students or academics we do not just discover facts (episteme), but the very fact that we are able to *discover facts* means that we have knowledge-how; the facts (discoveries) come second to this ability.

If we think of a practical skill, like playing a game well, Ryle (1945, 5) uses chess as an example, an expert might teach us all the rules and clever moves, and we might memorise them, and yet still be unable to apply them, in order to play well. Thus, the pedagogical challenge that emerges for lecturers in universities is the inability of some students to efficiently apply (knowledge-how) the rules (knowledge-that) to particular sets of circumstances.

In discussing this problem of application, Ryle (1945, 13) notes that a student might 'have a correct "hunch" that his self-suasions were invalid [practical application], though he [*sic*] could detect no fallacy in them'. Slonimsky and Shalem (2006, 52) echo Ryle when they state that, 'students may often come to realize that they have not met the criteria but may not know what it takes to meet them'. This is because knowledge-that does not lead to knowledge-how as a matter of course: 'learning-how differs from learning-that. We can be instructed in truths, we can only be disciplined in methods' (Ryle 1945, 14). For Eisner (2002), disciplinary knowledge is gained from experience because it involves deliberating over particular circumstances and thus people may become more adept at practical reasoning as they gain life experiences. It goes without saying that if people's life experiences have not required them to reason in a particular way, the challenge of developing such reasoning ability is considerable.

Through the process of education, students learn to develop their creative potential through the interplay of episteme, phronesis and reflective judgment. The aim of a university education is not to enable students to memorise bits of information, but rather to assist them to develop their cognitive structures and reflective judgment so that they are able to offer novel interpretations of the world. A computer metaphor illustrates this point: our minds are not only loaded with 'data files' (knowledge-that) 'but also sets of regulations or programs [knowledge-how] that determine how we operate on the world of our experience and how we experience the world we operate on' (Miller 1989, 157).

The high levels of racial and gender inequality at South African universities highlight the continued need to respond to the 'articulation gap' (DoE 1997, 22) between the underpreparedness of school leavers and the academic demands of higher education programmes. The different educational and socio-economic backgrounds that students come from manifest in unequal levels of background knowledge (of knowledge-that and knowledge-how) in preparation for university. This 'articulation gap' is wider for students who come from townships and rural schools that are characterised by the unavailability of particular subjects, less qualified teachers and a lack of learning resources such as technical, laboratory and/or computer equipment.

Students who have access to prerequisite subjects, but not to the learning resources needed to fully understand them, may face a 'learning paradox' (Pascual-Leone and Goodman 1979) at university. Miller (1989, 155) writes about the learning paradox in the teaching context:

> ... the problem is how to teach the understanding that must precede the action. How can one teach a person to experience a situation – understand a phenomenon – in a particular way when nothing in the situation provokes the experience and previous learning may obstruct the new experience or understanding?

In order to understand a law of physics, the student may need to practically demonstrate and 'experience the law' through application experiments so that knowledge-that 'this is a law' is thus arrived at through knowing-how to conduct experiments. There is a practical and a theoretical component to knowledge-how: knowing how to practically use technological resources and conceptually understanding the purpose for doing so.

The issue of access to technological resources, as a form of background knowledge, is highly significant when considering the teaching and assessment tools used at university today. The unfamiliarity with laboratory and technological resources further impedes students' learning and academic performance at university. Howie and Blignaut (2009) note the extreme disparities in access to ICTs of school learners in South Africa and argue that this becomes a concern for social inclusion and pedagogical success, which extends beyond a mere material resources question. Nonetheless, material resources, or lack thereof, do play a key role. The under-resourced nature of many schools in South Africa deprives students of the necessary background knowledge for pursuing a science degree. Citing Verspoor (2008, 37), Howie and Blignaut (2009, 355) argue that 'few schools (in Africa) have the inputs necessary for effective instruction' and that attempts to improve the quality of education are often hampered by 'absence of even the most basic materials and supplies'. Howie and Blignaut (2009, 358) found that only 18 per cent of science teachers in South Africa have used ICTs in their pedagogy with their learners, a finding corroborated by Chetty and Vigar-Ellis (2012).

