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A realist approach towards student application of agency, culture and social structures in demonstration of competency in argumentative writing

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This thesis is dedicated to my daughter Mita Rose Eybers and *all* LST 110 students, of the past, present and of the future. Thank you, Mom and Dad, for being pillars in my academic journey. Thank you to members of the Centre for Higher Education, Teaching and Learning at Rhodes University in eRhini for introducing me to realist ontology. Thank you to the members of the Unit for Academic Literacy at the University of Pretoria for inducting me into our shared discipline of practice. To my supervisor, Dr Helena Kruger-Roux, your argument is correct - angels are real blessings and I cannot thank you enough for your agency. To Professor Vasu Reddy, the Deanery of the Humanities Faculty of the University of Pretoria and the entire Humanities Faculty, this study *is* because of your belief in me. I thank you for from my heart.

ABSTRACT

The degree Doctor of Linguistics

Oscar Oliver **Eybers**

In his thesis, "*A realist approach towards students' application of agency, culture and social structures in demonstration of competency in argumentative writing*", the study explored intersectionality between first-year science students' cultural identities and the ways these aspects of students' epistemologies weave with their attempts to demonstrate competency in written, dialectical and rhetorical argumentation. The researcher employed Margaret Archer's (1995) morphogenetic model to divide students' experiences into three chronological phases. These time periods, which spanned the pre-university domain as well as the first and second semesters, were termed the conditioning, interactive and elaboration phases of students' Discourses (Archer, 1995). By analytically employing the morphogenetic cycle, this study simultaneously applied Gee's (2012) theory of Discourse to emphasise epistemic shifts, development and constraints in students' argumentation. The findings highlighted the interplay between and efficacy of on- and off-campus social structures, culture and agency as causal mechanisms in students' methods of participating in dialectical, rhetorical and written argumentation. Examples of active entities in students' argumentative Discourse emergence include their families, cultural communities, schools, degree programmes and professional communities. Findings from the study revealed that the majority of the participants experienced significant modifications to their scientific Discourses after reaching the end of the academic year. To argue effectively, first-year students had to modify their methods of participation in academic dialect and rhetoric that feed into their argumentative writing. The study concluded that due to the distinct cultural environment that universities represent when contrasted with the pre-tertiary experiences of all first-years, pedagogic mechanisms should be activated that facilitate their induction into argumentative, dialectical and rhetorical interactions, including writing, across the entire academic year.

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CHAPTER 1: INTRODUCTION AND CONTEXTUALISATION

1.1 Introduction

1.1.1 Rationale of the study

The rationale of a qualitative study is its motivation and the underlying reasons for its undertaking. The central rationale for the current study rests on the fact that upon entering institutions of higher learning, first-year students encounter unavoidable literacy practices involving argumentation. Argumentative writing, which is a central focus of this study, is a central practice that is applied to generate knowledge in universities. It is not possible for first-year students to succeed in their studies without participating in argumentative learning events. These encounters occur in multiple linguistic contexts. Examples of such contexts include verbal and written interactions between students and their peers, their instructors and the curriculum. As argumentation practices in universities generally require a greater level of criticality, depth and rigour when contrasted with students' application of similar practices during their pre-university experiences, this study aimed to find out how students draw on the social phenomena of culture, social structures and agency in their attempts to competently argue in their first year of enrolment. Argumentation, as practiced in universities and as construed according to the adopted theoretical framework of this study, is a social phenomenon. It is shaped by disciplinary, agential and institutional cultures. This study aimed to highlight how students draw on these social variables from before their admission to the university through the first year of their enrolment to generate new understandings of how first-year science students attempt argumentation to succeed academically as novice scholars. This is the rationale for the current study.

1.1.2 Intersections between the problem statement and research objectives

When academic literacy, specifically argumentative writing, is approached as a social practice, it is apparent that mastering this convention remains a battle for first-year students across the globe and in South Africa (Brandt & Clinton, 2002; Bangeni & Greenbaum, 2019). This problem is further exacerbated by the reality that South African students emerge from diverse socioeconomic backgrounds where the literacy practices they encountered in their homes, schools and local communities do not always mirror how they are applied towards written, dialectical and rhetorical argumentation in the university environment. This disjuncture between first-year students' pre-university language experiences and the linguistic expectations they meet on campus produces varying degrees of difficulty and diverse learning challenges in the ways that they attempt to demonstrate competence in argumentative writing.

Not all first-year students have experienced pre-university affiliations with individuals such as family members, teachers, and peers, who regularly facilitate dialectical, rhetorical and written argumentation practices of higher education. Therefore, in order to understand how students attempt to demonstrate their competency as argumentative and academic writers, the *problem* underlying this study rests in the reality that not enough knowledge is available to ontologically describe the actual interplay between social structures, agency and culture in ways that enable and constrain extended degree students in their attempts to demonstrate competency in argumentative writing. While previous scholarship engaged the significance of these variables in students' approaches to argumentation in the first year, the stance of this study is that new knowledge is necessary to generate understandings of the interplay between structures, culture and agency in students' development in argumentation that involves dialectical and rhetorical interactions in the universities' environment.

Reasoning around an academic argument, also known as a knowledge claim, and then warranting this claim with evidence as regularly practiced by members of science faculties is an academic literacy practice that all first-year students must master. Osborne, Erduran and Simon (2004: 916) state that because "science learning is […] considered to involve the construction and use of tools which are instrumental in the generation of knowledge about the natural world […] argumentation is a significant tool [...] in the growth of scientific knowledge". Without the capacity to competently declare and sustain an academic argument through writing, it will be difficult for first-year students to successfully demonstrate understanding with regards to course content in their scientific disciplinary domains. Obstacles in effective arguing can prevent students from passing their course and exacerbate South African universities crisis of student attrition.

1.1.3 Connecting the research problem, objectives and plan of development

In addition to its objectives, the central concerns of this study revolve around difficulties and problems students encounter when they are required to engage in university-level argumentation during their first year at university. To clarify: through a social realist ontological framework, the study aims to highlight how students attempt to draw on the powers and properties of social structures, culture and agency in their attempts to competently engage in dialectical, rhetorical and written argumentation at the University of Pretoria's Mamelodi Campus. The study aimed to achieve this goal by first critically engaging literature around social realism, including the morphogenetic cycle, as an explanatory framework of human experience and key theories affiliated with discourses that involve multiple literacy practices. In addition to articulating its qualitative methodology and affiliated data acquisition instruments, the study's empirical findings are presented according to its realist strata of analysis. Data presentation involves situating the participants' experiences in Archer's (1995) morphogenetic cycle. In the morphogenetic model,

the emergence of social experience is presented as phases of structural, cultural and agential conditioning, interaction and elaboration.

1.1.4 Conceptualising argumentation in the natural sciences

Argumentation is actively practiced in the natural science domain, which contextualises this analysis. Fischer, Kollar, Ufer, Sodian, Hussmann, Pekrun, Neuhaus, Dorner, Pankofer, Fischer & Strijbos (2014) list a range of competencies which fall under the argumentation umbrella that science students must master. These include applying scientific concepts and methods to demonstrate understanding of the content of arguments, evaluating the validity of scientific claims, and generating new knowledge (Fischer et al., 2014). Of importance to this study are the roles that argumentation and argumentative writing play in these processes and in first-year students' approaches to mastering affiliated conventions. Nieminen, Loikkanen, Ryokas and Mustonen (2020: 448) state that argumentative claims in the sciences are premised on and conveyed by way of "observational evidence". Significantly, natural scientists advance their observations and arguments via academic literacy practices, including argumentative writing. Ferretti and Graham (2019: 1346) reveal how argumentative writing enables scientists to present their findings, observations, representations, theories and models of analysis. As they declare, "writing enabled people to record, examine, and evaluate representations of reasoning as objects of reflection" (Ferretti & Graham, 2019: 1346). Argumentation and argumentative writing are central practices that scientists apply to dialectically engage each other and to advance propositions (Van Eemeren, 2018) that are related to the natural world and the foci of their investigations. Scientific endeavours are concerned with the unknown and the discoverable. As such, scientific argumentation involves navigating uncertainties (Chen, Benus & Hernandez, 2019) in the investigative process. In the perspective of Chen et al. (2019: 1235), the presence of uncertainty in scientific arguments "create[s] productive moments for students to collaborate in dialogue and navigate their understanding of natural phenomena toward […] coherent scientific explanations". Again, academic literacy practices are central to these processes. Literacy practices including writing, dialectical and rhetorical tools are utilised to interrogate claims involving natural phenomena.

1.1.5 Contextualising argumentation in the extended degrees programme

The purpose of the extended degrees programme at the Mamelodi Campus of the University of Pretoria, according to the Dean of the Mamelodi campus, is to "enhance students' basic knowledge and skills [and] to bridge the gap between school and higher education" (Ogude, Meyer, Mwambakana & Mthethwa, 2019). The postulation is that structurally there are varying ways of knowing and doing between universities and secondary schools, and that the extended degrees programme is mandated to equip first-years in mastering these discourses. Academic literacy practices are among competencies valued by the extended degrees programme as evidenced by the embedding of the Language and Study Skills (LST 133 and 144) modules in its curriculum. LST modules are mandatory subjects that all students must successfully complete. Warranting this stance, a former coordinator of the academic literacy module on Mamelodi Campus declares that "students' academic literacy and academic language abilities are unlikely to improve significantly without some type of intervention" (Fouché, Van Dyk & Butler, 2017: 15). However, in their assessment of the impact of the LST academic literacy module for first-year science students on Mamelodi Campus, Fouché et al. (2017) do not overtly make mention of argumentation, argumentative writing or explicitly link literacy practices to dialectical, rhetorical and written argumentation. This absence in their analysis is significant in understanding the current study's attempt to probe extended degree students' approaches towards argumentation. This is because the actual LST curriculum that is employed on Mamelodi Campus does not formally instruct students in the genre of argumentative writing. The participants in this study were not specifically introduced to the genre of the argumentative essay in the LST academic literacy curriculum on Mamelodi Campus. The researcher was conscious of this fact, bearing it in mind while observing and interpreting the participants' navigations of argumentative events and practices that featured elsewhere in their learning experiences during the year he interacted with them, and in his interpretation of their narratives.

1.1.6 Research questions

1.1.6.1 Question 1

How do students draw on social structures in their attempts to effectively warrant a written academic argument in the Faculty of Natural and Agricultural Sciences?

1.1.6.2 Question 2

What is the nature of the relationship between students' cultural identities and how they interact with multiple cultures in the higher education domain, while warranting a written academic argument in the Faculty of Natural and Agricultural Sciences?

1.1.6.3 Question 3

How do students exert their personal agency and interact with the agency of significant others in their attempts to effectively warrant a written argument in the Natural and Agricultural Sciences?

1.1.7 Research objectives

In this study the researcher aims to develop a deeper understanding of the following objectives:

1.1.7.1 Objective 1

The nature of the relationship between students' cultural identities and their interactions with social structures while warranting a written academic argument in the Faculty of Natural and Agricultural Sciences.

1.1.7.2 Objective 2

How students exert their cultural identities and interact with on-campus cultures in their attempts to effectively warrant a written argument in the Faculty of Natural and Agricultural Sciences.

1.1.7.3 Objective 3

How students draw on personal and additional sources of agency in their attempts to effectively warrant a written academic argument in the Faculty of Natural and Agricultural Sciences.

1.1.8 Significance of the study

It is unlikely that the problem of attrition will end soon, despite the significant strides that have been made in addressing first-year students' learning challenges and effective pedagogic mechanisms that have been implemented in South Africa's higher education sector, including extended degree programmes (Young, 2016). Due to this reality and the ubiquity of argumentation throughout students' curricula engagements in the natural sciences, it is critical that new knowledge about how they attempt to demonstrate mastery of argumentation, through academic literacy practices, is generated to address the attrition crisis afflicting South Africa's higher education system. This knowledge is essential for further developing academic literacy curricula and pedagogic methods in ways which incorporate students' epistemic diversity into learning experiences towards ensuring academic success. This is the sphere in which this study aims to contribute to the broader body of knowledge. It aims to generate insights of how first-year students experience attempts to weave their pre-university Discourse with acceptable modes of dialectical, rhetorical and written argumentation. It also aims to highlight to facilitators, theorists and researchers of academic literacy and argumentation how students are continuously juxtaposing,

navigating and negotiating multiple structures, culture and agency – their Discourses – as they attempt to write and argue in ways that are in accordance with academic deliberation in institutions of higher learning. Discourse refers to ways of being, interacting and communicating that are shaped by social contexts (Gee 2015). Each student who participated in this study emerges from and attempts to navigate social structures, culture and agency in ways which were shaped in their Discourses before they arrived at university and which continue to evolve while students operate as novice disciplinary members. Therefore, the central objective of this study is bringing to the fore the richness of the narratives and stories which the participants have shared with the researcher, as well as how these insights can empower curriculum developers and teachers to draw on aspects of students' Discourses, cultural epistemologies and learning orientations in their teaching methods and curricula design.

1.1.9 Limitations of the study

The study was restricted to the experiences of students in an extended degree programme. It also aimed to focus on and analyse argumentation that involves writing as a specialised practice within the scholarly field of academic literacy. Furthermore, this study is restricted to the experiences of students who are enrolled in the four-year science degree programme at the University of Pretoria. The central focus of this study is on how students experience argumentative writing practices that emerge from dialectical and rhetorical interactions in their first year of enrolment in the university domain. While students may have originated from geographical locations outside of Gauteng, the participants selected for the sample were restricted to being enrolled in the extended degree programme at the University of Pretoria. The experiences of students were also limited to the Faculty of Natural and Agricultural Sciences; the study did not consider other faculties at the university. This study is also restricted to a qualitative analysis.

1.1.10 Ethical considerations

1.1.10.1 Anonymity

Pinsonneault and Heppel (1997: 89) stress that anonymity "is expected to reduce fear of social disapproval and of evaluation, and to lower inhibition and censorship". If participants experience anonymity in this way, it "is believed to create an environment that improves participation and communication that promotes more objective and honest evaluation of ideas" (Pinsonneault & Heppel, 1997: 89). Pinsonneault and Heppel (1997: 90) also argue that "anonymity increases criticalness [and] has no effects on inhibition [in] group communication". Such perceived effects of anonymity benefit this study, as critical responses from participants who do not feel inhibited

to express themselves produce the type of rich data that addresses both the objectives and problems which motivate it.

By drawing on Pinsonneault and Heppel's principles in praxis, the real identity of participants were strictly guarded throughout and after the study was completed. Participants were provided with the opportunity to choose pseudonyms so as to protect their anonymity and their confidential disclosures.

1.1.10.2 Voluntary participation

Participants will also be selected by means of voluntary participation. By no means did researcher coerce any participant to engage in the research process at hand. Participants, were also informed of their right to withdraw from the project at any time without having to offer any explanation (see the consent form in Appendix D). Participation in a research project of this nature suggests a relationship between the researcher and the subjects of the study. Therefore, relational ethics is a facet which must be considered in terms of voluntary participation. Thiel and Dunsford (2010: 847) state that:

> Relational ethics involve an ethical self-consciousness in which researchers are mindful of their character, actions, and consequences on others. Relational ethics pertain to an ethic of care that recognises and values mutual respect, dignity, and connectedness between researcher and researched, and between researchers and the communities in which they live and work.

This study adopted the stance that, by allowing participants to feel free and unconstrained through their own voluntary participation, the principle of relational ethics is valued and practiced.

1.1.10.3 Informed consent

Equally of value to the ethical paradigm of this study is the notion of informed consent. The researcher did not engage any participant without receiving, in writing, their informed consent to participate in individual interviews, focus group discussions or the other instruments which apply to data collection. The researcher did not engage any participant in individual interviews without receiving their written consent. When participants agreed to participate in this study, their informed consent forms highlighted the conditions of the relationship between themselves and the researcher. Miller and Boulton (2007: 2199) declare that "the production and signing of a consent form [...] acts as a mechanism to 'contain' what are often, in reality, complex social worlds and research encounters which do not fit neatly into boxes which can be ticked". However, in order to protect the integrity, anonymity and confidentiality of the participants, it is necessary that such a

document is produced. It formally sets the conditions under which the relationship between the researcher and participants will be maintained.

1.1.11 Population sample

This study included a total of fifteen students in the final sample. Four students emerged from poor socioeconomic backgrounds. These students are assumed to have attended schools in urban South African townships. Six students emerged from rural areas and under-resourced schools. A further five students emerged from middle-class to wealthy families. This third cohort of students is assumed to have emerged from either former Model-C or private schools. The purpose of choosing this particular sample of first-year students is to highlight students' experiences of academic literacy and argumentation as impacted by the category of school they attended. The attempt to categorise students into poorly resourced, former Model C or more privileged schooling domains proved to be problematic as data from interviews with the participants revealed that their conceptions and actual experiences of the concept of 'home' differed from the researcher's own; this is that of a single-location and nuclear family-occupied home. A significant proportion of the students, especially those who possess characteristics of South Africa's populace which was marginalised under the pre-democratic regime, described 'homes' as being located in numerous places. That is, they had homes in rural and urban areas while, albeit with difficulties, adopting the urban university environment as a new home. Bangeni and Kapp (2005: 2) report that, while first-year students need to maintain a strong connection with their primary homes, as the academic year progresses "there is a gradual shift in the concept and designation of home". Their perspective is that because students constantly reposition themselves in relation to past interactions, the powers of the university's new cultures and significant social actors coerce a shift in students' identities (Bangeni & Kapp, 2005). The researcher was able to overcome the fluid conceptions of home as some of the study's participants clearly indicated the presence of homes in rural areas, while others clearly did not and described these domains as being located in strictly urban areas.

As asserted in the previous paragraph, the overarching aim of this study is to compare the experiences of students from diverse social and educational backgrounds. By engaging this sample of first-year science students, the researcher applied three concepts which Coyne (1997) believes must underpin the selection of research participants. These concepts are that sampling should be purposeful, deliberately selective and conducive towards the outcomes of a study (Coyne, 1997). The current study applied the concepts of purposefulness and selectiveness through the stratification of its sample, which is primarily concerned with highlighting students' family, school and geographical characteristics. It also applied the concept of theoretical conduciveness.

The above-described cohort of subjects was selected according to the concept of stratified sampling. According to Robinson (2014: 26), “[T]o delineate a sample universe, a set of inclusion criteria or exclusion criteria, or a combination of both, must be specified for [a] study”. Inclusion criteria “should specify an attribute that cases must possess to qualify for the study” while “exclusion criteria must stipulate attributes that disqualify a case from the study” (Robinson, 2014: 26). With respect to the cohort of students who are interviewed in this study, the distinguishing criteria are that one group should be restricted to students who lived and studied in urban South African townships, one group should emerge from rural areas, while the third group should emerge from suburban areas.

Table 1.1: Population sample

Name (Alias)	Gender	Text 1 submission	Text 2 submission	Geographical origin
Larry	M	Yes	Yes	Suburban
Ink	F	Yes	Yes	Suburban
Aldoy	M	No	No	Suburban
Kim	F	Yes	Yes	Suburban
Richard	M	No	No	Rural
Mary	F	No	No	Rural
Shaka	M	Yes	No	Rural
Sara	F	No	No	Rural
Siyabonga	M	No	No	Rural
Katlego	M	No	No	Rural
Faith	F	Yes	No	Urban township
Chabi	F	Yes	No	Urban township
Violet	F	No	Yes	Urban township
Nemo	M	Yes	No	Urban township
Denel	F	Yes	Yes	Urban township

1.1.12 Summary of the chapters

1.1.12.1 Chapter 2: Critical review of the literature

Chapter 2 provides a synopsis of the literature which was analysed and incorporated into this study's design. It also articulates the study's ontological and realist explanatory framework. This includes scholarship which conceptualises the phenomenon of academic literacy as a social construct. The chapter also reviews literature that highlights how discourses are applicable in analysing and interpreting the experiences of language users as they attempt to generate meaning and knowledge in academic environments. In addition, this chapter articulates key concepts and theories surrounding argumentation and argumentative writing.

Chapter 2 theorises cultural identities in the higher education context and their intersections with argumentation. In parallel to the view that academic literacy is one of multiple modes of literacies (see Section 2.8), this study adopts the stance that cultural identity is one characteristic of the human possession of multiple identities. Cultural identity is the personal affiliation of a human being to one or multiple collectives of humans who share histories, interests and goals. For first-year students, adjusting to a university's institutional cultures may be a daunting experience (Suransky & Van der Merwe, 2016). The chapter focuses on the interplay of students' cultural identities and their relationship with epistemic approaches to knowledge engagement and argumentation in the university environment.