Students from educationally disadvantaged backgrounds cannot be treated in the same way as those who come from a privileged background (Chetty and Vigar-

Ellis 2012). However, mainstream higher education programmes contribute to the articulation problem by treating the student intake as homogeneous instead of addressing the disparities in educational background (Scott, Yeld and Hendry 2007). This approach serves to privilege or reward 'traditional' student groupings (from well-resourced former Model C schools and independent schools) that have acquired the background knowledge needed to succeed at university. The challenge is to meet the needs of all students without making harmful differentiations between students. As Scott et al. (2007, 44) state, the increasing diversity of the student intake necessitates the modification of assumptions about traditional educational capital, '[a]s long as these unitary assumptions remain dominant, the articulation problem will continue to undermine the development of many talented students ... and will be exacerbated by any future growth in the diversity of the intake'. Therefore, universities have the responsibility to broaden students' 'epistemological access' (Morrow 2007) by offering students enhanced entry to theoretical knowledge (knowledge-that) and practices of knowledge production (knowledge-how). In other words, formal (physical) access to university in the form of admission constitutes only one form of access. Epistemological access is also relevant – there is a need for universities to be responsive to 'epistemological activities underpinning a systematized form of inquiry' (Slonimsky and Shalem 2006, 37). In order to perform well, students must not only gain access to established bodies of knowledge but must also be inducted into the associated disciplines.

Slonimsky and Shalem (2006, 56) point out that insiders to a discipline (lecturers) develop 'an embodied and practised sense of their actions, activities, and forms of relation within it'. Thus, knowledge-how is a form of habituation, or academic habitus (Bourdieu and Wacquant 1992) and academics or lecturers often fail to make explicit 'the form of their practice' (Slonimsky and Shalem 2006, 56), or in other words, fail to mentor students in knowledge-how. This makes adjusting to the teaching and assessment styles of university all the more difficult for those who have not had previous exposure to this academic habitus. Ryle (1945, 14) argues that 'knowledge-how cannot be built up by accumulation of pieces of knowledge-that'. This is because learning a discipline involves 'habituation' (induction into knowledge-how) and 'training' (learning knowledge-that) (Ryle 1945), two distinct forms of knowledge.

Slonimsky and Shalem (2006), looking at pedagogic responsiveness for academic depth, tacitly address the challenges of the distinction between knowledge-how and knowledge-that for underprepared students. They draw attention to students' struggles with adjusting to a text-based reality that requires a knowledge-how approach. Academic knowledge requires students to be able to engage with texts and understand how they relate to each other, how to analyse and situate them, how to distinguish between form (argument) and content of the text (Slonimsky and Shalem 2006, 41). These are skills which a large number of new university students do not have (Slonimsky and Shalem 2006, 46) and which they struggle to develop

because of their focus on knowledge-that. Slonimsky and Shalem (2006, 36) go on to argue that socialisation into the academy, in terms of learning responsiveness to the curriculum, should involve teaching and assessing students so that they know 'what is valued about the underlying discipline, and how it is assessed'. This is an important point for underprepared students who, given their educational background, might be used to rote learning (knowledge-that), but have not been mentored in acquiring knowledge-how.

METHODOLOGY

The scholarship programme on which this investigation is based was located at the University of the Witwatersrand (Wits), a Historically White University (HWU), in Johannesburg, South Africa. The programme was one of several initiatives that the university has embarked on to create more opportunities for individuals from previously disadvantaged backgrounds. The goal of this programme was to provide first generation, academically talented black South African women from socio-economically disadvantaged backgrounds with the necessary financial, academic, and psychosocial support, as well as learning and personal development skills needed to aid their adjustment, retention and throughput during their undergraduate and postgraduate studies, as well as to promote success in their careers. Of the twenty scholarship students, ten students came from Gauteng, seven from Limpopo and three from Mpumalanga. Eleven women had attended former Model C high schools, one participant had attended a high school located in a township, and eight participants had attended high schools in rural areas. In their high schools, all participants were in the top 5 per cent of Grade 11 and achieved a minimum of 65 per cent in mathematics, science and English on higher grade in their Grade 11 and 12 final examinations, with many of them earning marks considerably higher than 65 per cent.