A realist ontological framework is central to how the study's research questions were designed and how the data were accessed and interpreted. This is why realist ontology is mentioned in the study's title and why it was necessary to consider the ideas, theories and principles underpinning it. The researcher specifically aimed to determine how, in a social realist ontological and explanatory framework, extended degree students' experiences of attempting to master argumentation are shaped and influenced by the powers of social structures, culture and agency (Archer, 1995). This chapter details to the reader key concepts and principles affiliated with a social realist analysis. These concepts include morphogenesis and morphostasis (Archer, 1995: 163), which are central to the current analysis. Morphogenesis is the configuration of social structures, culture and agency in ways that enable the emergence of social events. In the context of this study, a social event may be how a student applies academic literacy practices to warrant an argument. Contrarily, morphostasis models configurations of structures, culture and agency where the desired events or outcomes are not adequately achieved or manifested. In this vein, the current analysis aimed to apply a social realist ontology to highlight how, in their attempts to demonstrate mastery of argumentation, first-year extended degree science students underwent

experiences of argumentative morphogenesis or morphostasis, specifically in their navigations of social structures, culture and agency.

1.1.12.2 Chapter 3: Methodology

This chapter discusses the qualitative framework and why it was relevant to the questions and objectives of the study. It considers key concepts associated with qualitative inquiries and their relevance to the aim of probing the relationship between students' cultural orientations and their attempts to demonstrate mastery of argumentation in their first year of enrolment. The chapter describes the data acquisition methods, including processes of coding and data analysis. In addition, the chapter discusses how the realist framework of the study influences methodological processes.

1.1.12.3 Chapter 4: Findings and discussion

Chapter 4 contains a presentation of the empirical findings of the study. These are presented within a social realist ontological framework to illustrate the enabling and constraining powers of structures, culture and agency as these relate to students' experiences of engaging in argumentation. The presentation of the results aims to illustrate how varying configurations of social structures, culture and agency, which are active in students' experiences in their first year of enrolment, lead to a sense of development in argumentation as well as experiences of struggling with this academic literacy convention. Empirical data is presented according to Archer's (1995) morphogenetic cycle.

1.1.12.4 Chapter 5: Conclusion

The purpose of this chapter is to reiterate to the reader, by way of a re-visitation of the key aspects of the discussion, what the significance of the study is. The researcher aims to reveal to the reader why it is necessary that curriculum designers and teachers, especially those in the academic literacy domain, identify the active structural, cultural and agential mechanisms that are continuously active in the ways that first-year students attempt to master argumentation in their first year of enrolment in the university environment. Readers are also drawn to the significance of Archer's (1995) morphogenetic cycle as an effective analytical device for analysing qualitative data; specifically in longitudinal studies that aim to observe participants' development over periods of time. By applying the morphogenetic framework, the researcher makes recommendations for how higher education curriculum designers may engage in content selection, teaching and assessment planning in ways that draw on structures, culture and agency in specific intervals during students' first year of enrolment. These recommendations are

advanced to aid the facilitation of students' pre-university and emerging scientific Discourses into the social environment of the University of Pretoria.

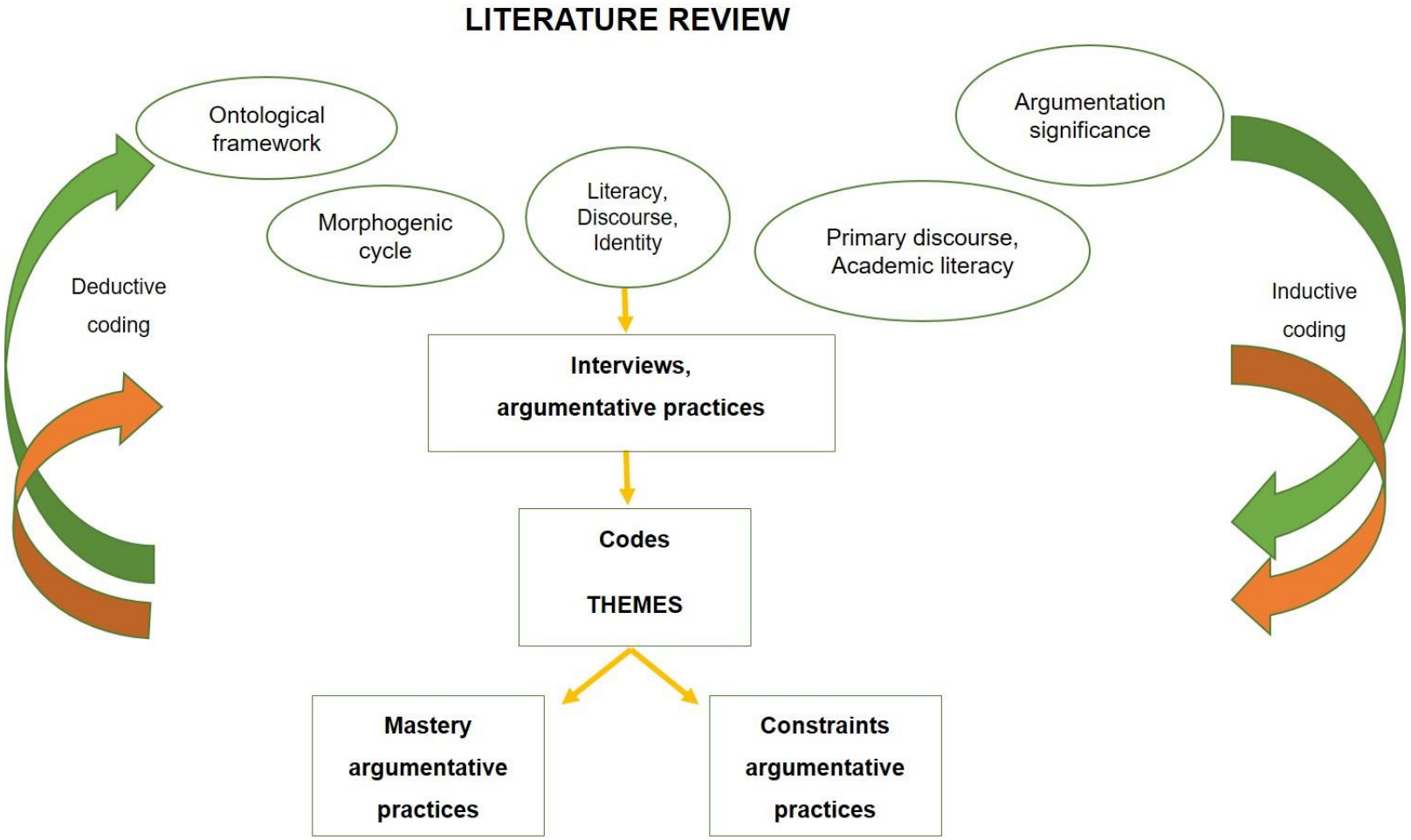

Figure 1.1: Research Development Plan

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter introduces the study's realist ontological framework[1]. An ontological framework represents a researcher's beliefs about the nature or structure of reality (Guba & Lincoln, 1994: 108). Pertaining to conceptions of the structure or form of reality, ontologists are interested in "how things really are" and "how they work" (Guba & Lincoln, 1994: 108). Varying ontologies present diverging perspectives of the structure or origin of reality, what reality consists of, and how it works. For example, constructivism and realism are often approached as dichotomous ontologies. Constructivism views reality as being mind-dependent and mind-originated, while realism approaches it as a mind-independent phenomenon that exists independently from human conception (Barkin, 2003). Pourhosein Gilakjani, Mei Leong and Nizam (2013: 49) define constructivism as "the philosophical position which holds that any […] reality is the mental construction of those who believe they discovered and investigated it". Realism, in contrast, is a philosophy which holds that a mind-independent reality exists (Hjørland, 2004: 488). This study adopts a realist ontological framework. For this reason, the concept of realism features in the study's title: A *realist* approach towards students' application of agency, culture and social structures in demonstrating competency in modes of argumentation.

In addition to the overview of the study's ontology, this chapter also provides a critical overview of the literature that informs the study's approach to the interplay of language, literacy, culture and identity. It reports on scholarly practices in higher learning institutions grouped under the terms multiple literac*ies* and academic literacy. According to Klein and Kirkpatrick (2010) and Cope and Kalantzis (2006), multiple literacies refer to the numerous modes and ways of using language that occur in everyday human life. Therefore, this theory is central in the current study due to its valuing of the diverse structural, cultural, and agential experiences that students bring to the university, shaping their pre-tertiary applications of multiple literacies. The academic literacy model (Lea & Street, 2006) focuses on how scholars apply language to generate, distribute, and interrogate knowledge; argumentation is one practice that may be incorporated into the academic literacies model.

Equally central to this chapter is its focus on the theories of primary and secondary discourses (Gee, 2012). Primary discourses refer to the use of language that speakers acquire outside of universities or professional domains (Gee, 2012: 156). Secondary discourses (Gee, 2012: 157),

[1] The ontological framework is discussed here and not with the methodology because of its importance for the morphogenic cycle which forms the basis for the study.

on the other hand, are linked to language usage in higher education and expert communities of practice. This study is interested in how intersections between students' primary and secondary discourses emerge in an extended degrees programme as students attempt to master academic writing, including argumentation.

Lastly, this chapter considers previous studies that focused on empirical and theoretical approaches for developing students' written argumentation. It was necessary to consider previous studies' findings to consider their relevance to the current study's concerns for difficulties that students encounter when required to use language for learning and argumentation purposes.

The core purpose of sharing this literature is to enable the reader to juxtapose existing theories relevant to the study with new insights yielded by this study and situate new insights within existing theories. While critical and social realist theories serve as meta-theories and explanatory frameworks for the study analysis, language, identity, and argumentation theories will help the reader understand how the researcher approached students' successes and difficulties in applying academic literacy practices argumentation.

2.2 Ontological framework

This section introduces the reader to the ontic model employed throughout this analysis. The study adopts a realist ontological outlook. This means that the objects of reality are viewed as existing outside of the human mind and without human cognition. Realist ontologies vary from constructivist ontologies. Constructivist theories hold that reality originates in the human mind and extends from it.

2.2.1 Critical realism

Although this study applies a realist ontological framework, it is essential to note that two realist schools of thought are used in the study. The first ontology, critical realism, was developed by Roy Bhaskar. His development of a realist theory culminated in his seminal text, *A Realist Theory of Science* (Bhaskar, 2013). Critical realism is considered the theoretical root from which the second ontological framework of this study emerged. This is social realism, which was formulated by Margaret Archer (1995). Bhaskar's ontology depicts social reality as being structured according to three domains. He labels these domains the real, the actual and the empirical (Bhaskar, 2013: xi).

Furthermore, he asserts that "the world is structured and differentiated [and] can be established […] th[r]ough the particular structures it contains and the ways in which it is differentiated […] for substantive scientific investigation" (Bhaskar, 2013: 19). In essence, Bhaskar maintains that there

are real generative mechanisms with powers to produce actual social events. The methodological observation of how humans experience actual events occurs in the empirical domain.

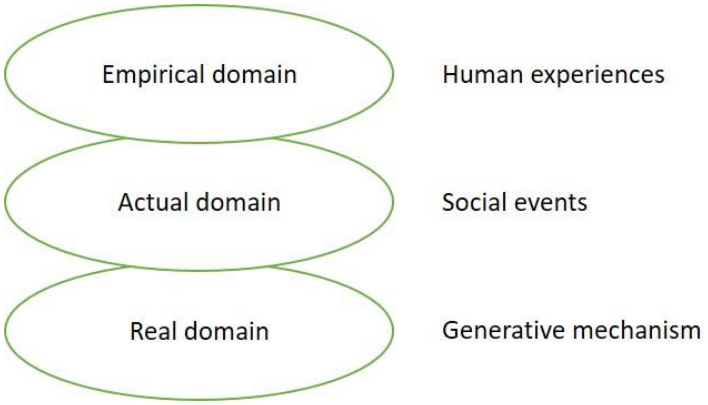

Figure 2.1: Eybers's representation of Bhaskar's overlapping critical realist ontology (Eybers, 2021).

The application of a critical realist ontological meta-framework is relevant to this study's objectives; these are to uncover the ways that social structures, culture, and agency possibly shape students' experiences of attempting to master argumentation. The critical realist ontological meta-framework helps identify and map generative mechanisms whose configurations may enable and/or constrain students' development in applying academic literacy practices towards argumentation. Identifying such mechanisms and observing their powers and activities in a realist explanatory framework is known as a causal explanation or, as Salmon (1998: 9) states, "[T]o explain an event is to identify its cause". Hence, the researcher aimed to identify and explain how generative mechanisms enabled students to demonstrate competency in argumentation; or, in contrast, the aim was to determine the inverse where generative mechanisms combined in ways that constrained students' developmental experiences in argumentation.

2.2.2 Social realism

Archer's (1995) social realist theory is an extension of Bhaskar's (2013) critical realist ontological model. It was developed after the emergence of critical realism but draws on Bhaskar's notion of stratified reality. Archer's ontological framework is of equal significance to the research paradigm of this study as that of Bhaskar. However, Archer's ontological framework receives greater emphasis analytically. The critical distinction between Archer's and Bhaskar's ontologies stems from Archer's further stratifying and naming of the generative mechanisms located in the real domain. Whereas Bhaskar (2013) broadly acknowledges the existence and powers of generative mechanisms in the real domain, Archer (1995) categorises these entities as social structures,

culture and agency. In a social realist ontological framework, illustrated in Figure 2.2, the interplay of the powers of these three mechanisms generates social events. In Archer's (1995) view, identifying these mechanisms and describing the interplay of structures, culture and agency, is necessary to avoid analytical conflation. Such conflation occurs when structures, culture and agency are theoretically approached as if they constitute a single or conjoined entity (Archer, 1995). In contrast, analytical dualism enables ontological theorisation in which social structures, culture and agency are acknowledged as separate mechanisms with their distinct powers that function in interaction with each other (Archer, 1995). This study highlights ways that structures, culture, and agency are active in students' attempts to master academic literacy conventions, including argumentation.

2.2.3 Structure, culture and agency

Structure, culture and agency are vital terms in this study. Of a multitude of critical and social realist concepts, these three constitute the broad analytical categories of this study's analysis. They are integral elements of a social realist ontological framework (Archer, 1995; Elder-Vass, 2005). In Archer's (1995) view, structures, culture and agency *are* the generative mechanisms located in Bhaskar's (2013) real domain. It is necessary to define these concepts with specific reference to their relationship to this study's theoretical conception of academic literacy as a social practice (Lea & Street, 1998; Patel, Anderson, Mpody, Guidry & Grove, 2018).

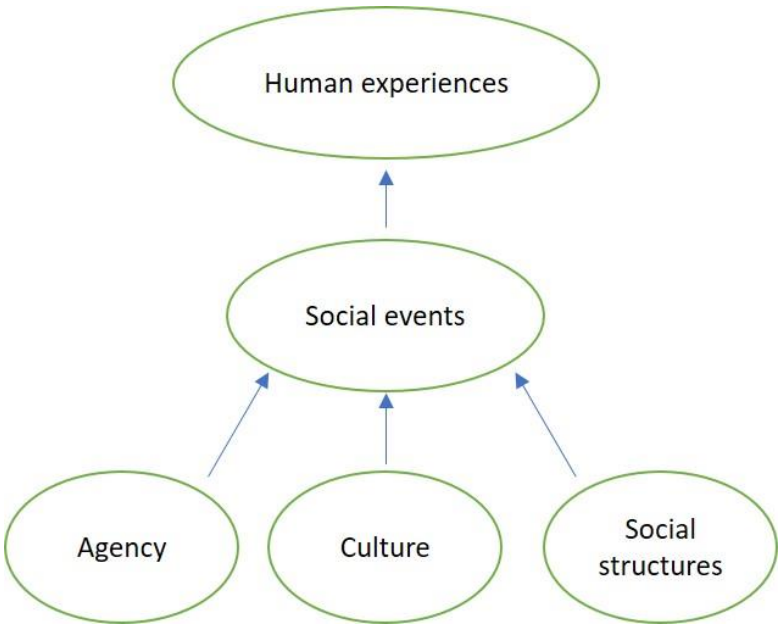

Figure 2.2: Bhaskar's realist domains juxtaposed with Archer's mechaims in the real domain (Eybers, 2021)

2.2.4 Social structures

Social structures, unlike tangible physical entities, are abstract yet real mechanisms in a realist ontology. Examples of social structures in the higher education sphere include faculties, academic departments and curricula. Bhaskar (2013) views structures as domains that enable varying modes of social life for agents operating in them. In this way, and as illustrated in Figure 2.2, universities and their curricula as social structures enable people to experience social lives, which are pedagogic and revolve around teaching, learning and the argumentative generation of knowledge. This study aims to probe the activities and powers of social structures in ways that potentially enable and/or constrain the participants' capacity to demonstrate competence in applying academic literacy practices towards argumentation. Such probing is conducted by considering the *interplay* between structures and students and the agency of other significant agents. Archer (1995: 6) declares that realist ontological theorising considers "the interplay and interconnection of these properties and powers". In this vein, the current study probes the interplay of real generative mechanisms concerning students' attempts to demonstrate competency and participate in argumentative practices and events during their first year of study. Structures that are considered in this study and which are key codes that emerged in students' narratives include, but are not limited to, gender, social class, occupational structures, peer study groups, geographical regions, schools, family, curricula and time (Bianchin, 2015).

2.2.5 Culture

Equally significant to this study's realist ontological framework and its conceptualisation of academic literacy as a social practice is the role of culture in students' development as argumentative writers. Within the real domain of a social realist ontology, culture is considered a generative mechanism (Archer, 1995). Culture is also viewed as possessing causal powers to generate events and human experiences when co-functioning with social structures and agents. Like social structures and within an analytical dualist framework, culture emerges from and is activated by human agency (Archer, 1995). Therefore, it remains necessary to separate the powers of culture analytically from the people (agents) who activate them (Giddens, 1984: 4-5). Culture does not equate to people, neither do social structures equate to culture. According to analytical dualist theory (Willmott, 1999), while these entities may co-exist in interplay with each other in diverse configurations to generate experiences, including those under the learning umbrella, they constitute independent mechanisms with their respective causal powers (Giddens, 1984: 5).

Kezar and Eckel (2002: 438) describe culture as "deeply embedded patterns of […] behaviour and […] shared values, assumptions, beliefs, or ideologies" belonging to collectives of humans. Academic institutions, including those of higher learning, contain multiple cultures. There are meta-institutional cultures, cultures associated with faculties and disciplines, students' cultures, and those active in academic departments (Agrawal, Groen & Hermundstad, 2018). Kezar and Eckel (2002: 438) state that "culture provides meaning and context for a specific set of people". By applying this theory within a realist ontological framework, this study aims to highlight how the interweaving of cultures (including students' personal cultures, disciplinary cultures and other active cultural entities on campus) in students' first year of enrolment induce experiences of enablement and/or constraint in their application of academic literacy practices towards argumentation.

The analysis also highlights how in diverse configurations of structures, culture, and agency, students draw on or neglect aspects of their own cultural identities (Section 2.5.3) in their attempts to argue competently in the higher education domain. As previously asserted, students enrolled in the extended degree programme, which contextualises this study, emerge from diverse cultural backgrounds.

2.2.6 Agency

Social structures and the phenomenon of culture would not exist without agency, which signifies the ability or inability of human beings to change or influence their social realities (Correa, 2011). Human agency is required to activate the powers of social structures and culture. This activity constitutes the interplay of entities in the real domain (Section 2.2.1). Another concept which mirrors agency is 'actors' (Archer, 1995: 276). Archer (1995: 278) states that actors are "role incumbents", implying that everyone is restricted to roles that are determined and shaped by structural and cultural conditions (Archer, 1995). Varying roles in universities, including those of students, writers, researchers or curriculum designers, are shaped by governing structural and cultural conditions. In the context of this study, this assertion has ramifications for analytically approaching the literacy-related journeys of participants. This is because structural and cultural constructs either enable agents to or constrain them in taking up new roles required in the academy (Archer, 2010). Archer (2010: 6) describes the internal process of considering enabling and constraining structures, culture and agency in our experiences as the human process of reflexivity. When first-year students argue by drawing on environmental variables, including the powers of agency and structures in the university, they engage in reflexivity by considering which resources may enable their advancement of disciplinary-based claims.

2.3 The morphogenic cycle

Archer (1995: 163) illustrates her theory of the interplay between structures, culture and agency in the morphogenic cycle. In the morphogenic model of reality, structure, culture and agency are attributed powers of elaboration. Elaboration refers to the powers of social structures, cultures and agency to expand while exerting influence on human interactions. Relationships in universities are outcomes of structural, cultural and agential elaboration. In the morphogenic cycle, Archer (1995: 195) emphasises social structures as sites of "conditioning" where ideologies of powerful agents perpetuate. Examples of structural and agential elaboration in universities include the powers of the offices and the agency of curriculum designers to shape students' learning and assessment. In this example, the curriculum designer's agency and the enabling properties of their office structure are elaborated through the curriculum. It is necessary to reiterate that social structures, culture and agency constantly operate in tandem while reproducing social conditioning. Social conditioning, in educational contexts, occurs when agents participate in shared domains while advancing and employing culturally specific practices.

2.3.1 Structural elaboration and students' discursive experiences

Structural elaboration occurs when the cultural and knowledge systems of agents in educational contexts perpetuate. Examples of cultural practices revolve around methods of instruction and assessment. Acceptable on-campus modes of argumentation by way of academic literacy practices equally constitute cultural practices. When students master the cultural practices of a module, for example, sustaining disciplinary claims with data, they elaborate the structural properties of the curriculum. Since social structures are sites of social conditioning, cultural practices can be viewed as structural emergent practices. A structural emergent property is characterised by "its primary dependence upon material resources, both physical and human" (Archer, 1995: 175). Archer's viewpoint is that structural elaboration is not possible without human agency. For a curriculum to elaborate its objectives and properties, it must involve the agency of lecturers and students. The current study's concern about structural elaboration relates to students' preparedness for knowledge generation through argumentative writing as rooted in their pre-university origins. Not all students in southern Africa come from social structures where argumentation practices and principles mirror acceptable modes of arguing in universities. Argumentation is a higher-order thinking function (see Section 2.7). As a discursive function that cannot be divorced from STEM (science, technology, engineering and mathematics) practices, argumentation practices are ubiquitous in universities. In Soysal and Yilmaz-Tuzun's (2019: 1) analysis, it was found that teachers' discursive moves influence students' approaches to "knowledge providing [and] evaluating, communicating, monitoring, and evaluating–judging [and] critiquing". Each of these higher-order cognitive functions is required for discursive argumentation, including argumentative writing. Soysal and Yilmaz-Tuzun's (2019) linkage of instructors' discursive moves to the ways students attempt to warrant scientific concepts in argumentation confirms structural elaboration through the curriculum. This is because not only do instructors determine acceptable cultural practices, but they also assess students' performance. Students, in turn, attempt to emulate the argumentative, cultural practices of lecturers after interacting with them.

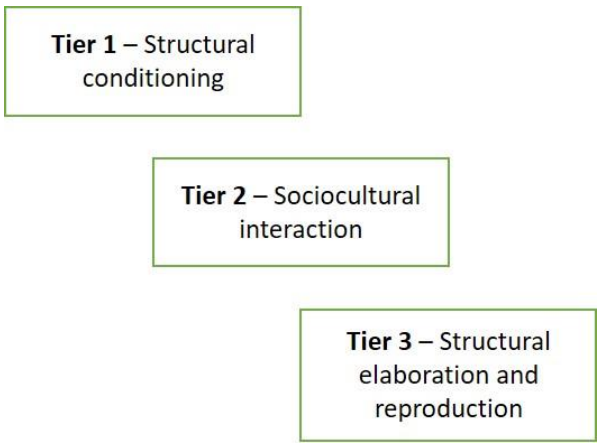

Figure 2.3: The basic morphogenetic cycle (adapted from Archer, 1995).

Not all first-year students, including some of the participants in this study, have access to world-class scientific artefacts that established scientists at the University of Pretoria do. Such tools and artefacts are necessary for the praxis of practical experimentation and scientific argumentation. Structural access to scientific tools provides scientists with the material resources for building their arguments. The challenge for first-year scientists, those from materially resourced and under-resourced structural domains, is that they have not been exposed to the complex juxtapositions of scientific experimentation and argumentative writing for as long as their instructors have. Kuhn, Zillmer, Crowell and Zavala (2013: 483) articulate this pedagogic concern as follows:

> Young students are most likely to regard science in epistemologically simplistic terms as accumulating fact, rather than as the evolving coordination of theories and evidence in which human interpretation is central.

Even though first-year natural science students from all regions in Africa and across the globe are novices at university, they must master the required discursive and argumentative practices to succeed academically. Scholars have highlighted the challenges South African university students experience while attempting to use language to demonstrate mastery of their courses. Boughey (2000), with reference to Gee (2012), highlights how systemic philosophy students straddle the linguistic Discourses (Gee, 2015) of their off-campus communities and on-campus academic literacy to convey mastery of course content. Boughey (2000: 6) describes the discursive gulf that students must cross as:

> Differences between the ways of thinking, acting, valuing and speaking which students bring from home and school discourses […] which they must acquire in order to gain membership of academic discourses.

In recognising the gulf between students' pre-university Discourses (see Section 2.5) and mainstream discourses, Jacobs (2007) argues for an evolved approach to academic development. She reasons that "disciplinary lecturers have […] tacit knowledge […] of the […] discourses within their disciplines [and] need to make explicit what is tacit for their students who are not yet part of the affinity group to which they belong" (Jacobs, 2007: 872). Jacobs' concern is that academic development practitioners, including literacy developers, are insufficiently exposing students to the specialised ways that language is used to argue in mainstream disciplinary structures. This concern is raised since students' methods of discursively generating knowledge in higher education are significantly influenced by their instructors. Gee refers to expert disciplinary languages as secondary discourses (see Section 2.5.1). In the context of the Faculty of Natural and Agricultural Sciences at the University of Pretoria, mainstream disciplinary structures that shape students' experiences include the academic departments in which they are enrolled. Jacobs' stance is that academic literacy developers require knowledge of students' diverse primary Discourses to effectively facilitate their transition into employing acceptable modes of linguistic utility on campus. As she reasons, lecturers must make explicit via academic literacy practices knowledge that is tacit to them. However, given the attrition crisis that South African universities continue to experience among first-year students, it is evident that there is a knowledge gap in the interplay of students' primary Discourses and on-campus discursive practices. The current study aimed to address this gap in knowledge.

2.3.2 Cultural elaboration and students' experiences

In the morphogenic cycle, social structures constitute the domains wherein human experiences occur. In Archer's (1995) theory, social structures constitute the parts of society. However, the parts of society are powerless without the efficacy of human agency embedded in people (Archer, 1995: 170). What is meant here is that the properties and powers of social structures, such as a curriculum or an academic department, require the agency and culture of human beings to be actuated. A parallel process of cultural elaboration accompanies group conditioning in social structures (see Figure 2.4).

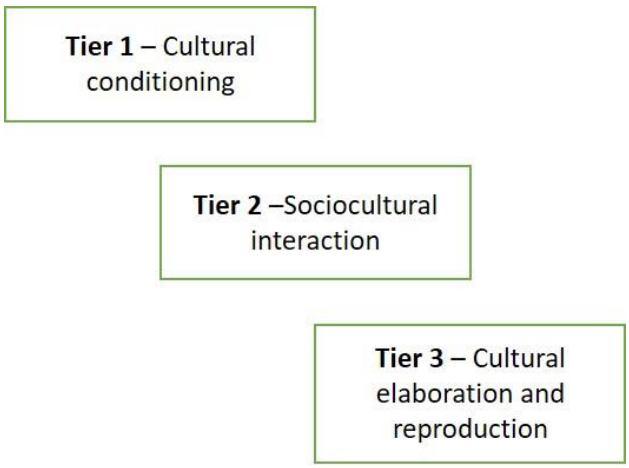

Figure 2.4: Archer's model of cultural elaboration (Author, 2021).

Cultural and structural elaboration occur concurrently. This is because the cultural principles of agents are embedded in the curriculum, in assessment practices and indirectly through content shared in course readings. As students interact in and with these pedagogic structures, the cultural principles embedded in them are elaborated. For these reasons, Gee (2012: 7) refers to networks of language, people and social systems as cultural models. When students employ argumentative principles and practices that are reflective of the agency and cultures of curriculum designers, structural and cultural elaboration occurs.

In the southern African context, cultural elaboration in higher learning institutions poses academic development and learning challenges for some students. As previously asserted, not all students emerge from pre-university cultural domains that reflect the accepted epistemic practices on campus. Kapp and Bangeni (2020: 81) declare that a significant proportion of university students in South Africa "straddle the boundaries of home and the academy over time". Kapp and Bangeni's (2020) analysis, conducted among occupational therapy, psychology and philosophy students, emphasises the interplay between students' identities and the linguistic demands posed by university study. They highlight that in 2020, language-related struggles persisted among second-language English speaking students. On the one hand, students must master the university's medium of instruction; on the other, they must master academic literacy practices, a peculiar set of cultural and epistemic practices. Kapp and Bangeni (2020: 91) argue that some occupational therapy, psychology and philosophy students have difficulties expressing themselves because "learning identities shape participants' [ways of] participation, attitudes and decisions" in discursive interactions. Diverse identities in universities can cause "conflicting expectations [between students and staff] about subject positions" (Kapp & Bangeni, 2020: 91).

Kapp and Bangeni's (2020) and Boughey's (2000) concerns about the structural and cultural disjuncture between students' identities and their struggles to master expert secondary discourses on campus resonate with the research problem of the current analysis, namely: How do students from diverse cultural and geographical origins overcome the unavoidable hurdle of negotiating their cultural Discourse while simultaneously aiming to master argumentative discourses including writing on campus? Despite the similarity between the previous studies and the current study, there are also significant differences. For instance, the Kapp and Bangeni (2020) study is situated among a mixture of occupational therapy, psychology and philosophy students, and Boughey (2000) focuses on philosophy scholars, while the current analysis is set among physical and life science students. Another distinctive characteristic of the present analysis is its embeddedness in an extended degree programme (see Section 1.9) tailored to academically vulnerable students.

2.3.3 Group elaboration and scientific discursive experiences

South Africa's higher education system is facing a crisis related to the development of future scientists. It is generally agreed across educational, industrial and public spheres that the nation needs more expert scientists to develop. Reddy (2005: 392) asserts that "mathematics and science are key areas of knowledge and competence for […] the social and economic development of South Africa". Alarmingly though, a Council for Higher Education (2013) report reveals that roughly 55% of all university entrants do not successfully exit the system. Young (2016: 16) highlights how "students at higher risk of failing are those from historically underrepresented […] groups in both higher education as well as the economy". The high attrition rates in South Africa's higher education system are untenable if the nation wants to develop future scientists. South African universities' attrition statistics indicate that group elaboration among historically marginalised communities is characterised by constraints and struggle. Stunted group elaboration among formerly marginalised communities in universities counters the aims of the South African government's White Paper of 2013. The White Paper for Post-School Education and Training (Higher Education and Training, 2013) identifies knowledge as a critical mechanism for generating a developing state. This policy states that the South African government (Higher Education and Training, 2013: viii):

> Recognises that the right to access an educational institution is not enough and that institutions must provide education of a high quality. The system envisaged must provide paths for articulation between various qualifications, and there should be no dead-ends for students; there should always be a way for someone to improve their qualifications without undue repetition. Meeting the needs of learners of all ages and levels must be a central purpose of the education and training system.

Eight years after the publication of the 2013 governmental policy, South African higher learning institutions are still experiencing difficulties in achieving this aim. Successive years of high levels of student attrition also suggests that "the needs of all learners of all ages and levels" are not met. If students' learning needs are not met, the greater southern African region's growth is stunted. Reddy (2005) identifies scientific knowledge as constituting key fields that are necessary for developing South Africa. Knowledge from the natural sciences is needed to develop future professionals who can generate solutions for problems plaguing vulnerable communities whose members do not have access to or voices in universities. Negative group elaboration in South Africa's universities reflects Boughey's (2000) and Kapp and Bangeni's (2020) concerns. This is because structural and cultural factors undeniably constrain a significant proportion of first-year students from succeeding on a systemic level. Archer's (1995) theories of structural and cultural elaboration are valuable tools for identifying social variables that constrain and enable first-year students' success. The present study aims to identify some of these critical variables, specifically as related to the ways first-year natural science and extended degree students attempt to apply academic literacy practices in argumentation.

Kapp (2010) argues that language was applied as a tool for furthering the government's aim of socioeconomic stratification in South Africa during the pre-democratic dispensation. She reasons that "language was conflated with ethnicity and used as a tool to separate and divide people, physically and socially (through geographic separation), and mentally, by instilling constructions of inferiority and superiority" (Kapp, 2010: 30). Kapp's claim is relevant to the problem addressed in this study in the sense that South Africa's recent history of social inequality caused disjuncture between disciplinary modes of arguing and discourses in universities and the pre-university epistemic experiences of many first-year students.

Geisler (1994) describes how language is used in higher education as affiliated to expert knowledge fields. Evidence of expertise in higher education are academic texts. Written texts are "objects of expert knowledge [that] afford and sustain […] expert representations […] available to *insiders* [emphasis added] to the academic professions" (Geisler, 1994: xi-xii). By virtue of having just completed their schooling, first-year science students are outsiders to the peculiar ways that academics use language. The current analysis posits that the epistemic juncture between students' pre-university Discourses and the unavoidable argumentative practices they must master to succeed academically contributes to the premature exit of a significant proportion from higher education institutions. Young's (2016) data affirms this claim. His view is that South Africa's "completion rate of 30% suggests that only 5% of [scholars] are effectively being served by the higher education system" (Young, 2016: 18). This statistic suggests that universities' modes of inducting students into the utility of accepted epistemic practices that involve literacies are

insufficiently incorporating students' epistemologies into the curriculum. Boughey and McKenna (2016: 1) identity this problem as emerging from constructs of students as "decontextualised learner[s]". A decontextualised approach to students' Discourses in higher education negates the reality that "the literacy practices that are valued in the university emerge from specific disciplinary histories [that] students are […] expected to master […] as if they were common sense and natural" (Boughey and McKenna, 2016: 1). The current study highlights students' pre-university cultural and discursive practices to address the knowledge gap on first-year science students' epistemologies and the mandatory epistemic practices on campus that they must acquire. By employing Archer's (1995) theories of structure, culture and agency, this study reveals how first-year natural science students' epistemologies are shaped by their homes, schools and their geographical domains of origin.

Morphogenesis and morphostasis (Section 2.3.4) are critical concepts in this analysis; their importance cannot be overemphasised. The researcher activates these concepts through praxis in the presentation of the analysis results. Archer (1995) describes real, generative mechanisms enabling the emergence of actual events as morphogenesis. In her view, morphogenesis involves the active co-functioning of real mechanisms which lead to end products; these products may be learning events, processes, or assessments (Archer, 1995). The central purpose for employing Archer's theory of morphogenesis is to highlight how various configurations of social structures, culture and agency generate varying students' experiences of evidencing development in argumentative practices. Archer (1995: 458) states that "the morphogenetic perspective [deals] in endless cycles of […] social interaction […] between structure and action". The intention of employing Archer's morphogenetic cycle in this analysis is to highlight the diverse and varying ways active and real social variables, specifically structures, culture, and agency, combine in some of the student participants' experiences of mastering argumentative practices. As related to the context of this study's concerns, the morphogenic cycle is illustrated in the figure that follows.

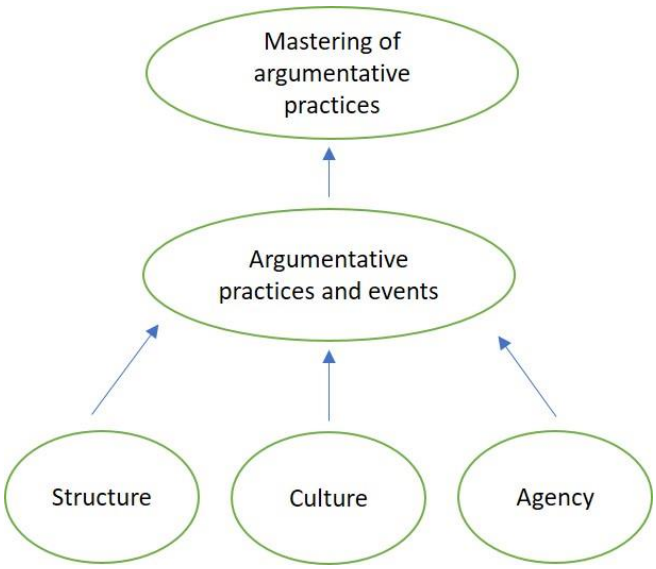

Figure 2.5: Morphogenic experience of mastering argumentative practices (Eybers, 2020).

2.3.4 Morphogenesis and morphostasis

This study recognises that not all students successfully apply academic literacy practices for learning advancement and argumentation for knowledge development. Indeed, scholars indicate that a significant proportion of students fail to complete their first year of enrolment due to the rigour of university-based learning and, integrally, the embedded challenge of mastering academic literacy practices, including argumentation (Gomatam, Charyulu, Latha, Hussain, Chandra & Dandu, 2020; Zhu, 2001). Accepting the reality that not all students master academic literacy conventions and apply them as learning tools for argumentative purposes, this study applies the theory of morphostasis (Archer, 2010: 274-75). Whereas morphogenesis refers to the emergence (Elder-Vass, 2005) of forms of social experiences, including mastering argumentative practices, morphostasis refers to constraining the emergence of experiences (Archer, 2010: 277). In a morphogenic cycle, a combination of structures, culture and agency enables the emergence of developmental argumentative experiences. With morphostasis, their configuration constrains the morphing of experiences of mastering argumentation competencies (Esmond & Wood, 2017: 236). This theory is applicable to the difficulties students encounter when attempting to write and speak argumentatively. The following figure illustrates a morphostatic cycle reflecting students' experiences of constraints in trying to master argumentative practices.

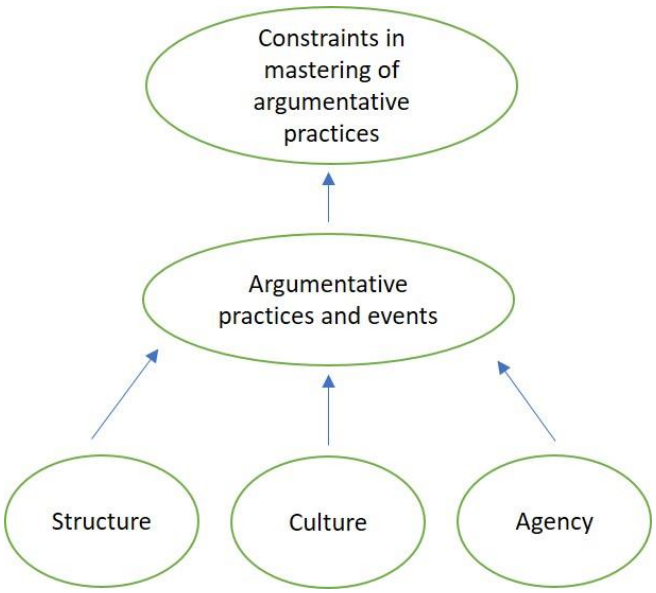

Figure 2.6: Morphostatic experience of mastering argumentative practices (Eybers, 2020).