Regarding the throughput rate of the programme, fourteen (70% of) students failed a year of study: two students failed their first year, six failed their second year and six failed their third year. Failing a specific year of study refers to a student not meeting the minimum requirement to progress to the next year of study, in which case the student was required to repeat the courses she failed. Of these fourteen students, five students were academically excluded and one student dropped out of university in her second year of study. It is noteworthy that of the six students who were academically excluded or dropped out of university, four attended high schools in township or rural areas.

The programme participants were provided with assistance that included academic, psychosocial, and financial support. Although all the participants had access to personal tutors who assisted them with their academic work, they reported confronting difficulties. Given that the programme participants received comprehensive support, and given that the scholarship recipients performed

exceptionally well in SET during their high school years, we focus on the participants' reports relating to background knowledge.

With the participants' consent, the lead author conducted individual interviews with each of the nineteen scholarship participants in 2009 (there were originally twenty scholarship participants, one failed her first year and left university in 2008). The individual interviews elicited information concerning participants' home language, language of instruction during high school, university preparedness, academic challenges, and support systems available to them. Each interview was approximately one hour in duration, was audio-recorded, and transcribed.

Data analysis

The transcripts of the interviews were coded by the lead author and participants were assigned pseudonyms. Given the volume of data, Atlas.ti (a qualitative data analysis software) was employed to facilitate the coding process. Preliminary categories, based on the pre-ordinate quotations pertaining to background knowledge, were generated and served as a guiding framework for subsequent coding of information. Based on these categories, the data was subjected to thematic content analysis in three broad stages. First, segments of data were read and re-read for familiarity and their latent and implicit meanings. Second, the items were coded and then grouped according to predominant themes, and lastly, analyses were made based on Ryle's (1945) categories of knowledge-that and knowledge-how. The study's trustworthiness was enhanced as a result of the three authors engaging in the data analysis process independently, reviewing and interpreting the data adhering to the aforementioned three broad stages of analysis. Subsequently, the authors consensually agreed on the themes derived. This approach served to curb the biases, assumptions and expectations that each individual researcher may have had about the data, and minimised an incomplete, ill-informed, or distorted interpretation of the data.

DATA AND FINDINGS

The participants' reports pertained to their respective high schools and the university's academic practices. More specifically, background knowledge or lack thereof emerged as salient for their preparedness to cope and succeed academically. The analyses of the data were informed by Ryle's (1945) formulation of knowledge-how and knowledge-that, how they can be understood as distinct challenges, but also how they come to be intertwined.

Background knowledge refers to having been previously inducted into the practical application of knowledge for efficacious academic work (knowing [or not knowing]-how to do things) as well as possessing established factual (and discipline related) academic knowledge (knowing [or not knowing]-that something is the case) (Ryle 1945). The participants reported that not having had adequate preparation

(particularly as it pertains to SET disciplines), meant that they arrived at university not knowing-how and/or not knowing-that. Many of the participants who reported a lack of background knowledge hailed from under-resourced rural schools. We first address knowledge-how, then move on to knowledge-that, and finally examine some examples that demonstrate how knowledge-how and knowledge-that are linked.

Knowledge-how

Several participants discussed arriving at university without knowing how to practically apply their knowledge for efficacious academic work and suggested that lack of this knowledge hampered their academic progress. The following excerpts illustrate the ways in which not knowing-how became problematic for academic success. The excerpts reveal that the participants' concern with not knowing-how emerged in relation to the demands imposed on them by the courses they were required to take.