When academic literacy practices involving argumentation are approached as social phenomena, as in the ontological context of this study, consideration of the influences and roles of people and structures are central (McGrath & Kaufhold, 2016: 933; Hyland, 2002: 352, 357) to understanding how students' attempts to advance knowledge are shaped. In realist and analytical dualistic investigations, such as Willmott's (1999), it is essential to separate and simultaneously identify how these entities co-function. The three realist theoretical categories employed in this research are relevant for understanding the learning challenges of first-year students' success in the face of their high attrition rates in South African universities. South Africa is currently experiencing a crisis in its schooling system and has one of the highest youth unemployment rates in the world. Marumo and Sebolaaneng (2019: 13,479) state that "about 38.2 % of [South African] youth aged 15 to 34 are unemployed, and […] in the first quarter of 2018, more than one in every three youth in the labour market [was] jobless". It is from this social landscape that a significant proportion of first-year natural science students emerge. Diko and Letseka (2009) highlight that poverty in South Africa is a variable, among numerous others, which contributes to student attrition. South Africa's socio-economic conditions evidence a morphostatic effect on how *some* students endeavour to argue successfully in their subjects. In a social realist meta-framework, the powers and activities of students' communities and families, as social structures and generative mechanisms, impact the manner by which they attempt to demonstrate mastery of academic literacy and argumentative practices as first-year students (Bhaskar, 2013: 3; Archer, 1995). However, this is not an assertion as it is revealed in the presentation of the results that students' difficulties and successes in argumentation correlate with their pre-university Discourses and

discursive experiences in the genesis of the first semester. Instead, the analysis found that in many ways, students from diverse geographic, cultural, and disciplinary orientations uniquely combine structures, culture, and agency in their argumentative strategies.

2.4 Conceptualising literacy, Discourse and identity

2.4.1 Academic literacy as one of multiple literacy modes

While the focus of this analysis is on students' application of academic literacy practices (which include argumentative strategies), it is acknowledged that the field of academic literacy and its associated conventions may theoretically be situated in the broader field of multiple literacies (Klein & Kirkpatrick, 2010; Cope & Kalantzis, 2006; Lillis & Scott, 2007). Academic literacy is one of various modes of literacies and is specific to the higher education domain. Academic literacy modes of communicating are embedded in secondary school curricula where students are exposed to secondary discourses. As a communicative approach, multiple literacies, which are conceptually aligned with multimodality, recognise that humans employ diverse strategies and techniques to share knowledge and communicate. These strategies are always socially and historically emergent and contextualised (Cope & Kalantzis, 2006). In the parameters of scientific teaching, Klein and Kirkpatrick (2010) describe the function of multiple literacies as enabling diverse representations of disciplinary knowledge and phenomena. For example, the employment of multiple literacies may aid scholars in their attempts to comprehend scientific concepts by linking them to broader abstract theories (Klein & Kirkpatrick, 2010). Academic literacy modes that are applied while scholars are active in online environments or when they apply additional tools (such as EndNote or Skype) as they engage disciplinary content require the use of multiple literacies for knowledge advancement. Multiple modes of literacies manifest in numerous forms. They may be visual in the form of images, graphs or charts (Alberto, Hughes, McIntosh & Cihak, 2007) or draw on specific literacy traditions, including writing, specific to academic departments (Ioratim-Uba, 2019). The current study highlights how students apply multiple literacy strategies in the academic environment, emphasising ways in which students engage in written practices for knowledge development and argumentation.

The theory of multiple literacies is significant for the context of this study for several reasons. University students based in South Africa, including those who were the focus of this analysis, emerge from diverse ethnic and geographical backgrounds. Each of these domains, namely students' ethnicity and geographic origins, employs literacy and discursive practices distinctive to it. This theory is encapsulated in sociocultural linguistic stances (Arnold, 2019; Pérez Báez, 2018). Gee (2012; 2015) postulates that Discourses emerge from among different kinds of people with varying histories and identities. This theory's significance in analyses of language practices

applied in universities is that science faculties contain multiple Discourses associated with disciplines. Furthermore, they also include multiple literacy modes of communicating, which are affiliated with the Discourses. Such application occurs in two domains: (1) the core disciplinary domain and (2) generic academic literacy modules, which aim to empower students in language use (Kamberelis, Gillis & Leonard, 2014; Carstens, 2010). While genres manifest as written products and processes in learning events, they also incorporate relationships between disciplinary members due to their social nature (Badger & White, 2000). In the context of the current analysis, argumentative writing, dialogic and rhetorical reasoning are critical genres that first-year science students must master. Of significance for the present analysis is the reality that not all first-year students had been exposed to social literacies genres that are used to argue in higher education before they start at university.

2.4.2 Multiple identities and academic literacy practices

Like the theory of multiple literacies, the concept of multiple identities is significant to the focus of the current study. This concept manifests in the data analysis chapter of this study. Its significance is two-fold. Firstly, students bring to the university their personal and multiple Discourses (Gee, 2015). Students' primary Discourses (see Section 2.5) are constituted of intersections between cultural uses of language they acquired at home and in their communities and schools before arriving at university. Archer (2003) distinguishes between pre- and post-university students' Discourses as corporate and primary identities in her realist theory. Intersections between students' pre-university identities and languages are dynamic in the first year of enrolment. These include being family and community members, scholars, aspiring disciplinary members, future experts, citizens or refugees (Martiny, Froehlich, Deaux & Mok, 2017: 301). The notion of multiple identities in the South African higher learning context has special meaning. South Africa is a multilingual and multicultural society. While our country has twelve official languages, including sign language, there are multiple variants to each of these. Because Discourses (Gee, 2015) are an integral feature of cultures and cultures feature integrally in languages (Brock-Utne, 2018), South African universities are flooded with cultural richness when they admit first-year students. The current analysis aims to dissect the interplay between students' cultural identities and their application of multiple literacies in their attempts to master academic literacy practices while engaging in argumentation.

2.4.3 The academic literacies model

While academic literacy practices are identifiable as part of a collective of multiple literacies, they display communicative features that are not always practised in the same critical and in-depth ways in non-academic communities. Communicative features that distinguish written academic literacy practices from non-academic modes of communicating include avoiding plagiarism or applying concepts and theories common to disciplinary departments (Irwin & Liu, 2019). Lea and Street's (1998) foundational academic literacy model helps conceptualise what is meant by academic literacy practices. The academic literacies model is "concerned with meaning making, identity, power and authority" (Lea & Street, 1998: 227-228) as manifested in dialectical and rhetorical interactions in universities. It "foregrounds the institutional nature of what counts as knowledge in any particular academic context" (Lea & Street, 2006: 228). Academic literacy practices vary according to fields of study, culture and genre (Lea & Street, 2006). Disciplinary domains where academic literacy practices are applied shape how students and scholars function in cultural communities (see Section 2.5.3). For example, students enrolled in a chemistry module will apply academic literacy conventions in distinct ways from students enrolled for accounting. They may share conventions, but Discourses (Gee, 2015) and agency in these departments have different concerns. To connect Lea and Street's (1998) model of academic literacy to this study's objectives (see Section 1.7), first-year students enrolled in the natural science extended degree programme enter a process of transitioning from Discourses that were applied in their families, secondary schools and pre-university communities to the Discourses of senior curriculum designers and lecturers. South Africa's dismal higher education attrition rates (Young, 2016) suggests a significant proportion of students and the system itself are not effectively navigating this discursive transition. Modes of arguing in higher education (see Section 2.7), of which argumentative writing is one, constitute cultural practices that disciplinary practitioners employ to generate and contest knowledge in the fields in which they operate. Argumentative writing enables communities of scientists "to record, examine and evaluate representations of reasoning as objects of reflection" (Ferretti & Graham, 2019: 1346) in ways that are distinct from non-academic communities. Further, natural science cultural communities evidence unique dialectical, rhetorical and written argumentative strategies when compared to each other. Again, reasoning methods employed by expert scientists constitute secondary discourses (see Section 2.5.1) that few students acquired during their pre-university experiences (Geisler, 1994). Cultural inputs which students bring to the university and that are of interest to this study's problem statement and objectives include but are not restricted to students' personal, family, and community influences that enable or constrain how they attempt to use academic literacy practices while participating in varying modes of argumentation.

As articulated by Lea and Street (1998, 368), the academic literacy construct is not restricted to focusing on discipline-specific subjects or modules. Lea and Street (1998: 368) distinguish the academic literacies model from the study skills model that approaches academic literacy practices as "individual and cognitive skill[s]". The second model, named the academic socialisation model, highlights processes of culturalisation as students adopt and elaborate the cultural principles of curriculum designers and their lecturers through writing and reading strategies. A critical distinction between the academic literacies model and the aforementioned models is the academic literacies model's accentuation of "what counts as knowledge in any particular academic context" (Lea & Street, 1998: 368). During students' pre-university experiences, they had been exposed to many Discourses that do not construct knowledge in the same ways as seasoned scientists. In South Africa, pre-university Discourses are shaped by students' geographical homes, families, schools, and the many cultural communities they belong to. Unlike sociocultural communities on campus, including academic departments, students' Discourses are affiliated to and shaped by many communities. Similarly, academic practitioners share and adhere to communicative practices, rules and conventions that they themselves have inherited or established. Very few first-year science students, including the participants of the current analysis, had prior experience of university lecturers' normative practices. Yet, when they arrive on campus, they are immediately expected to demonstrate competency in these argumentation conventions or risk failing. Due to having to straddle multiple Discourse homes (Bangeni & Kapp, 2020) and new literacy practices, many first-year science students fail or drop out of the system (Young, 2016). As a result of this crisis and a perceived need to create knowledge to address it, intersections between students' Discourses, pre-university literacy experiences and the navigation of the University of Pretoria as a new cultural environment are one of the variables that the current analysis aimed to highlight.

2.4.4 Academic literacy practices and events

An academic literacy practice is an act; it is a mode and a communicative tool applied within educational environments (Kalman, 2008; Carstens, 2008) to convey ideas and arguments. Academic writing constitutes an academic literacy practice (Kalman, 2008). In a discursive framework, academic writing is construable as a cultural tool for advancing values and knowledge according to communities' goals. In this sense, students employ academic writing practices, including argumentative writing, to demonstrate aspects of their academic and cultural identities (Carbone & Orellana, 2010: 294) in disciplinary communities. This is also the function of secondary discourses in universities (see Section 2.5.1). Scholars apply secondary discourses (Gee, 2012), including writing, to demonstrate their understanding and awareness of the principles that govern argumentation in their academic communities. Carstens (2008) specifies

discussion, analysis, argumentation, explanation, and description as fundamental written modes that undergraduate students must master in his academic literacy construct. Each of these academic literacy practices features to a greater or lesser extent in the dialogical and rhetorical strategies of scientists involved in inquiry.

Academic literacy practices occur within events. Examples of academic literacy practices that are active in events include notetaking during a lecture and rhetorical warranting of a written argument with empirical data. Kalman (2008) situates literacy events in larger social domains, including faculties and academic departments. In the university environment, academic literacy events always involve literacy tools, genres or modes as students engage in comprehension processes or knowledge generation. As socially constructed phenomena, academic literacy events are governed by multiple policies and regulations and cultural frameworks embedded in institutional cultures (Kalman, 2008). Actual lectures, participation in group projects, or searching for information online constitute literacy events within the broader context of courses, the department, and faculty. Finally, Kalman (2008) depicts academic literacy events as involving interactive dynamics between participants. As students participate in academic literacy events, they employ those communicative modes identified by Carstens (2008). Some of these events require individual modes of communicating, including solitary submission of assessments and the genre construction involved in writing essays. Alternatively, designing an infographic requires interactive academic practices, such as oral exchange and collaborative accessing of data for the project.

McWilliams and Allan (2014: 1) list additional academic literacy practices and modes of communication, which include, but are not limited to, critical thinking, database searching and referencing, use of formal register, and manipulation of a range of academic genres. In Blanton's seminal study (1994: 4), academic literacy is characterised as involving interpreting texts, agreeing or disagreeing with them, linking them to each other, extrapolating data from them, and presenting them in a manner that is appropriate to the audience. Albeit at their first year of enrolment and a level of lesser criticality than senior scholars, first-year students are still expected to apply these conventions. This study is interested in how social structures, culture and agency possibly weave into students' learning experiences of attempting to argue and demonstrate worthiness as members of discourse communities within universities by applying these academic literacy practices (Gee 2012: 2-3).

When approached in a sociocultural framework (Gee, 2012), the significance of academic literacy practices is that they are shaped by disciplinary cultures, agents and structures in the higher education domain. High school teachers' agency and cultures are equally efficacious in introducing students to expert Discourses. While it is not denied that off-campus communities apply argumentative practices and modes specific to their cultural systems, these do not always

mirror the modes, rules, and conventions that are mandatory in universities and higher learning institutions. Here, reference is made to conventions necessary for academic essays, articles, or theses to be accepted according to peer standards in disciplinary communities. Whereas individual members of off-campus communities determine the character or form of literacy events and practices, on-campus literacy events and practices are governed by influential agents (Section 2.2.6), including deans, professors, lecturers, and curriculum designers. Therefore, when off-campus literacy practices are compared with the modes which agents in the university apply to generate knowledge, it is evident that there are noticeable distinctions. Some of the variations and similarities between academic argumentation as practised in universities and argumentative modes found in students' homes and communities are discussed in Chapter 5.

Wittek and Habib (2013: 275) state that "academics have been portrayed as identifying strongly with their disciplines [and] as embracing the culture of their disciplines in a way that evokes the workings of tribal life". Off-campus actors, who may share interests that mirror disciplinary concerns, do not write about these concerns in the same investigative or critical depth as students and lecturers are expected to. Rather, some individuals may apply what Torres (2018) refers to as heritage languages: those languages used in the non-academic setting. Therefore, when first-year students enter academia, it is necessary to implement interventions that increase their awareness of those disciplinary principles that shape academic literacy practices and develop the skills essential for demonstrating the comprehension of course material.

Blanton (1994: 2) suggests that influential agents determine acceptable ways of participating in the conventions mentioned above in universities. This is because there exist "power[s] of community to mould language, language behaviour, and operational assumptions about reading, writing, books, and schooling", which shape pedagogical norms for academic literacy (Blanton, 1994: 2). Students must demonstrate competence in academic literacy and argumentative practices to demonstrate understanding and mastery of disciplinary content. Within the domain of social linguistics, these practices constitute more than technical or mechanistic acts. By effectively employing them, students demonstrate their ability to adopt identities, roles, and ways of doing, which are recognised within their disciplines (Hyland, 2002; Street, 2006). Approached through a sociocultural framework, academic literacy productions, be they written texts, arguments, or reports, may be labelled as products of what particular communities accept as genuine forms of knowledge (Boldyrev & Dubrovskaya, 2015: 27). These products are in turn shaped by the behaviours, ways of doing and identities of disciplinary practitioners, including students (Boldyrev & Dubrovskaya, 2015).

When the above academic literacy associated processes are viewed through social lenses, such as Street's (2006) ideological model, it is possible to approach academic literacy conventions, upon which argumentation relies, as indispensable features of knowledge construction for first-year students. Street's (2006) ideological model of literacy mirrors Gee's (2012) theory of Discourses. Street (2006) conceptualises the ideological model of literacy by contrasting it with the autonomous model. The autonomous model of literacy views written, rhetorical and dialogical practices as de-contextualised phenomena (Street, 2006). Alternatively, the autonomous model holds that literacy practices are easily transferred across cultural contexts. In contradistinction, the ideological model represents literacy practices as always being active in cultural models (see Section 2.6.5). Street (2006: 2) claims that literacy practices including reading and writing are "rooted in conceptions of knowledge, identity, being". Street's references to knowledge and being allude to the epistemological and ontological characteristics of academic literacy practices. On the one hand, academic literacy practices stem from the knowledge systems of powerful agents in universities. On the other, academic literacy practices reflect and elaborate the ontologies of influential agents who determine required and acceptable literacy practices in universities. The results of such determinations in the curriculum, as reflected in the literacy genres and assessments students must master, do not always correlate with the epistemic and ontological worldviews of first-year students who emerge from diverse sociocultural communities. The ontological and epistemic chasms between dominant life views on campus and students' diverse identities (see Section 2.5.3), as reasoned in this study's thesis, is contributing to a crisis of attrition in South Africa's higher education system. Insufficient knowledge of students' pre-university literacy experiences and their intersections with students' epistemological and ontological roots contributes to their dropping out or failing the first year. This is why the current study aims to surface students' pre-university Discourses including their cultures, ways of being and educational experiences. He warns that when academics or facilitators of academic literacies approach associated conventions as impersonal or a-cultural processes, they risk doing more harm than good to the very students they aim to empower (Hyland, 2002). Therefore, it is necessary to make explicit to students the principles that motivate the application of literacies employed on campus and how these ways of doing are linked to their academic development.

2.4.5 Academic literacy as a sociocultural discourse

Theories of sociocultural linguistics enable analysis of the interplay between agency, culture, and structures in students' engagements of academic literacy practices (Hodges, 2015; Boldyrev & Dubrovskay, 2015). This is because these theories value and emphasise how various social mechanisms shape the human usage of language and literacy practices. Culture is one such social variable. Bucholtz and Hall (2005: 586) define sociocultural linguistics as "the broad inter-

disciplinary field concerned with the intersection of language, culture and society". This conception is relevant to the current study as it, too, values the cultural activities of disciplines in students' experiences of argumentation, writing and other academic literacy practices. In addition, this study highlights students' cultural origins and orientations and how they interweave with their approaches for participating in academic literacy practices. Principles of sociocultural linguistics correlate with values of the New Literacies Movement (Kist, 2004). Street (2003: 78), a founding member of this movement, describes the correlation in his ideological model of literacy with the New Literacies Movement by asserting that literacy practices are always embedded in and emerge from social contexts (see Section 2.4). This embedding occurs in work, educational settings, or ethnically related cultural collectives (Street, 2003: 77-78). Social literacies (Street, 2003) that are active among families, in communities or academic departments are shaped by those agents who apply them. These individuals include agents who approve curriculum, curriculum designers, lecturers, tutors, and students (Street, 2003: 78). Within a social realist ontology, the combined actions of these individuals determine the emerging forms of academic literacy practices in university spaces. A sociocultural approach towards academic literacy emphasises the social and human features of language use. It recognises that such practices draw on the cultures and values which are contextually situated in them. University departments are examples of such social structures. It is important to note that some academic development scholars in southern Africa believe the autonomous approach to learning continues to operate in universities. In fact, Boughey and McKenna (2016) hold that the autonomous approach to learning has contributed to the emergence of student protests and marginalisation experiences in South Africa's higher education system. Like Kapp and Bangeni's (2020) concerns around students' diverging experiences of "homes" between campus and their communities of origin, Boughey and McKenna (2016) alert curriculum designers to the reality that not all students are adjusting to institutional cultures. South Africa's crisis of attrition among first-year students warrants their observations and concerns. The current analysis shares the view that indirectly, the dis-articulation between students' epistemic and ontic worlds with the actual pedagogic experiences they encounter while navigating university curricula exacerbates tensions that erupt in protests.

The concepts of culture and cultural identity are central to the focus of this study. In this analysis, the researcher aims to highlight how students' cultural identities are active in the ways that they attempt to use language as a tool to learn, to demonstrate understanding in the academic context, and to argue. The researcher attempts to link students' cultural identities and how social variables that shaped their primary discourses follow them into their first year of study and shape how they attempt to apply language for learning and knowledge development. Using a social realist ontology (see Section 2.2), the researcher highlights how social structures have shaped students' primary discourses and their orientations towards applying academic literacy practices in written

argumentation. Such social structures include class, gender and culture (including those of the home, school and community), and agency (including family members, teachers and peers).

2.5 Primary discourses and academic literacy practices

Social discourses incorporate the identities, cultures, histories, values, and principles of communities (Flowerdew & Wang, 2015: 82). They also manifest in the ways that humans apply literacy practices. Primary and secondary discourse theories help interpret students' literacy and argumentative experiences as they transition from their pre-university lives to being new members of academia. According to Gee (2012: 156), primary discourses are those Discourses we acquire at an early stage of our lives. These Discourses shape our ways of being a person—specifically, a non-professional person (Gee, 2012: 156). From within a social realist ontological framework, primary Discourses are acquired through the interplay between structures (such as the home, family, and community) and agents (including parents, guardians, and community members) (Archer, 1995: 8). Primary Discourses provide humans with a sense of "self" (Gee, 2012: 156) and a foundation for using language in everyday life.

The theory of primary discourses is relevant to this study's contextual concerns as it suggests that the ways in which students use language or literacy practices before arriving at the university do not always reflect academic literacy discourses and practices. Makalela (2018: 9) states that "very little is known about how remote rural African communities where indigenous literacy patterns can still be discerned to make sense of their world". Here, a distinction is drawn between literacy and discursive practices of rural and urban domains. South African universities are populated with students who emerge from such environments, some of whom are participants in this study. The pedagogical implications of this discursive variation, as Makalela (2018) argues, is the disjuncture between academic discourses and the cultural and agential characteristics of some students. The existence of such literacy disjuncture and experiences is not restricted to students who emerge from rural environments. Rather, students from multiple and diverse social and cultural contexts must adjust in unique ways to the peculiarity of academic literacy practices.

2.5.1 Secondary discourses and academic literacy practices

Unlike primary discourses, secondary discourses are associated with expert and professional communities of practice (Gee, 2012; Geisler, 1994: 81). Literacy modes and practices which are active in universities are simultaneously affiliated with the acceptable ways of using language and literacy practices in expert or professional settings. Secondary discourses, including those beginning with a capital 'D', and disciplinary discourses aid language users to identify themselves as members of social networks or groups (Gee, 2012: 161). Gee’s (2012) construct of Discourses

with a capital 'D' is central to the current analysis. It reflects this study's understanding of language and literacy application as transcending mechanistic processes that can are reducible to sentence and grammatical levels. Rather, Discourses are embodiments of deep-rooted epistemologies and ontologies that humans, including first-year natural science students, exude while engaged in dialectical, rhetorical and written argumentation. Another view of Discourses, according to the thesis of this analysis, is as personal ontologies. Ontologies, shaped by an individual's epistemic beliefs, are representations of their experiences of reality. Discourses with the aid of language and literacy practices function as the tools individuals apply to evolve their beliefs reflexively while sharing them with others. Examples of Discourse tools that are applied reflexively and externally in communities of practice include dialectical, rhetorical and written modes of argumentation. According to realist theory, reflexivity involves internal conversations people have with themselves as they navigate social structures and agency (Archer, 2003). Archer (2003: 167) also identifies what she terms "communicative reflexives". Communicative reflexives emerge after human thoughts are articulated in dialogue, rhetoric and argumentation with groups of people (Archer, 2003: 167). The relevance of Gee's (2015) big 'D' Discourse theory and Archer's (2003) reflexive construct for this study relates to first-year students. Before and after entering South African universities, the students are enabled and constrained in diverse and varying degrees in internal and communicative reflexion processes. Highlighting these variables as active in students' pre- and post-university entrance experiences is the primary objective of the study at hand.

2.6 Conceptions of identities

In the preceding sections, the interrelationship between students' cultural identities and their application of language for learning and argumentation is theorised extensively from within sociocultural linguistic and realist ontological frameworks. At this juncture, it is imperative to acknowledge that multiple disciplines conceptualise culture in unique ways. Psychologists, including Kang and Bodenhausen (2014: 550), argue that all human beings embody multiple identities. For example, a single individual may simultaneously be a parent and child, a novice scholar and a disciplinary member in the university. From a psychological perspective, the theory of multiple identities enables a construct of cultural identity as being multifaceted and shaped by social context. Reasoning from within the field of language and education studies, Parkinson and Crouch (2011: 84) construct identity as something that humans *do* instead of it being something that we *are*. This is a profound concept: it suggests that our actions in different social contexts define our identities as human beings. According to Ochs (1993: 288), who reasons within the field of language and social interaction, the concept of *identity* is broad and denotes "a range of social personae, including social statuses, roles, positions, relationships […] institutional and […]

community identities". The theory of multiple identities applies to the experiences of first-year university students. As they join the university as new members, their status is that of novice disciplinary members. Their roles include being learners but also novice knowledge producers through argumentation. Further, the university environment requires that students participate in multiple interactions in disciplinary and other communities to advance personal learning projects.

2.6.1 Conceptions of cultural identities

Deriving from the above theory of multiple identities, one of the identities humans possess is their cultural identity. Cultural identities are active in the university environment and are abundant (Valimaa, 1998: 120). Cultural identities operate in and navigate three domains. These are institutional (Suransky & Van der Merwe, 2016: 578), disciplinary (Fomunyam & Teferra, 2017: 200), and personal cultural domains. Locating cultural identities in the three aforementioned domains mirrors Gee's (2015) construct of Discourse with a capital 'D' (see Section 2.5). Discourses transcend social borders while embodying principles and values from the cultural models in which they operate. Cultural identity is rooted in the very notion of culture itself. Valimaa (1998: 120) describes culture as an analytic device for understanding shared human experiences. According to Esteban-Guitart and Moll (2014: 31), culture displays socio-demographic traits, social institutions, artefacts, agency of people, practices and activities. Culture also involves values and norms that motivate individuals and social groups (Van den Bos et al., 2005; Greenberg, Solomon & Pyszczynski, 1997). The synthesised proposition from these theorists is that before humans engage in actions, they intrapersonally consider the values, principles, or norms of a particular community that frame their behaviour options (Van den Bos et al., 2005: 92). Such introspection occurs in the home, community, and schools.

In addition to the cultural identities students bring with them, first-year science students enter the university as a cultural environment (Bojuwoye, 2002: 277-278). Whether at the level of the institution or the discipline, first-year students are required to adopt or, at the very least, demonstrate awareness of the values, principles and norms which motivate the ways through which their senior counterparts engage in argumentation (Välimaa, 1998: 121; Correa, 2011: 670). However, data in South Africa suggest that first-year students are struggling to adapt to the cultures of institutions of higher learning. Annually, South Africa loses roughly 30% of all first-year students; these students either drop out or do not successfully complete their first year of enrolment (Young, 2016: 15-16). While culture is not the only learning impediment to first-year student success, its powers (Archer, 1995: 145) and activities may constrain student development. Academic literacy practices (Lea & Street, 1998: 368) and argumentation (Polo, Lund, Plantin, & Niccolai, 2016) are cultural tools for conveying knowledge – sometimes in emotional ways. As such and within the framework of secondary discourses (Gee, 2012), students

must master conventions to succeed in higher education. Processes of mastering such conventions, which constitute critical literacy (Vasquez, Janks & Comber, 2019), are essential for interactions between scholars in advancing knowledge. In a sociocultural linguistic framework (Gee, 2012), academic literacy conventions are construable as one set of cultural practices which disciplinary members apply to demonstrate their mastery of linguistic and argumentative practices in their communities (see Section 2.4.5).

Methodologically, accessing students' pre-university experiences enables researchers to gain insights into their previous employment of discourses, roles, or identities. In the southern African context, Bangeni & Kapp's (2005; 2009; 2011; 2017) analyses highlight how intersections of students' cultural identities and literacy practices that are required to argue occur at deep levels of being. In their interactions with twenty social science students, Kapp and Bangeni (2011) reveal that the participants of their analysis did not stop using pre-university linguistic resources as they interacted with course content. However, as they progress through their degrees, social science students' must navigate shifts between their primary Discourses and secondary discourses that they must master at university. Kapp and Bangeni (2011: 205) claim that their data "show that […] changes in students' language and literacy attitudes and practices […] were intricately related to social roles and boundaries". Kapp and Bangeni's (2011) study is significant to the current analysis in that it is also concerned with students' longitudinal development while employing academic literacy practices. What distinguishes the current analysis is its focus on natural science students over one academic year.

Sapir (1949: 32) states that "language is a guide to social reality [which] conditions all our thinking about social problems and processes". He continues to assert that "the 'real world' is to a large extent unconsciously built up on the language habits of the group" (Sapir, 1949: 32). This study highlights natural science students' language and language use experiences by accessing their social realities while they are developing dialectical, rhetorical, and written argumentation.

2.6.2 Epistemology and cultural identities

Epistemology is a philosophical branch concerned with ways of knowing. According to Su and Bellman (2018), epistemological approaches encapsulate the beliefs and theories that individuals come to hold about knowledge and knowing. When theoretically conjoined, epistemologies are construable as emerging from primary and secondary discourses (Gee, 2012). The philosophy of epistemology has implications for research and development in the fields of academic literacy and argumentation in South Africa's context. This is because students bring to the university a wide array of cultural identities and persuasions (see Section 2.5.3). Due to the emergence of first-year students from diverse cultural and socio-political domains, there is bound to be epistemic

incongruence between some of their primary discourses and those discursive and epistemic traditions which are active in the academy. To be specific, what the researcher is asserting here is that students' pre-university epistemic experiences, like their primary discourses, may not mirror the epistemic and discursive practices which are mandatory in the university. The philosophy of epistemology aids in conceptualising academic literacy practices and argumentation as epistemic phenomena in universities that are embedded in culture and identities (Lea & Street, 1998; Gee, 2012) but do not necessarily incorporate and apply these in ways that reflect students' pre-university epistemic experiences.

It is vital to recognise that in the same ways that students possess multiple identities and discourses, they employ multiple epistemologies or ways of knowing in their attempts to make sense of the world. This concern is acute in South Africa, where scholars such as Angu (2018) and Kumalo (2018) highlight the need to de-marginalise students' epistemic identities in the curriculum and through learning experiences. When first-year science students, such as the students enrolled for the extended degree programme who participated in this study, enter institutions of higher learning, they are exposed to a multitude of new epistemologies. These epistemologies, often affiliated to fields of study, operate at the level of the institution, department and among agents; this includes academics and scholars (Ellery, 2017: 923). A positive understanding of these epistemic modes is also demonstrated by applying discourses, academic literacies and argumentation. The current study aims to unearth epistemic strategies which students use for argumentation.

2.7 Conceptualising argumentation

For the purposes of this study, argumentation is conceptualised as constituting a critical convention, resource or academic literacy practice that is essential for academic success. In Walton's (2000) view, argumentation is an ancient tool that was and still is applied to construct knowledge. In contemporary times, Cope, Kalantzis, Abd-El-Khalick and Bagley (2013) theoretically link critical academic literacy practices that are employed in scientific writing and, in turn, argumentation. These practices include, but are not restricted to, introducing claims and counterclaims to the reader, using language to navigate written arguments, and concluding these arguments persuasively (Cope, Kalantzis, Abd-El-Khalick & Bagley, 2013). The function of constructing knowledge and arguments through the medium of multiple academic literacy modes repeatedly emerges in students' narratives and this study's findings. Van Eemeren et al. (1996: 5) define argumentation as follows:

> [It is] is a verbal and social activity of reason aimed at increasing (or decreasing) the acceptability of a controversial standpoint for a listener or reader, by putting forward a constellation of propositions intended to justify (or refute) the standpoint before a 'rational judge'.

Argumentative processes, which scholars apply to generate, contest, and compare empirical claims, are communicated through discursive practices that involve intersubjectivity (Schwarz & Glassner, 2007: 450). Intersubjectivity occurs when two or more scholars define the parameters of an argument and incorporate their agency or the agency of others into their attempts at sustaining claims (Flowerdew & Wang, 2015: 82). An example of an inter-agential interaction is when intersubjectivity is activated between interlocutors. When scholars argue, their cultural identities and agency (see Section 2.4) influence the nature of the argument. In contemporary South Africa, students' positionality is central in contestations around curriculum design. The recent #FeesMustFall and #RhodesMustFall protests suggest that many South African university students experience cultural abjection. There are claims that the dialectical, rhetorical and written traditions they bring to the academy are not valued and made invisible (Kumalo, 2018). First-year science students cannot avoid engaging in inter-agential interactions and arguments; argumentation is ubiquitous in the extended degree (ED) programme. When students participate in group tasks, reference expert ideas, and draw on the agency of their teachers in attempting to argue in an acceptable manner, they participate in interlocutory relationships. The intersection of students' voices and the data they warrant in their written arguments constitutes an intersubjective process (Schwarz & Glassner, 2007). As a researcher attempts to convey their ideas, their own subjectivity is interwoven with the subjectivities and empirical data previously generated by their peers, colleagues and senior members of their disciplines.

2.7.1 Objectivity and subjectivity in argumentation

The principles of objectivity and subjectivity are pertinent to the analysis of argumentation practices in the tertiary sphere. While objective analysis (Davis & Bellocchi, 2018: 1420), which is associated with the nature of science and scientific enquiry paradigms, is characterisable as a decentralisation of the self by observational methods, subjective approaches recognise the activity of human agency, culture and worldviews in scientific scholarship (Klempe, 2012: 373-374). Applying principles of objectivity and subjectivity is not an uncomplicated task for first-year students. Undoubtedly, writing in the secondary school domain requires using multiple genres, including those necessary for "interpersonal communication skills" where the self is active (Weideman, Du Plessis & Steyn, 2017: 4). However, writing and arguing in higher education spaces, especially in the sciences, is often characterised by the requirements of objectivity. This transition in genre and rhetorical mode has proven problematic for some students (Zhu, 2001).

Undeniably, philosophical traditions from 18th century Europe permeate in contemporary scientific disciplines where the notion of objective observation is prevalent and appears to dominate subjectivity (Klempe, 2012: 375). This permeance has ramifications for the performance of first-year students who, as novice practitioners of academic literacies, may not have been exposed to conventions of objectivity that are required in some disciplinary modules. Therefore, this study aims to unearth how students' subjectivities are interwoven with their attempts to navigate argumentation in an academic programme that values objective analysis and argumentation.

Argumentation, whether intended for resolving differences in outlook or for contestation and the generation of knowledge, requires claims, a process of warranting, and data (Gleason, 1999) to advance the stance of an interlocutor (Osbourne et al., 2004: 1; Toulmin, 2003: 53, 89). While the application of these argumentative elements is common in the research practices of senior academics, to *some* first-year students, they constitute new, and at times, conflicting, ways of communicating when compared with literacy practices in their families, schools and communities. To clarify, students from homes where expert Discourses are active are more prepared for argumentation practices in universities than those who may not have had such exposure. However, due to the interplay of social structures, culture and agency in realist theory, students from homes with less exposure to expert Discourses can access them through alternative resources. Sampson and Clark (2008) assert that "students need to learn how the scientific community uses arguments in order to construct knowledge and [which] criteria […] counts as a good argument". Here, the role of argumentation in generating knowledge in the scientific community is affirmed. Swoyer (1999: 72) constructs argumentation as "a goal directed social practice embedded in different types of dialogues". The reference to sociality and dialogues is relevant to this study's theorisation of argumentation as a cultural and people-originated competency that first-year extended degree students must master through the use of language.

2.7.2 Branches of argumentation

Argumentation is comprised of numerous branches. While diverse in the ways that they manifest and are applied in the linguistic domain, they are theoretically underpinned by common principles. These principles draw from disciplines as diverse as philosophical logic, linguistics, communicative studies, discourse analysis, dialect and rhetoric (Van Eemeren, 2017). The current study positions argumentation within the discipline of sociocultural linguistics (Section 2.4.5) and the field of academic literacy (Section 2.4.3). Reflecting the view that argumentation practices equally influence the evolution of argumentative analyses, Van Eemeren (2017: 323) states that they "have always been the starting-point as well as the end point of our theorising". In his concept of argumentation, Van Eemeren (2017: 326) also advocates "critical discussion" as

an analytical model for argumentation discourse. Part of this proposition stems from the accepted premise that argumentation differs from quarrels or debates, which are often subjectively charged and emotional. While not denying subjectivity, criticality involves close reading of texts and responding to them in ways that demonstrate an awareness of a *community*'s epistemic traditions (Pachecho, 2018). Academic literacy modes constitute the tools that scholars apply to evidence awareness of disciplinary principles associated with their communities of practice. Participants in a scholarly argument are also expected to demonstrate objectivity (Section 2.6.1) towards data analysis in a rational manner (Besnard & Hunter, 2008). A critical distinction between scholarly argumentation and a non-scholarly quarrel or debate, which is influenced by the principle of objectivity, is that while the first aims for resolution, the second does not always do so (Van Eemeren, 2017; Van Eemeren et al., 1996).

2.7.3 Toulmin's model of argumentation

Stephen Toulmin's (2003) model of argumentation is one of the most recognised in contemporary studies of the field. Undoubtedly, his seminal text, *The Uses of Argument* (Toulmin, 2003), continues to serve as a theoretical foundation for how current branches of argumentation are debated and continue to evolve. Toulmin's (2003: vii) personal philosophy draws on the theoretical traditions of Aristotle, Plato and Descartes. Toulmin (2003: 2) expresses his appreciation of Aristotle's thought as follows: "For [Aristotle,] questions about 'apodeixis' […] were questions about the proving, making good or justification—in an everyday sense—of claims and conclusions of a kind that anyone might have occasion to make".

Apodicticity is a conceptual component of Aristotelian logic conception. It refers to propositions that may undoubtedly be proven as true. In contrast, assertory propositions, also known as syllogisms, are those propositions which do not rely on or assert surety (Read, 2017). In Husserl's phenomenological paradigm (1970: 165), Apodicticity refers to self-evident propositions. Deriving from these principles, Toulmin's (2003) model of argumentation aims to articulate a conception of scientific and scholarly arguments as lucidly articulated and warranted with data. Key conceptual components that make up Toulmin's (2003: 89, 95) model of argumentation include warrants, counterarguments, grounds, claims and conclusions. These concepts are illustrated in the following figure.

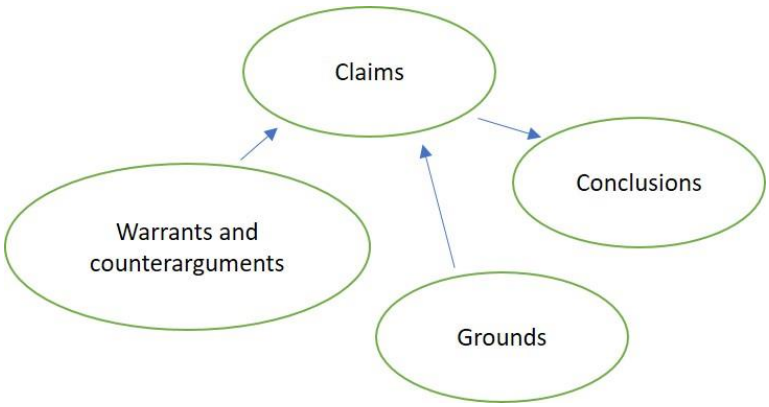

Figure 2.7: Model of argumentation (adapted from Toulmin, 2003).

Toulmin (2003: 90) reasons that, because all assertions and claims may be challenged, it is necessary to appeal to facts as their foundations. The process by which facts and data are applied is called a warrant (Toulmin, 2003: 95). In sustaining a claim, scholars are not restricted to using facts in their warranting. Instead, they may also draw on rules, principles and other inferential techniques which aid in the sustenance of a claim (Toulmin, 2003: 91). It is necessary to distinguish between facts and warrants in a Toulmin cycle. In Toulmin's argumentative cycle, facts are applied explicitly in an argument, while warrants operate implicitly (Toulmin, 2003). He applies the metaphors of evidence in court and the application of legal principles as examples of how data and warrants operate in scholarly arguments. In Toulmin's (2003: 7) perspective, "logic is concerned with the soundness of the claims we make—with the solidity of the grounds we produce to support them [and] the firmness of the backing we provide for them". Toulmin employs a legal analogy to clarify his construal of sound logic. For a legal practitioner to prove her case, she must persuasively warrant legal principles and evidence in ways that advance her stance in court. Likewise, scholars and first-year natural science students need to apply such logic when juxtaposing theories, concepts and empirical data in dialectical, rhetorical and written argumentation. The significance of Toulmin's model of argumentation to the context of the current study is that first-year students are also expected to apply data (facts) and warrants in varying configurations in their disciplinary modules. Even the extended programme participants of this study were expected to engage in multiple argumentative literacies during the course of the academic year. These argumentative practices evidence a level of depth and criticality, which is more intense than most pre-tertiary modes of arguing. Therefore, it is necessary to develop new understandings of students' discursive capabilities, within a Toulminian framework, of applying facts, data, and scientific theories in advancing arguments. Doing so introduces them to some of the epistemic discourses regularly employed by more senior scholars to generate knowledge.

2.7.4 Informal logic

The argumentation branch of informal logic is concerned with the norms, standards and criteria of arguments (Blair & Johnson, 2000; Sinnott-Armstrong & Fogelin, 2015). According to the current thesis, informal logic is an indispensable branch of argumentation for all faculties in universities. Informal logic is made up of principles that guide how dialectical, rhetorical and written argumentation emerge. These principles designate acceptable strategies that interlocutors can apply and are negotiated before scholarly arguments ensue. In Blair and Johnson's (2000: 93) outlook, informal logic "designates that branch of logic whose task is to develop non-formal […] criteria [and] procedures for the analysis, interpretation, evaluation, critique and construction of argumentation in everyday discourse". By drawing on Govier's theorisation of informal logic (1992), Blair and Johnson (2000: 94) reason that this branch values those *conventions* that regulate communication modes through which claims are warranted. An informal logic framing of argumentation also values those everyday instantiations of argumentation that are not academic in nature or context. These events can also be critical in focus and evoke higher thinking processes as they require interlocutors to apply background knowledge and understanding in argumentation contexts (Blair & Johnson, 2000: 91).