Judith:	But it came to my surprise when I came here, in Engineering you have to do drawing. So I thought maybe in high school if they knew you're going to do something like Engineering they should like introduce courses, like drawing or ...
Interviewer:	So they didn't have technical drawing?
Judith:	No, not at all, it was just Maths, Science, Biology and Geography.
Interviewer:	Okay and what type of drawing is it? Is it like 2 or 3 dimensional drawings or ...
Judith:	Ja, isometric drawings, it's more like Engineering Drawings. It's Engineering Drawings. So they didn't have such.
Interviewer:	Engineering graphics?
Judith:	Yes.
Interviewer:	Okay.
Judith:	Like I struggled.
Interviewer:	Is it?
Judith:	In my first year, ja.

Judith reported on aspects relating to the practical application of knowledge, knowing-how 'to do drawing'. As an engineering major, her concerns suggest that she did not know how to perform key academic tasks that were necessary; 'you have to do drawing'. Judith's recommendation ('maybe in high school if they knew you're going to do something like Engineering they should like introduce courses, like drawing') points toward the onus being on the high school to ensure students are exposed to, and inducted into, the discipline. She implied that her high school should offer drawing courses to students who plan to pursue studies in SET fields that require practical knowledge with respect to advanced and technical forms of drawing. This suggests that this form of knowledge-how is key for university preparation. It is worth noting that Judith had previously attended a rural school that,

as she indicated, only offered the following SET related courses: 'Maths, Science, Biology, and Geography'. These offerings are limited and based on Judith's accounts do not induct students into the practical and applied aspects of technical drawing. She suggested that as a result of not knowing how to draw she struggled in her first year of study.

Similarly, Nomxolisi reported not knowing how to practically apply the knowledge necessary to understand the teaching tools used at university.

Nomxolisi:	You know the projector thing, I've got – like even now I've just started for this semester, there are no lectures on the projector because like I don't understand the projector, I didn't just get used to it, so we didn't have a projector.
Interviewer:	Okay so you're used to the chalk and the green board. So okay the projector is, is it like a PowerPoint or?
Nomxolisi:	Yes, so it's like, let's say the lecturer comes with the graph and shows you, you don't even know how they got that.

Nomxolisi reported being unable to understand how the content of a PowerPoint presentation is arrived at and thus she struggled to follow a lecture utilising this technology. At first sight this may appear to be a trivial matter, but Nomxolisi suggested that moving away from the chalkboard method, which entails the lecturer working out problems by writing with chalk (which Nomxolisi is familiar with), and moving toward a PowerPoint system where the calculations appear without being physically demarcated by the lecturer may be daunting since the lecturer does not physically go through the step-by-step process of arriving at an answer. As Nomxolisi said, she did not know how the graph was derived, 'you don't even know how they got that'. She reported not having been exposed to this type of technology at her rural high school ('we didn't have a projector') and thus not having been inducted into this type of technology and pedagogical practice. What must be taken into consideration is that Nomxolisi (along with the rest of the participants) was majoring in a SET field. SET fields require students to frequently apply their knowledge to solve mathematical problems and perform calculations and equations; thus, the issue raised here is whether PowerPoint is a good tool for teaching students how to solve these problems and equations.

The lack of knowledge-how identified by Nomxolisi points toward her having been underprepared by her rural high school to function in university classrooms that as a matter of course make use of PowerPoint technology, as well as other forms of technology. Nomxolisi's report thus suggests that there is a considerable gap between the resources and technology available at an under-resourced rural school and what is being used to facilitate teaching and learning at one of the country's most distinguished universities. Starting university without being inducted into the process of following lectures in which PowerPoint technology is used has meant that she has struggled to 'get used to it'. Nomxolisi suggested that this type of knowledge

is acquired through experience, and is not as straightforward as learning discipline related factual knowledge, principles, or truths, in other words, knowledge-that.

Knowledge-that

The report below provides an example that points to participants lacking not only knowledge-how, but also lacking established factual academic knowledge (that which can be taught or learned in a relatively straightforward manner). In the example below the participant was not familiar with established academic knowledge relevant to her particular SET discipline. This lack of knowledge was related to the lack of preparation she received at high school and the lack of background provided by first year courses at university.