The relevance of informal logic argumentation to the context of this study relates to the existence of rules and regulations which govern argumentation and academic literacy practices in higher education (Lillis, 2002; Brett, 1991). For example, in dialectical argumentation, scholars normally do not denigrate the character of the theorist whose ideas they are interrogating. However, for students who are accustomed to subjective modes of reasoning where it is acceptable to conflate an interlocutor's character and their line of reasoning in critique, arguing according to informal logic is new. Principles of informal logic that senior scholars apply in argumentation include rational contestation and reasoned deliberation. Awareness of informal logic principles requires an understanding of the differences between scholarly deliberation and non-scholarly disputes. According to Felton, Garcia-Mila and Gilabert (2009), differences in logic behind deliberation and disputes rest in the following characteristics: Disputes are "aimed to defend a viewpoint and undermine alternatives" while critical deliberation requires arriving "at a viewpoint by comparing and evaluating alternatives" (Felton, Garcia-Mila & Gilabert, 2009: 422). Logical principles applied in universities do not always correlate with the epistemic orientations and experiences that students bring to the university as novices. Students need to be trained in incorporating informal logic principles into dialectical, rhetorical and written argumentation. Scholars, including Udefi (2014: 108), concede that students bring to the university particularised epistemic and ontological orientations in Africa and elsewhere in the globe. These modes of arguing and epistemic strategies are embedded in students' primary Discourses (Section 2.5). Quintana and Correnti

(2018: 1133) refer to these methods as everyday argumentation skills. Within an informal logic framework, and as Govier (2013) postulates, everyday argumentative practices which actors employ beyond the university's borders are legitimate argumentation resources with norms and criteria of their own. The challenge for first-year students is drawing on and employing these resources towards conventional argumentation, which is acceptable to assessors and other authorities. The informal logic framework is applicable towards the theorisation of argumentation experiences of the student participants in this study. They, too, must navigate their cultural identities, primary discourses, and the inescapable task of arguing and engaging knowledge in the university.

2.7.5 Logical fallacies

The argumentation branch of logical fallacies is concerned with unacceptable moves or strategies in arguing. Logical fallacies, in this context, do not adhere to negotiated criteria or norms which are pre-established for argumentation events (see Section 2.4.4). Hahn and Oaksford (2007) list arguing from a position of ignorance and circularity as examples of argumentation fallacies. While the first is relatively easy to conceptualise, the second refers to arguments which "assume […] that which [they are] supposed to establish" (Hahn & Oaksford, 2007: 705). First-year students who are unaccustomed to warranting claims and reasoning in the ways that more established scholars advance their arguments may err by advancing argumentative moves that are not acceptable in universities but may be applicable in non-academic contexts. Within a discursive framework, informal logic is necessary to foster effective dialectical, rhetorical, and written argumentation in secondary discourses. The fact remains that some off-campus Discourses permit reasoning that is steered by principles that scholars in higher education may categorise as logical fallacies. Intersections between acceptable logic and the difficulties first-year students encounter while participating in argumentation as newcomers in the university are of concern to the current analysis. Without knowledge of informal logic and fallacies in universities, students' risk of failing increases.

An example of informal logical fallacy within the academic domain, which some first-year students may engage in due to informal logic from their primary discourses, is solely relying on their subjective opinions to warrant claims. For example, in students' written submissions for this study, there were instances of plagiarism and unreferenced claims. Such fallacious moves are generally avoided by senior scholars who share informal logic around citation and referencing conventions when formally drawing on previously published research findings. Unlike senior scholars and researchers familiar with the argumentation logic of their disciplinary fields, first-year students must still learn to apply them effectively. The determination of informal logic (Section 2.6.3) criteria and norms in argumentation events is shaped by the epistemic principles (Hahn & Oakford, 2007:

707) and cultural systems of participants. As such, not all first-year students emerge from social contexts which mirror the argumentation traditions of disciplinary communities in institutions of higher learning.

2.7.6 Rhetorical argumentation

Philosophical rhetoric has implications for the analysis of argumentation theory and how rhetoric is active in universities. Broadly, rhetoric refers to processes of utilising language to persuade a listener or listeners in an argumentative event (Walsh, 2017: 1). In Western philosophy, Aristotle is credited as one of the founding theorists in this art (Jebb & Sandys, 1909). Aristotle's outlook was that rhetoric serves the purpose of discovering available means of persuasion in arguments (Jebb & Sandys, 1909: xxiv). Rhetorical moves, according to Aristotle, are applied by focusing on particular elements of a claim while advancing them from established premises (Newman, 2001: 5). Aristotle's propositions still resonate in argumentation practices in the contemporary age. Scientists of the natural and social sciences continue to apply rhetorical strategies to develop or contest knowledge (Buehl, 2016: 1).

Harris (2002: 164) argues that rhetoric aims to enable communicators to know and develop knowledge. Because scientific experimentation and argumentation are social in nature, rhetorical functions that manifest through the application of academic literacy tools enable the advancement and contestation of knowledge. Scott (1967: 109) also advances the claim that rhetorical moves are epistemic strategies. Epistemology, being the philosophy of knowing, values the various ways by which individuals and communities attempt to know and understand physical and social phenomena (Scott, 1967). In this framework, the very act of applying a rhetorical strategy equates to an epistemic move due to individuals drawing on disciplinary and personal constructs in their advancing of claims. The significance of the interplay between rhetorical practices and students' epistemic orientations within the current study context relates to South Africa's diversity. South Africa is a nation rich in cultural, linguistic, and ethnic diversity. These social variables have produced an endless array of epistemic and rhetorical traditions among our students.

The concept of rhetorical argumentation is vital to this analysis since not all students emerge from sociocultural environments where the same logic governs public modes of arguing as in universities. Structural and cultural variables characterise distinctions between students' pre- and on campus rhetorical experiences (see Chapter 5). For example, in some indigenous African communities, critique of the perspective of an elder in public is viewed as a sign of disrespect. In Africa, elders often fulfil the roles of healers and spiritual leaders. Kariuki (2015: 5) reasons that "due to the respect, fear and reverence that these experts have in society, they play a crucial role in truth-seeking. They also mediate between the living, ancestors and God". It is from such cultural

models where elders continue to facilitate disputes and public deliberations that many first-year natural science students come from. Simultaneously, many South African students emerge from communities where traditional modes of deliberation are replaced by public violence. In the absence of rhetorical argumentation governed by principled logic or the values of elders, many South African youth regularly witness clinics, schools and other institutions being physically destroyed by angry community members. Such violence contrasts with scientific rhetoric, where reasoned deliberation and consideration of alternative views are essential for advancing knowledge. Yet, all first-year science students are expected to master the rhetorical practices of senior scholars in very short periods of time. This is the lived experience of some of the participants in the current study who have had to overcome structural hurdles during their pre-university experiences to reach the University of Pretoria.

2.7.7 Rhetorical argumentation and the sciences

Scientists in the natural, built, and technological spheres apply rhetorical processes in developing new knowledge, contestation thereof, and advancing innovative thinking. Scientific rhetoric also plays a central role in making accessible innovations and concerns within disciplinary communities to the broader public (Druschke & McGreavy, 2016: 46). Since the mid-20th century, theorists have continually expounded on the centrality which rhetorical processes accomplish in the scientific domain (Samuels, 1950). In articulating his value of rhetoric as applied in the natural sciences, Harris (1991: 283) states that most scientific innovations have emerged due to persuasion. As such, scientists must be equipped with those rhetorical skills required to advance their claims. They need to be aware of the principles which govern acceptable ways of arguing and advancing claims in public spaces.

Rhetorical scholarship in the scientific domain persists in the 21st century. The influence of Aristotle's rhetorical paradigm is still applied in praxis through the inquiries of contemporary scientists (Wolfe, 2011). As Wolfe (2011: 194) points out, a key element of Aristotle's argumentative scheme is the concept of "enthymeme". An enthymeme "demonstrates or 'proves' the author's conclusion based on granted or accepted premises" (Wolfe, 2011: 194). Contemporarily, scientists apply enthymemes to ensure that they adequately warrant the claims they advance with data. The enthymematic process is illustrated below.

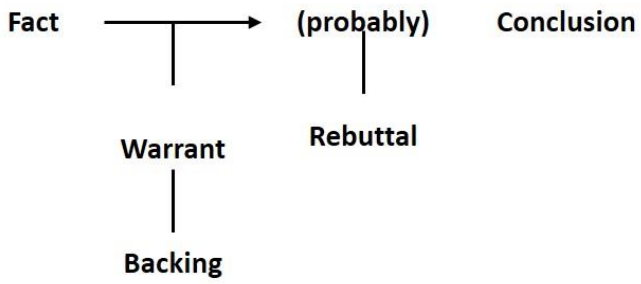

Figure 2.8: An enthymematic argument (Toulmin, 2003).

Enthymematic arguments are regularly applied in the natural sciences. As asserted in Section 2.6.3, dialectical and rhetorical arguments are governed by informal logic. These are negotiated principles that determine acceptable argumentative moves. To reiterate, logical fallacies are un-negotiated argumentative moves. Informal logic and logical fallacies constitute negotiated argumentation principles in an enthymematic cycle. If interlocutors agree to reason around data that is less than three years old while avoiding data that exceeds this timeframe, they have applied informal logic and fallacy principles in determining negotiated principles. Establishing logical principles while designating fallacies to avoid, as seen in the example mentioned, have ramifications for how data is warranted. Praxis around informal logic, fallacy principles and data presentation constitute the premise domain of an enthymematic cycle.

2.7.8 Dialectical argumentation

Dialectical arguments occur when two opposing viewpoints are engaged in dialogue. Larrain et al. (2014: 1019) assert that a dialectical argument may also arise within a single individual when, discursively, that individual juxtaposes conflicting views and then expresses their stances in a linguistic mode. One of the implications of dialectical argumentation for argumentative practices is that it highlights the value and need to incorporate opposing views. Drawing on Leitao's model of an argument (2000), Larrain et al. (2014: 1019) state that for a dialectical process to be complete, it must contain an original claim, counterargument(s) and response(s). Larrain's concept of dialectical argumentation (2014) draws on principles from Toulmin's (2003) model and the enthymematic cycle (see Figure 7). This differs from a quarrel or emotional conflict in which advancing only one side of an argument is considered an acceptable move. A dialectical argument requires that discursive actors critically consider each other's claims, even if they are in opposition.

Pera's (1994) three-person dialogue model of argumentation also values claims, counterarguments, and rebuttals. In this model, the three participants are the "scientific investigator, nature and a sceptical scientific community" (Hitchcock et al., 2001: 128). The consequence of this dialectical scheme for universities is that, in processes of scientific argumentation, scholars always advance their stances by engaging in dialogue with their disciplinary communities. McBurney and Parsons (2000: 371) qualify this dialectical process by underpinning it with the following principles: "Every theoretical explanation proposed by a scientific investigator is contestable by anyone [and] every theoretical explanation adopted by a scientific community is defeasible". The significance of this concept to the attempts of first-year students in mastering argumentation is that, before entering the university, not all students experienced dialectic argumentation, whether in their homes, schools and communities, by applying the same literacy practices and logical principles that are necessary for an academic critique of argumentation stances. For example, in most African societies, song, dance and prose are employed in advancing epistemic principles through dialect. Traditional African communities are structured according to age grades. Interlocutors are endowed with powers specific to their rank in the community. While the application of informal logic and fallacy principles in African communities' dialogic traditions is the same as those embedded in scientific fields, the rituals and modes of expression between the two domains diverge. Seroto (2011: 77) describes how during Africa's pre-colonial era, "the curriculum of indigenous education […] consisted of traditions, legends and tales and the procedures and knowledge associated with rituals which were handed down orally from generation to generation". It is from such cultural contexts that many first-year natural science students emerge. In addition to being introduced to the rigour of university-level study, the challenge some of them face is applying informal logic and fallacy principles through new dialectical practices that are common practice to powerful agents in academic departments.

2.8 Previous studies on teaching argumentation

2.8.1 Rhetorical argumentation

Rhetorical argumentation, as conceptualised in Section 2.6.5, emphasises public declarations. This practice is common to senior scientists but, as applied in universities, is new to some university students. By virtue of having mastered secondary disciplinary discourses (see Section 2.5.1), senior scientists have had more experience in publicly sharing or contesting knowledge than first-year students, such as the participants in this study. Aristotle expressed the function of scientific rhetoric when he stated that data accessed from experiments are often shared with the public through appeals to logic and emotion (Ryan, 1992: 291). However, as in Aristotle's era, scientific and rhetorical practices remain predominantly the domain of experts. As secondary discourses employed in scientific domains, rhetorical arguments constitute practices that

scientists predominantly utilise to persuade and convince each other of their stances in debates that are contemporary to their fields of study. Most novice scientists, including contemporary first-year students in universities, have not fully developed their authorial voices (Olivier & Carstens, 2018) or sufficient mastery of disciplinary knowledge to engage in rhetorical argumentation at the level of established researchers. This is the aspect of rhetorical argumentation that is of interest to the current study.

In his analysis of the difficulties that students encounter while engaging in written rhetorical argumentation, Peloghitis (2017) lists organisational, cultural and strategic features that they must surmount to advance their claims. Organisationally, argumentative texts are structured in designated ways, usually determined by academic departments, to advance claims (Peloghitis, 2017). Not all first-year students are accustomed to the structures of argumentative writing as practised in universities and their new academic departments. In addition, written argumentative practices are shaped by expert cultural environments (Peloghitis, 2017). Students' instructors are often, but not always, qualified experts experienced in the rhetorical and argumentative conventions of their disciplines. These argumentative practices do not always mirror argumentative modes, which students employed during their pre-university learning *and* cultural experiences and are often new to them. Lastly, Peloghitis (2017: 402) identifies rhetorical strategies, including the warranting and juxtaposing of personal claims with findings of previous expert studies, as a challenge for novice scholars. This study investigates how students navigate these academic requirements while simultaneously being influenced by agency, culture and social structures.

2.8.1.1 Dialectical argumentation

In the learning domain, dialectical argumentation fulfils a similar role as that of rhetorical modes of arguing; it is intended to advance knowledge. However, where rhetorical argumentation (see Section 2.6.7) principles emphasise arguing in the public domain, dialectical argumentation is concerned with the roles of dialogue in knowledge generation. Scientists and senior scholars in institutions of higher learning employ complex dialectical strategies (McBurney & Parsons, 2000) in their generation and contestation of knowledge. McBurney and Parsons's (2000: 371) model of dialectical argumentation involves a triangular relation between nature and the objects of science, data and scientists' dialectical and analytical interpretations. In this model, dialogue and written communication are central for communicating arguments. Not all first-year students are accustomed to applying written academic literacy conventions that rely on dialectical principles, as theorised by McBurney and Parsons (2000). Reinforcing this claim in the South African context, Van As, Fouché and Immelmann (2016: 12) observe that, in terms of students' preparedness, there is an "ever-increasing gap between secondary and higher education". In a South African

analysis by Lubben, Sadeck, Scholtz, and Braund (2010), it was found that identifying claims, counterarguments, and the dialogic construction of meaning between teachers and among peers in arguing is pedagogically challenging. Lubben et al. (2010) attribute these challenges to an existing gap in making explicit to students the interplay between scientific and ethical considerations in processes of warranting claims. Due to the social character of dialectical argumentation and expert discourses, on the one hand, and students' cultural, religious, and ethnic diversity on the other, it is unsurprising that novice scholars struggle to apply this mode of arguing.

2.8.2 Navigating the principles of informal logic and logical fallacies

In the same manner that some novice students struggle to apply principles affiliated with the rhetorical and dialectical argumentation branches, many find it challenging to apply principles of informal logic and logical fallacies (see Section 2.6.3). There is a strong correlation between the principles associated with these argumentation branches and learning challenges, which students encounter in the application of academic literacy practices. This correlation is evident in that informal logic, and logical fallacy principles govern acceptable and unacceptable argumentative moves. Likewise, the application of academic literacy conventions, which also constitute a secondary discourse (see Section 2.5.1), is governed by conventions, rules, and academic epistemic modes. Due to this interrelationship between informal logic and logical fallacies with academic literacy principles, Northedge (2003) argues that students need to be taught and empowered to participate in academic discourses. Practical academic literacy examples of applying principles associated with informal logic and logical fallacies include effective structuring of arguments, interweaving personal and expert voices in warranting, and demonstrating an awareness of referencing conventions. In his investigation of Grade 12 South African learners' experiences of applying language for learning, Oyoo (2017) identifies their struggle to interpret and apply scientific concepts in writing as a learning hurdle that constrains effective argumentation. Developing students' capacities to apply scientific concepts in written or oral argumentation is the domain of academic literacy and language practitioners.

2.8.3 Sociocultural factors and students' argumentation in South Africa

This study's South African context warrants concentration on its local sociocultural characteristics. Communicative argumentation is also a sociocultural practice and Discourse (Gee, 2012). Students' and academic traditions of argumentation are shaped by the social contexts in which they emerge and are practised. Academic literacy and sociocultural theories hold that it is objectionable to divorce epistemologies embedded in students' home languages from analysis of on-campus discursive practices. Languages are rich repositories of epistemic systems. Most

South African students speak more than one language at home and in their home communities. Therefore, they represent epistemically diverse epistemologies upon arriving at universities. In the Van As, Fouché and Immelmann (2016) investigation, critical academic literacy "abilities" were identified that are essential for communicating and learning in the university. However, these scholars do not isolate academic literacy abilities, which include paraphrasing, employing subject-specific terminology and conventions from their broader concerns and recommendation; these include a pedagogy that enables students' acquisition of academic literacy abilities in an integrated plan where extended degrees fulfil the role of inducting first-years into academic literacy abilities and, in turn, academic argumentation which relies on these abilities (Van As et al., 2016: 19-20, 28). Reasoning from South Africa, Khumalo and Maphalala (2018) suggest that without the ability to effectively apply academic writing conventions, including the competencies listed by van As et al. (2016), students cannot participate in the social construction of knowledge. When academic literacy "abilities" (van As et al., 2016) are framed in a sociocultural framework, it is essential to recognise that the development of understanding of students' attempts to participate in university argumentation requires consideration of those human and social factors that shaped their language experiences before and during their first year of enrolment.

2.8.4 Argumentation in the Curriculum and Assessment Policy Statement (CAPS) domain

It is necessary to note the embedding of argumentation in South Africa's secondary schooling system. The system is governed by a policy and set of statements named CAPS. This stands for Curriculum and Assessment Policy Statement (Department of Basic Education, 2011). The immediate pre-university domains are known as the Senior Phase, which constitutes Grades 7-9, and the Further Education and Training Phase, which caters to Grades 10-12 (Department of Basic Education, 2011). Guidelines for home language English instruction, argumentation principles and practices are mentioned in both phases of the policy. In the Senior Phase's (Department of Basic Education 2011: 35) categorisation of competencies, "writing and presentation" is designated. Among competencies that the Department of Basic Education (2011: 40) affiliates with "writing and presentation" is the argumentative essay genre. Critical argumentative competencies that the Department of Education (2011: 40) also lists are students' ability to "show a specific opinion or viewpoint and argue to defend or motivate a position". However, as the results of this study reveal, formal assessment in argumentative writing, while considered a critical learning outcome, was optional in the students' pre-university curriculum and examinations. The majority of the participants in this study expressed an aversion to argumentative writing and preferred expository and discursive genres. The fact that not all participants were required to write an argumentative essay highlights how universities and

secondary schools operate as differentiated systems. While such differentiation is not necessarily problematic, all first-year students continue to face challenges in attempts to embody Discourses of knowledge production upon arrival at the university.

2.9 Conclusion

The purpose of Chapter 2 was to provide an overview of key concepts that inform this study's theoretical framework. These concepts are stratified into three categories. The first category relates to realist ontology with emphasis on Archer's (1995) morphogenic cycle. The second theoretical category focuses on academic literacy, primary and secondary discourses. The third category details argumentation concepts as applied in the institutions of higher learning. These theoretical categories and their related concepts are central to understanding the problem that this study addresses: Why are students struggling to adjust to the University of Pretoria as a sociocultural environment that advances knowledge through argumentative practices? The three theoretical categories equally shape how empirical data from students' interviews are presented and interpreted within a qualitative approach. This process is illustrated in Figure 8. Students' interviews are presented according to the realist morphogenic cycle. To clarify, students' experiences are presented across three phases: The pre-university phase (T1), Semester 1 (T2) and Semester 2 (T3). These chronological phases are deliberately correlated with Archer's (1995) end-of-tier concepts, namely, social conditioning, interaction, and elaboration.