Joyce:	And then software development, I just got short of the 50%.
Interviewer:	It's a difficult subject.
Joyce:	So I was like – ja – it's programming and a lot of people never did it at school.
Interviewer:	Oh.
Joyce:	Ja. So like the first year I was just shocked and the lecturer like he just thought maybe we're one of those who knows everything and then he open the 'code blocks'. I didn't even know what a 'code block' was.

In contrast to the excerpts above, which provide examples of participants struggling with knowledge-how, Joyce reported not knowing that something is the case (Ryle 1945). Joyce reported her lack of knowledge-that in the specific software development course by noting that she 'didn't even know what a "code block" was'. A 'code block' here represents subject specific jargon that would be commonly known by those familiar with software development. Indeed, familiarity with what a 'code block' is represents possession of established academic knowledge and is something that can be imparted (Ryle 1945). Joyce further reported being 'shocked' by this experience. She implied that the lecturer expected students to come into the classroom already possessing subject specific knowledge and information necessary for the discipline, despite the fact that 'a lot of people never did it [programming] at school'.

Ryle (1945) implies that knowledge-how is more difficult to acquire than knowledge-that. However, the findings indicate that the SET scholarship participants under study entered university lacking both (a) practical knowledge for efficacious academic work (not knowing-how to do things); and (b) established factual (and discipline related) academic knowledge (knowing-that something is the case).

Knowledge-how and knowledge-that

The following excerpts from participants' reports show the link between knowledge-how and knowledge-that. The two are discussed as mutually reinforcing. The excerpt

from Fortunata's report below focuses on how her high school paved the way for successful induction into university.

Fortunata:	Well academically because we do what is required of us. Like, there's lots of ground knowledge that you pick up from high school that you take into varsity.
Interviewer:	Okay.
Fortunata:	And socially well, sports. We played sports at school.
Interviewer:	Alright.
Fortunata:	They encouraged debating, public speaking. All these things where you had to interact with and we did so many other fun stuff, like drama, dance, music.

Among other activities, Fortunata reported participating in playing sports, debating, and public speaking. Engaging in these social and academic activities proved that she had been inducted into specific social and academic forms of practical knowledge that require application. Despite her making the distinction between the social and academic realms, Fortunata suggested that she possessed practical knowledge and that she knew how to do things, as opposed to merely knowing established factual academic knowledge (rules and principles). For example, she noted, 'we played sports' instead of reporting that she learned about sports. Knowing how to play a sport or knowing how to debate would, following Ryle's (1945) logic, involve the knowing of a set of rules and principles that would render playing or debating possible. In this way, both knowledge-how and knowledge-that are types of knowledge Fortunata possessed, which we know she could only possess through application.

Less tacitly than Fortunata, Mpho pointed directly to the importance of application and the practical *knowing-how-to* aspects of background knowledge.

Mpho:	I'm taking Biology for example it wasn't just a matter of knowing your work and cramming it, but it was also a matter of understanding and applying it and the Biology teacher I had [in high school], she would use a lot examples, from the outside, she would try and make you really relate with the subject, than just to understand it and pass it then leave, she wanted you to really grasp the essence of bio, and that also was one of the reasons why I ended [up] loving it as well. So, it was little skills, the basic things people still do not know even like drawing graphs, people fail too you know, and it is kind of – you know part of it is funny and at the same time it's a serious thing because [these are] little things, like, that a person needs to know.

Mpho implied that knowing rules, principles, and truths ('knowing your work') is not sufficient for academic success, what is also necessary is practical application and being inducted by a teacher (in this case her Biology teacher) into the academic practices of the discipline. What is required is more than rote learning. She suggested a deeper engagement with the discipline – that the knowledge she acquired was not imparted, but part of a process of being inducted into the discipline of biology.

The significance of knowing how is highlighted by her reference to 'little skills ... like drawing graphs'. Drawing graphs requires practical know-how, which Mpho, unlike Judith (who did not know how to do engineering drawing) acquired as a result of her high school preparation. Knowledge-that, that is, possessing established factual (and discipline related) academic knowledge, is different to knowledge-how. Knowledge-how requires the attainment of skills (the acquisition of 'little skills'), thus implying that it cannot be 'cram[med]', but instead requires induction into the discipline. Nonetheless, for academic success to be achieved, the two work together in a mutually reinforcing manner.

As argued by Ryle (1945, 14), knowledge-that does not lead to knowledge-how as a matter of course, 'learning-how differs from learning-that ... knowledge-how cannot be built up by accumulation of pieces of knowledge-that'. The interviews with students indicate that participants who reported having been adequately prepared possessed knowledge-how. In reporting that they know-how, participants thus also reported that they know-that. For, 'knowing-how always involves the knowing of a rule' (Ryle 1945, 10). In other words, knowing-how implies that one knows-that.

Both Fortunata and Mpho attended well-resourced former Model C schools. While these schools do not guarantee that students will acquire knowledge-how and knowledge-that, they tend to have better qualified teachers, when compared to rural schools, and have more resources and courses on offer. They are thus more likely to be better places for the inculcation and induction necessary for the acquisition of knowledge-how. The type of knowledge which Fortunata and Mpho acquired is convergent with the academic practices of the university. Participants in possession of such knowledge are more likely to cope with the institutional practices and demands of university. Regrettably, Fortunata and Mpho represent a minority of participants who have had access to high schools that are not only well-resourced, but that successfully induct students into knowledge-how.

DISCUSSION

Despite the scholarship programme's comprehensive support, the findings suggest that the academic practices that exist at university and within SET majors serve to privilege and reward students who enter university with knowledge-how. As a result, SET scholarship programmes which recruit low-income students (who have attended under-resourced rural schools or former Model C schools that do not offer a wide variety of courses to prepare students for SET studies) are necessary, but insufficient. What is needed is a more equitable system and fundamental change in the institutionalised academic practices of schools and HWUs. The schooling system which is characterised by vast discrepancies between well-resourced independent or former Model C schools, and schools in rural areas or townships, continues to operate in a manner that inducts some into knowledge-how practices while others

are placed at a disadvantage when they enter university. In light of a schooling system that continues to be characterised by inequalities, the university needs to be responsive to these challenges and acknowledge the discrepancies between high schools in South Africa. Accordingly, it needs to make necessary changes that will facilitate the success of students who have not previously had opportunities to acquire knowledge-how and knowledge-that. In particular, measures need to be put into place so that under-resourced and low-income students who display promising potential in high school can compete with affluent students (who have had access to technology and have been afforded the opportunity to gain knowledge-how) on an equal footing. This may mean designing SET courses so that they intentionally: (a) impart established factual and discipline related academic knowledge (knowledge-that); and (b) induct students in the discipline so that they may acquire practical knowledge for efficacious academic work (knowledge-how). This requires an expanded view of access that not only affords students a physical place at university, but that also takes into consideration epistemological access and makes visible the commonly taken-for-granted academic practices that require students to have practical academic knowledge.

CONCLUSION

Academic success is often put down to individual effort, based on a system of meritocracy, with structural factors largely being overlooked, leading to a discourse of exceptionalism for young, poor, black women to succeed in SET. The study's findings challenge this view. Our examination of participants' reports on background knowledge indicate that those who have previously not had opportunities to acquire knowledge-how and knowledge-that struggle to succeed academically. Thus, the high schools that participants have attended matter as these schools either impart, or fail to impart, key background knowledge. While SET scholarship programmes are well-intentioned and indeed assist black women who come from low socio-economic backgrounds, what is needed is a critical understanding of the overarching institutional structures and practices that largely go unquestioned and that play a role in imparting (or failing to impart) the background knowledge necessary for success in SET fields. Future research on the enduring practices and structures of South African educational institutions, and their role in perpetuating inequalities, is warranted. Moreover, universities need to be open to assessing their institutional structures and creating equal opportunities for success, irrespective of students' backgrounds.

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NOTE

1. For the purposes of this article we refer to Ryle's (1945) distinction as knowledge-how and knowledge-that.

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