After presenting the data in the three morphogenic tiers, the study progresses to interpret and discuss its finding via deductive and inductive methods. Archer's (1995) concepts of morphogenesis (enhancement) and morphostasis (constraints) are central in analysing students' experiences. It is necessary to reiterate that Archer's (1995) key concepts of social structures, culture and agency is equally central to the presentation and critical discussion of the data. It is these three conceptual domains that distinguish the current study from previous, similar analyses.

Structurally, the University of Pretoria does not evidence scholarship that explicitly employs a realist ontology and Archer's (1995) morphogenic cycle to analyse academic literacy development in the Faculty of Natural and Agricultural Sciences[2]. While the Unit for Academic Literacy and academic literacy facilitators have conducted analyses around intersections between modes of communication and students' identities, they did not employ Archer's realist theory and morphogenic cycle. In this regard, the current study aims to contribute to the University of Pretoria's repository of knowledge. Neither are there previous *realist* orientated analyses

[2] This is the first morphogenic analysis in the Unit for Academic Literacy towards academic literacy practices.

emerging from UP that explore first-year science students' approaches towards argumentative interactions that involve academic literacy practices. Ellery's (2016) analysis, situated at Rhodes University, employed realist theory to probe first-year science students' experiences of attempting to gain epistemological access into the science faculty. While Ellery's (2016) study provides an overview of epistemic challenges students navigated to succeed academically, the current analysis differentiates in focus in that it aims to highlight the ways that students' pre-university, first, and second-semester structural interactions shape their argumentation strategies through academic literacy practices. An additional distinguishing factor between the current analysis and Ellery's (2016) investigation is this study's valuing of students' attempts to demonstrate mastery of argumentative writing. Methotodologically, the Ellery study (2016) and the current analysis approach the social structure, time in divergent ways. Ellery's Rhodes University analysis extended across the first and second years of students' enrolment in a two-year extended programme. The current analysis divides students' experiences across three chronological phases in a one-year foundation programme.

South Africa possesses rich scholarship that investigated intersections between students' cultural identities and origins. In Case's (2015) realist analysis that was conducted among chemical engineering students, it was found that some students experience difficulties in achieving a sense of corporate agency or social identity (Archer 2000). Case (2015 13) reasons that: "Students exercise *corporate agency* through their engagement with peers […] to facilitate their achievement of academic success [but that] these interactions [are] also constrained […] by the demographic markers into which students were born". Archer (2000) labels students' demographic origins as features of their primary agency. Archer's concept of primary agency mirrors Gee's (2015) concept, primary Discourse, which constitutes early-life intersections between language and identity. While Case's (2015) analysis shares concerns with the current analysis around students' methods of drawing on agential and structural -resources to advance their learning, unlike this investigation, it does not emphasise either academic argumentation or literacy practices. Like the Ellery (2016) investigation, Case's probe into agency provides an overview of epistemic challenges that a significant proportion of first-year South African students encounter in universities. On the other hand, this study specifically employs realist theory to analyse first-year students' agentic approaches to argumentation and argumentative writing in universities as cultural practices (see Section 2.4.5). What is meant here is that this study is interested in determining how structures, culture and agency induce either morphogenesis or morphostasis in the emergence of students' identities as novice arguers.

With a central interest in argumentative writing, this study is concerned with how the participants attempt to demonstrate their mastery of argumentation in the higher education sphere. While the analysis solely concentrated on a cohort of first-year students, all tertiary students are expected to demonstrate multiple argumentation strategies for academic success (Braund et al., 2013). Each of these strategies may be theoretically aligned to one or more schools of argumentation (see Section 2.6). Some of these strategies include incorporating and applying facts and warrants as required in Toulmin's (2003) framework. From within the framework of informal logic (see Section 2.6.3), first-year students must be aware of and navigate those norms and criteria which senior members of their discourse communities have negotiated as being acceptable argumentative moves (Blair & Johnson, 2000).

As with the theory of informal logic, the logical fallacies paradigm requires interlocutors to employ strategies negotiated by the participants in an argument (Hahn and Oaksford, 2007). Such moves are determined within discourse communities, including in academic departments. As a discursive practice, rhetorical argumentation (see Section 2.6.5) draws attention to the need for students to demonstrate argumentative competency by employing persuasive moves (Van Eemeren, 2018) in public spaces. In the context of first-year science students, argumentative rhetorical practices are unavoidable during in-class interactions, peer group discussions, and online interactional domains.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The main purpose of this chapter is to describe the methodology underpinning this study. It aims to clarify to the reader what the broader research paradigm is that acts as a meta-theory for discussing the way that data is selected, accessed, and interpreted. According to Creswell and Poth (2017: 17, 19), a study's methodology is a plan of action and procedures geared towards attaining its outcomes. Outcomes, in this case, are identical to the objectives of a study (see Section 1.7). An effective methodological strategy requires integration between its theoretical framework, its data accessing instruments and its interpretive tools (Creswell & Poth, 2017: 15, 147). This section will provide an overview of qualitative research and the theoretical underpinnings of the study's data acquisition methods. This chapter will elaborate on principles underscoring qualitative research, the study's interpretivist approach towards data analysis, the study's research instruments and the researcher's experiences of affecting this investigative process.

3.2 Qualitative research

The nature and concerns of this study require that the thoughts and experiences of first-year students are accessed. Methodologically, the study is in the domain of qualitative inquiry (Denzin & Giardina, 2010; Gergen & Gergen, 2000). In Golafshani's (2003) outlook, a qualitative study aims to analyse social phenomena in context-specific settings. Dey (2003) describes qualitative data as focusing on the meaning which subjects ascribe to real phenomena and their experiences thereof. The unearthing of meaning is a critical function of qualitative studies and this meaning is accessed and interpreted by researchers through language (Dey, 2003). The experiences and captured thoughts of research subjects as expressed through language constitute qualitative data. The aim of the qualitative researcher is to bring to the attention of the reading audience an accurate and truthful description of subjects' experiences (Finlay, 2006). The researcher must also be able to coherently illustrate these experiences within the framework of the study's problem identification and objective frameworks (Dey, 2003).

It is critical that the methodological approach of a study is suitable to its aims. In this vein, Flick (2018) highlights the necessity of appropriateness in the selection of methodological data acquisition strategies. Methodological approaches should be relevant to the type of data being sought. Qualitative studies are focused on empirical data, such as narratives which are verbally expressed or written (Creswell & Poth, 2017). As this study aims to access students' narratives,

a qualitative framework and associated data acquisition methods (see Section 3.5.1) are applicable to its research questions and aims.

Student interviews constitute a qualitative research method. Gill, Stewart, Treasure and Chadwick (2008: 291) acknowledge that "there are a variety of methods of data collection in qualitative research, including observations, textual or visual analysis […] and interviews (individual or group)". The interview is viewed as an effective qualitative method because it is capable of directly accessing data from the participants involved. Gill et al. (2008: 292) summarise the purpose of interviews as being towards "explor[ing] the views, experiences, beliefs and/or motivations of individuals on specific matters". It is for these reasons that this study applies interviews towards accessing the learning experiences of the participants involved.

3.3 Research paradigm

The concept of a research paradigm is critical to a study's methodology. Guba and Lincoln (1994: 107) define a paradigm as a systemic framework which defines the researcher's conception of the nature of the world, the place of humans in it and the "range of possible relations to this world and its parts". Conceptions of the nature of the world are ontological considerations (see Section 2.2). Guba and Lincoln (1994) declare that a study's research paradigm should enable the integration of its epistemic and ontological concerns by addressing the following questions:

- Ontologically, what is reality and how may humans come to know and describe their experiences of it?

- What is the nature of the relationship between a knower and what may be known?

Drawing on the paradigmatic and theoretical linkage between ontological and epistemic concerns in a qualitative inquiry, we may conclude that a study's research paradigm determines how data is analysed and interpreted. The research paradigm applied in this study is *interpretivism* (O'Donoghue, 2007). This paradigm was selected due to its compatibility with the study's realist ontology, its epistemic outlook (see Section 2.5.3), and its intended methods for accessing data. A key interpretivist principle is that human beings possess multiple identities which are socially constructed and are constantly changing (Khan, 2014). Khan (2014) reasons that for researchers to identify, understand and incorporate their participants' multiple-identities into their analyses, it is necessary to interactively engage them – preferably through dialogue. For this reason, applying individual interviews as a data acquisition instrument was effective as it enabled dialogue between the researcher and the participants of the project. An interpretivist paradigm requires acknowledgement that individuals will come to know the social and physical worlds in varying ways due to their diverse experiences and social origins (Khan, 2014). This paradigm and theory

are relevant to this study as it strives to understand how a diverse cohort of first-year science students attempt to master written, dialectical and rhetorical argumentation while drawing on their diverse pre- and post-university geographical, educational, and social interactions.

Qualitative methodologies and interpretivist research paradigms require the observation and interpretation of experiences (Ormston, Spencer, Barnard & Snape, 2014). For example, in the context of this study, the researcher interpreted the narratives of students' interviews. Within the qualitative tradition, interpretation of the utterances and observation of the actions of research subjects enable us to further our comprehension of how cultural, historical, psychological and social influences impact students' experiences (Ormston et al., 2014). When data from interpretivist instruments, including the individual interview, are analytically transposed onto a realist ontology in the current study, the researcher is enabled to observe how students draw on social structures, culture and agency in their attempts to develop argumentatively. Whether from their pre-university experiences or from those which emerged from their enrolment in the four-year degree university programme, transposition of data from students' interviews was effective in that the study's ontological framework, research method and the broader qualitative field were able to co-function and sustain each other in the aim of developing new knowledge.

3.3.1 Case study research

This analysis adopted a case study approach. Case studies are methodologies that concentrate on social phenomena in particular contexts. In Yin's (1981) seminal text, a case study is defined as a research strategy that incorporates qualitative and quantitative data. Such data "may come from fieldwork, archival records, verbal reports, observations, or any combination of these" (Yin, 1981: 58). Yin's conceptualisation of case studies speaks towards why the current study adopts this research strategy. The researcher was based in the field. He spent more than three years of fieldwork capturing verbal reports with the participants of the investigation. To only view case studies as a set of research strategies is a restricted conceptualisation. Cresswell (2007: 73) reasons that case studies may be constructed as "what is to be studied" or "a case within a bounded system". Cresswell's (2007) construct of case studies is relevant to the current analysis' methodological approach. Specifically, this study is concerned with the cases of students bounded in the EP and their argumentative development within the broader system of the University of Pretoria's Natural and Agricultural Sciences Faculty. Cresswell (2007: 73) adds that: "Case study research is a qualitative approach [that] explores multiple bounded systems (cases) over time, through detailed, in-depth data collection". This theory is relevant because the current analysis chronologically extends from students' pre-university experiences through their first year of enrolment. In addition, Cresswell's (2007) allusion to multiple bounded systems reflects this

analysis' attempt to highlight the efficacy of multiple social structures in students' learning experiences.

Interviews (see Section 3.5.2) are accepted as effective data acquisition tools for case study research (Hancock & Algozzine, 2006). This is due to the efficacy of individual interviews in enabling researchers to directly access the experiences of participants. The richness and substance of qualitative research rests in the actual (see Figure 1) experiences that emerge in participants' narratives (see Section 3.4.1). Case studies and qualitative research are incomplete without access to the understandings that humans have of experiences that occur in "bounded social contexts" (Cresswell, 2007: 73). Interviews assist social scientists in identifying intersections between participants' epistemic and ontological worlds. In this study's realist framework, interviews further the attainment of the objectives of accentuating the interplay of social structures, culture and agency as manifested in students' attempt to argue through written, dialectical and rhetorical practices. Interviews are analytical mechanisms that allow social inquiries access to Bhaskar's (see Figure 1) empirical domain. Bhaskar (2008: 40) reasons that dialectic is "at the heart of every learning process". Interviews in case studies are facilitated through dialogue; dialogue being application of language that involves questioning, speaking and listening, to communicate. In a critical realist ontology, as Bhaskar (2008) suggests, dialogue that is required in interviews permits researchers glimpses of the actual events and empirical experiences of their participants. Further, dialogue provides the researcher with access to the *meanings* that participants of a case attribute to their experiences in bounded social contexts. This analysis applied a case study method to frame the experiences of students who are contextually bounded by the EP.

Qualitative research strategies, including case studies, situate researchers in the field, in the social structures from where the actual experiences of participants emerge and where they exert their agency. In the context of the current study, the field in which the researcher interacted with participants is the EP programme. Researchers must be immersed in the fields of their study to participate in observation. Babbie (2014: 57) states that "field research [is] the direct observation of events in progress". Case studies that involve field research require "going where the action is and […] watching and listening" (Babbie, 2014: 57). To access students' experiences, the investigator in this study visited the Mamelodi campus for a period of three years to interact with the participants. He also had to travel to their residences and meet them in various locations in Pretoria. It is necessary to reiterate that the participants' cases that are highlighted in this study also surface students' pre-university learning and social experiences before the researcher met and interacted them. Mouton (1996: 142) reasons that case studies fulfil "archival or documentary" roles. They aid scholars in preserving stories from real people's experiences that otherwise would

be lost if not recorded. Mouton (1996) claims that qualitative studies enable researchers to affect longitudinal analyses. In longitudinal investigations, reflecting the current case study, changes in participants' attitudes due to cultural, structural and agential shifts are the focus over an extended period. Case studies are therefore appropriate analytical tools for researchers who aim to tap into the rich experiences from participants' past and present experiences.

3.4 Theories for data analysis

This study applied two theoretical approaches and constructs to enhance the interpretation of students' declarations. These are narrative and deductive theories (Earthy & Cronin, 2008; Burnard, Gill, Stewart, Treasure & Chadwick, 2008).

3.4.1 Narrative approach

A narrative approach aids researchers in extracting meaning from the disclosures of a study's participants. Creswell and Poth (2017: 54-55), in reference to Polkinghorne (1995: 54), state that it is necessary to distinguish between "analysis of narratives" and "narrative analysis". The distinction between these modes of interpreting qualitative data is that while the first emphasises application of paradigm thinking in describing emergent themes, the latter is concerned with descriptions of phenomena in a sequential plot line (Creswell & Poth, 2017). This study implemented both modes of applying narrative analysis. It adopted an 'analysis of narratives' approach in its attempt to draw correlations between participants' declarations and a social realist paradigm (see Section 3.4.4) to identify possible evidence of the interplay of social structures, culture and agency. Thus, in the coding of students' narratives, emphasis was placed on those variables associated with social structures, culture, and agency (Archer, 1995). In addition, this study employed 'narrative analysis' in its intentional incorporation of time. What is asserted here is that the study deliberately aimed to elicit students' responses in designated tiers (see Section 2.3) during the academic year to highlight intersections between their pre-university and campus-based experiences.

When researchers access the experiences of a study's participants, they receive data in the form of accounts; the concept of accounts is applied synonymously with narratives or stories (Earthy & Cronin, 2008). The value of these human constructs that emerge in interactions between researchers and a study's participants is that they reveal truths of peoples' lives (Earthy & Cronin, 2008). As a study's participants enable glimpses of their lived experiences through the sharing of their stories, the researcher is tasked with extracting meaning with the support of the study's theoretical and ontological frameworks (see Sections 2.3 and 2.4).

3.4.2 Realism and narrative approach

Studies including the current analysis that employ realist ontologies towards data and narrative analysis also employ the concepts of causality and emergence (Salmon, 1998; Frosini, 2006). Such application occurs when considering the powers that structures, culture and agency possess in generating social events and experiences, as well as in interpretations of how empirical data reflecting such phenomena are accessed. Each concept, causality, and emergence (see Section 2.3.3) is critical for interpreting personal reports surrounding students' experiences of developing in and employing academic literacy practices for the purposes of dialectical argumentation in realist ontologies. In an Aristotelian philosophical paradigm, causality denotes the causes of events, things, properties or systems (Frosini, 2006). Frosini (2006) stresses that in Aristotle's viewpoint, knowledge and understanding of the causes and premises of phenomena is as necessary as understanding the phenomenon itself. Analyses which revolve around the causes and premises of phenomena are concerned with emergence. Social experiences emerge when the powers of real entities, including structures, culture, and agency, are activated. These are approached as active mechanisms (see Section 2.2.3) with powers to cause emergent students' experiences of developing or being constrained in argumentation.

3.4.3 Deductivist and inductivist reasoning

Scholars are often required to declare their line of reasoning when theorising empirical data. Common approaches include deductivist and inductivist analyses in describing social phenomena. Scholars have also debated the merits and demerits, as well as the relations, between the two lines of reasoning (Johnson-Laird, 2010). While it is necessary to note that there are multiple variations of both modes of analysis, a key distinction is that in a deductive approach, researchers aim to juxtapose data and potential conclusions by referring to adopted theories or premises. The current analysis employs a deductive and an inductive approach towards data analysis. In an inductive mode of empirical sense-making, the researcher engages with participants' experiences while simultaneously aiming to build or induce a theory (Crupi, 2015). An inductive approach is often associated with grounded theory. Robrecht (1995: 213) states that in this analytical mode, "a researcher does not have to have a clear idea of what will happen once an issue is being studied, since […] theory is developed as […] data are collected".

Fletcher (2017: 186), in distinguishing between grounded and realist approaches towards data analyses, reasons that while the first is data-driven the latter "uses a […] theory and researcher-driven analytical process". This does not mean that realist analyses do not value data. Rather, a realist approach towards data analysis approaches, interprets, and frames it in a deductivist mode of reasoning. What is asserted here is that as a realist researcher analyses data, they

simultaneously juxtapose and attempt to interpret it with its key theoretical concepts. These concepts include causality, emergence, and analytical dualism (Willmott, 1999), which is the observation of the separate yet intersecting powers of social structures, culture and agency. As Ryan (2018: 4) observes, realist approaches to data analysis involve "find[ing] a theory, mak[ing] predictions based on the theory and [using] observation or experiment to test it". In the current study, the primary meta-theory is realism; the researcher aimed to test the powers and efficacy of social structures, culture and agency as causal entities in students' attempts to master multiple academic literacy practices towards argumentation.

3.4.4 Realist research and emergence

The concept of emergence is critical for understanding narrative analysis in a realist methodology and ontological framework (Pratten, 2013; Elder-Vass, 2007; Le Boutillier, 2013). It is as central to a realist methodological approach as deductivist reasoning principles. Scott (2005) goes as far as to claim that, in realist paradigms, explanations which do not acknowledge emergence are insufficient. His claim is that the task of a realist researcher is to explain how experiences of a study's participants emerge from and may be theoretically reduced to the powers and activities of social structures, culture and agency (Archer, 1995). While the current study is concerned with highlighting the causality and interplay between social structures, cultures, and agency in the ways that shape how students come to experience development in dialectical, rhetorical and written argumentation, the study is equally aimed at highlighting and explaining students' experiences of epistemological emergence (Elder-Vass, 2005); that is, how students come to know how to argue through rhetorical devices in their first year of enrolment.

3.5 Research instruments

3.5.1 Researcher as research instrument

Researchers of social inquiries are their primary data acquisition instrument (Wa-Mbaleka, 2019). Wa-Mbaleka (2019) argues that the data researchers interact with affects their emotions, and this affect shapes how they interpret and present knowledge. Wa-Mbaleka (2019) suggests that due to their vulnerabilities while collecting data, it is impossible to divide the Discourse of social scientists from their methods, methodology and strategies for presenting and interpreting the empirical domain (see Figure 1). Numerous scholars have articulated the role of the researcher as the research instrument. According to Piantanida and Garman (1999: 79), "the researcher is as much a part of the inquiry as the intent of the study and the inquiry process. In fact, the researcher's thinking lies at the heart of the inquiry". This is because a researcher's ontological and epistemological orientations shape their approaches to understanding the problems and data

that emerges from accessing qualitative data (see Section 3.7). According to Meloy (2001), researchers understand by doing. Meloy (2001: 95) reasons that "how an individual finds focus and the focus that an individual finds are directly linked to who the individual is". Meloy's (2001) statement is an ontological affirmation that the Discourses of qualitative researchers, like those of the students who volunteered as participants in the current study, are active mechanisms in the utility of literacy practices for knowledge development. Discourses cannot be separated from the ways that individuals' epistemologies (see Section 2.5.4) intersect with written, dialect and rhetorical argumentation. However, because literacy practices are shaped by powerful individuals, researchers are required to navigate the value systems emphasising their agency, institutional structures, and academic cultures. This navigation, like dialectic argumentation that considers counterarguments, often involves the researcher incorporating expert voices, theories, and ideologies that conflict with his ontological and epistemological Discourse. In this sense, while the researcher remains a research instrument, in a realist ontology, the researcher's agency is only as free (or not) as he can navigate agency, social structures and cultures that constrain and enable his original vision for the generation of his dissertation. In Archer's (2003: 93) realist theory, the process of navigating powerful agency, structures, and cultures while a researcher strives to be a research instrument in their project is known as "the internal conversation". During internal conversations during which the researcher aims to manifest their Discourse through data engagement, they reflexively negotiate "constraints and enablements" emerging from structures, cultures and agents that impact their study (Archer, 2003: 138).

3.5.2 Individual student's interviews

This study is particularly interested in highlighting experiences which may have shaped students' pre-university Discourses (see Section 2.3.1) and orientations towards augmentation before and after they arrived at the university. In Seidman's (2006) view, the true purpose of in-depth interviews is to apply the knowledge that emerges from them to understand the lived experiences of a study's participants. Qualitative researchers may never fully understand the experiences of a study's participants; however, data which emerges from in-depth interviews enable us to recognise the limits of our understanding (Seidman, 2006) while simultaneously allowing us to observe the social journeys of humans.

Individual student interviews were administered to probe students' navigations of structures, culture, and agency according to a set schedule across the span of their first year of enrolment. Students were interviewed three times throughout the academic year (see Section 2.3). Initially, students were interviewed in the beginning and end of the first semester. The final and third round of interviews occurred towards the end of the second semester. The purpose of this time division was to observe the development of students' academic Discourses that incorporate written,

dialectical and rhetorical argumentative practices. The study also aimed to highlight students' own perspectives towards their mastery of the academic literacy practices associated with argumentation. The interview was conducted in such a manner as to correlate with and elicit responses that could be coded according to the study's ontological framework (see Section 2.2). As Gill, Stewart, Treasure and Chadwick (2008) note, an interview should move from general to more specific questions, while the question order should be relative to concepts of importance in the study. Working through this process enabled the researcher of this study to code the utterances of participants according to a social realist theoretical framework.

The researcher asked questions which were specifically related to the categories of structures, culture, and agency. The questions (see Appendix 2) were designed to uncover how the three mechanisms were active in students' learning experiences in unique ways. Some of the questions overlap into multiple domains. This is expected in a realist ontology where the notion of interplay (see Section 2.2.3) between the varying domains is acknowledged.

To enable efficient coding and thematic analysis of students' narratives, Atlas.ti, a qualitative research application, was employed. Rosenfeld, Gatten and Scales (2013: 134) state that "Atlas.ti offers [analyses] that [enable] the researcher to quantify qualitative information through coding, data query […] and networked visuali[s]ation". As a technological platform, Atlas.ti was also adopted due to its capacity to aid researchers in further dissecting narrative themes into smaller units known as codes. Benaquisto (2008: 3) describes the coding process as "steps the researcher takes to identify, arrange, and systematise the ideas, concepts and categories uncovered in the data". To reiterate, codes as mirroring ideas, concepts and categories are extracted from the narratives of a study's participants. Codes constitute the details that emerge from interactions between the researcher and project participants. Because people tell their stories by weaving different plots, people, and themes into them (Bamberg, 2012), Atlas ti aids in the capturing of these details and their inter-relationships. In addition, this analytical tool is applicable to the specific highlighting of codes extracted from within a realist ontological structure, as utilised in this thesis. Rosenfeld, Gatten and Scales (2013) are of the position that Atlas ti assists researchers in identifying patterns and meaningful units derived from participants' declarations. These patterns and units may be embedded in categories, which in the context of this study are social structures, culture, and agency (see Section 2.4). The data of this analysis was co-coded in Atlas ti by the researcher and an external researcher.

It is necessary to elaborate the discussion on the interplay between this study's approach to categories and codes of analysis within a social realist framework. This analysis employed social structures, cultures and agency as its categories of analysis. Data constituted categories, also known as *themes*, are the structures wherein analytical codes were generated. In adopting social

structures, culture and agency as its thematic categories (see Figure 8), the analysis employed the construct of a theme as a domain in which codes emerge repetitively (Vaismoradi, Turunen & Bondas, 2013). In T1 of this study's presentation of its findings, key codes that emerged in students' pre-university Discourses included their homes, family members, local communities, peers, schools, and teachers. In T2, among other codes, repetitive codes around students' Discourses include peers, lecturers, family members, curricula, degrees, and professional goals. Lastly, in T3, repetitive codes that surfaced in students' narratives included, but are not restricted to, exams, career goals, peers, study groups and the structure of time.

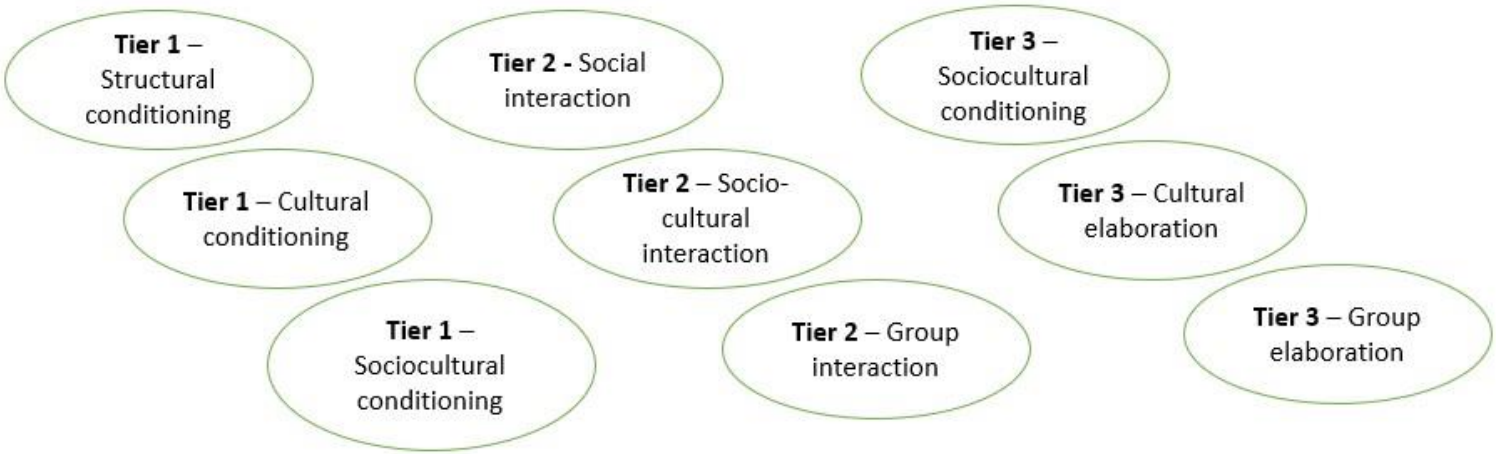

Figure 3.1: Data presentation domains according to Archers' morphogenetic cycle (Eybers, 2021)

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3.5.3 Data analysis process

Table 3.1: Research analysis process based on Braun and Clarke's (2006) research design procedure (Author, 2021).

Phase of analysis	Process	Realist implication of process
Phase 1	Familiarising yourself with your data	Researcher immersed himself in the actual and empirical domains through close reading and co-transcription of students' interviews.
Phase 2	Generating initial codes and search for themes	Open codes were extracted according to social structures, culture, and agency; initial themes were identified.
Phase 3	Refinement of codes	Codes were refined according to the foci of T1 T1 (Discourse conditioning), T2 T2 (Discourse interaction) and T3 T3 (Discourse elaboration).
Phase 4	Reviewing themes.	Themes were reviewed according to the meta-theories of morphogenesis and morphostasis.
Phase 5	Defining and naming themes.	Final report emerged with three themes: Students' primary Discourses unequally prepares them for argumentation in universities. During academic interactions, students' pre-university Discourses undergo morphogenesis or morphostasis as they attempt to master argumentation practices. Students whose pre-university Discourses mirror dominant Discourses in the university are less required to undergo Discourse morphogenesis. Students who emerge from communities with alternative rhetorical and dialectical traditions are more likely to experience Discourse morphostasis.
Phase 6	Producing the report.	Students' experiences from the empirical domain were collated to produce the study's conclusions and recommendations.

3.6 Trustworthiness, reliability and validity

The concepts of trustworthiness, reliability and validity are necessary for assessing the appropriateness of a study's methodology. Their acknowledgement equally drives researchers o adhere to the ethical commitments they make to the participants of their study and the institution in which the analysis is conducted. These concepts trustworthiness, reliability and validity are also affiliated with the capacity of a study's methodology and methods to generate consistent and accurate data which (Anney, 2014). Trustworthiness relates to how researchers incorporate principles of "credibility, dependability, conformability, transferability, and authenticity" (Elo, Kääriäinen, Kanste, Pölkki, Utriainen, & Kyngäs, 2014: 1) into their methods of accessing and presenting the results of their findings. There is a relationship between the concept of methodological trustworthiness and reliability and validity. Noble and Smith (2015) distinguish between these qualitative principles as follows: validity denotes the precision of the results of a study as accurately reflecting the data which was accessed. Reliability refers to the consistency of research methods, specifically as referring to the application of research instruments (Noble & Smith, 2015). Golafshani (2003) suggests that trustworthy and reliable studies enable the replicability and repeatability of a study's methodological strategies by future researchers. Noble and Smith (2015: 2) concur with this viewpoint by stating that the principle of reliability enables "consistency of […] analytical procedures […] that may have influenced the findings". Their claim is that the application of selected data acquisition tools should be consistently applied and should not be diverged from in a qualitative study. In the context of this study, the principle of consistency was applied to timeframes in which students were interviewed and in the wording of interview questions.

Mouton (2002: 156) argues that the principle of reliability in social inquiry assists researchers in avoiding bias and "reactivity" while presenting and interpreting data located in the empirical domain (see Figure 1). A key strategy that social scientists employ to guard against observer bias and over-reactivity to the empirical domain is triangulation (Mouton, 2002: 156). The method of data triangulation is also known as multiple operationism (Mouton, 2002). Data triangulation methods require accessing and analysing data through more than one interpretive device. When scholars utilise multiple theories and models to present, interpret and formulate conclusions via multiple operationism, they guard against data reactivity and bias (Mouton, 2002). Mouton (2002) acknowledges that it is unrealistic to expect scholars to divorce their personal epistemologies and ontologies from data presentation and critical interpretation. Confirming the activities of human subjectivity (see Section 3.7) in social inquiry, Babbie (2014: 163) stresses that there are always "tensions" between principles of reliability and validity and that, ultimately, a trade-off emerges

from their application around the empirical domain which enhances the integrity of an investigation.

3.7 Researcher's subjectivity

It is necessary to note that throughout this project the researcher was employed as a full-time lecturer and coordinator of an academic literacy module[3] at the Hatfield Campus of the University of Pretoria. In addition, he taught Natural Science, Veterinary Nursing Science, and Economic and Management Sciences students throughout this research project. Consciousness of the researcher's structural positioning in an academic literacy unit constantly surrounded his approaches towards the experiences of the participants and the data of this study. Therefore, it was necessary to acknowledge and suppress possible biases towards the academic literacy curriculum applied at the Mamelodi Campus and to humanely submerge pastoral sympathies for the student participants as a researcher and not as their teacher.

This study centred on argumentative writing in its attempts to understand students' broader experiences of dialectical and rhetorical experiences in their first year of enrolment. Again, there are issues relating to subjectivity, curricula, and methodology that arise around this focus. Firstly, the academic literacy curriculum at the Mamelodi Campus where this study is contextualised did not include an argumentative essay as a formal assessment in the curriculum. In addition to group report writing, students' argumentative writing submissions were expository in character as described in their narratives.

3.8 Conclusion

This study is located in the qualitative domain. As such, it employs data acquisition and analysis methods that are conducive to understanding the stories, memories and lived experiences of the student participants. To reiterate, the primary data acquisition methods are the researcher as an instrument and individual student interviews. Further, interpretivism and social realist concepts are triangulated to identify the meaning and symbolism of students' verbal declarations, specifically in the broad analytical categories of agency, culture and structure.

3 This module enrols over 1,400 students annually.

CHAPTER 4: FINDINGS AND DISCUSSION

4.1 Introduction

In this study component, empirical data is shared and analysed according to the study's theoretical framework (see Chapter 2). To reiterate, all names representing students are aliases. The presentation of the data is structured in a social realist ontological framework (see Section 2.3) that constitutes part of this study's analytical categories. Students' experiences are presented with emphasis on the activities of social structures, culture and agency. In this way, the study emphasises how these entities "constitute[s] different levels of stratified social reality, each possess[ing] distinctive emergent properties which are real and causally efficacious" (Archer, 1995: i). The data are also grouped according to the participants' geographical origins. This is to emphasise properties and powers that structures, culture and agency evidence in the Discourses of students' from South African suburbs, urban townships and rural domains.

It is necessary to reiterate the significance of the concepts, morphogenesis and morphostasis, as applied towards the presentation of the data (see Section 2.3.4). When the researcher employs the term 'morphogenic', the aim is to illustrate a configuration of social structures, culture, and agency in students' experiences that enables their development in argumentation practices, including writing. The inverse experience is described as 'morphostatic'. When this study employs the concept, it is meant to describe a configuration of structures, culture and agency that inhibit students' capacities to demonstrate competency in argumentation. It is equally necessary to restate the centrality of Gee's (2012) sociocultural construct of discourses in data presentation. Two of them are primary and secondary discourses. When this study references primary discourses, it is to indicate how students applied *and* incorporated languages into social interactions before arriving at the University of Pretoria. The concept, secondary discourses, in contradistinction, is applied to indicate the usage of expert literacies that students encounter after they arrive in the university environment.

The data is presented according to Archer's (1995) morphogenic sequence. Students' experiences are grouped according to phases that this thesis names the "pre-university Discourse", “Discourse interaction”, and “Discourse elaboration” phases. The purpose of structuring data in the three morphogenic stages is to highlight students’ Discourse characteristics before they arrived at the University of Pretoria (T1 T1). T2 T2 highlights how students’ Discourses weave and *interact* with institutional and off-campus agency, structures and cultures in various learning experiences. Lastly, T3 T3 illustrates how, at the end of the academic

year, students' experiences of Discourse elaboration as novice scientists and arguers were enabled or constrained through navigating structures, culture and agency.

4.2 Tier 1—Pre-university Discourses

In T1, this study aimed to highlight the efficacy of social structures, culture and agency in students' pre-university Discourse conditioning. Conditioning in Archer's (1995: 195) perspective involves "structural and cultural tendencies" that can shape Discourses in diverse social domains. Humans adopt or adapt to the structural and cultural tendencies of the communities in which they operate. The realist construct of structural and cultural elaboration relies on human agency. If people reject structural and cultural tendencies, these tendencies will lose their efficacy since they rely on "their reception and realisation by people" (Archer, 1995: 195). While peoples' agency is necessary to elaborate structural and cultural tendencies, the existence of powerful Discourses and literacy practices in communities cannot be denied. Literacy practices dominant in social contexts are always designated by powerful agents (Street, 2006: 6; Brandt & Clinton, 2002). The significance of dominant literacy practices to this study relates to the ways students navigate powerful Discourses and literacy practices as shaped by their pre-university Discourses.

4.2.1 Homes

The home is *the* primary social structure in which human beings undergo structural, cultural and agential conditioning (Musitu-Ferrer et al., 2019). In this analysis, meso codes that emerged from data interaction in the macro "home" code include the agency of parents, other family members, educational resources (human and non-human), and access to multi-modal literacy practices educational resources. Bangeni and Kapp (2005) argue that the construct of 'home' is a central social structure that shapes peoples' Discourses well into adulthood. Humans regularly refer to experiences involving the home around fears, belonging, learning and rejection (Bangeni & Kapp, 2005). In the data presentation that ensues, students' pre-university Discourses interaction with agency, educational and literacy resources are highlighted.

4.2.2 Agency in the home

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

Parents were the primary agents for children and youth who grew up with them. According to Musitu-Ferrer et al. (2019), "parents exert a strong influence" on their youngsters' epistemic and ontological worldviews. It is parental agency that shapes the primary Discourses of children. Parents and guardians are the original guides in how youth develop epistemic interests. Larry stated: "[M]y dad is a doctor, and he's the only one that works. My mom has an Honours in psychology". Larry's statement revealed that in the structure of his home, he was exposed to

doctors' expert and medical Discourses through the agency of his father. Larry's mother was also exposed to secondary discourses by virtue of her post-graduate degree. Confirming the activity of his father's agency in his personal Discourse, Larry disclosed that he wanted to study "paediatrics or neurology". Larry emphasised his father's agency by asserting:

> I always enjoyed the subject of [science but] I definitely think it is exciting because my dad is a doctor and he obviously knows that subject well. So, he was able to tell me cool things, and I was able to tell him cool things.

Larry revealed how his love for science was stimulated through dialectical argumentation and agential interactions with his father. Not all student participants from the urban-suburban cohort emerged from homes where the parents were active in the physical sciences. On the other hand, Larry was directly exposed to the Discourse of doctors through his father's agency.

Ink's father was the CEO of a jewellery company. While he was not involved in a profession that directly involved practices around the natural sciences, Ink was exposed to expert, secondary discourses through her proximity to him. Ink asserted that her family did not directly influence her motivation to pursue the sciences. She stated: "I think I am probably the first in my family to go to university. I don't know about my very distant family if they've achieved any qualifications, but as far as I know, I am the first in uni". Like Ink, Aldoy did not identify his parents, including his mother, whom he described as a "stay at home Mom", as agentially influencing his decision to pursue studies in science. Rather, he attributed his pursuit of studies in the sciences as a personal challenge to overcoming dyslexia and its effects on how he learned. Aldoy stated:

> My main goal was just to prove to myself that I can do this year quite well. Like, do fine throughout the year and be able to cope with it all because I am kind of unsure what I want to do.

Kim's agential exposure in the home resembled Larry's exposure to and influence by his father's Discourse. This was because Kim also aimed to join an industry in the same fitness field in which both of her parents were entrepreneurs. She described her parents' Discourses as follows:

> My Dad, he's the breadwinner at the moment. He sells gym equipment. My Mom, she's a PA, and she sort of does that, but it's not her fixed-job. She doesn't go in every day… she's more of a stay-at-home Mom.

Kim's mother owned a sportswear shop. This student acknowledged her family's and her own agency in her scientific Discourse as follows: "Since I took Grade 9, I've been interested in physiotherapy. And obviously my dad's in the health and fitness industry". Through her father's

agency, Kim was exposed to the Discourses of health professionals. Like Larry, Kim's agential and structural conditioning in the home stems, in part, from exposure to her parents' expert affiliations. Archer (1995) reasons that when people are exposed to structural and cultural conditioning, they can suspend, modify and redeploy active properties in those domains by exercising their individual agency. Kim's decision to not sell sportswear and equipment like her parents, but to remain in the fitness field, is evidence of how she agentially modified the culture of her home.

Rural cohort (Richard, Katlego, Siyabonga, Shaka and Mary)

Students from this cohort emerged from rural regions in South Africa. All of these participants, except for Richard, came from working or lower-middle-class families. Richard's experiences will be shared first. This is because he shared characteristics with students' Discourses in the urban-suburban cohort (Larry, Ink, Aldoy and Kim). Richard's parents were wealthy farmers. They exported produce internationally and were entrepreneurs in South Africa beyond agriculture. Richard grew up with his parents on a farm that had numerous employees. In his community, he had opportunities to interact with other farmers and agricultural scientists from the University of Pretoria, who influenced his pre-university Discourse. When asked to describe the breadwinners in his home, Richard stated: "Mostly my dad. It was first my mom, and now it's my dad. He's currently a Macadamia [nut] farmer. Mother retired last year". Richard emphasised the agential and cultural influences of his parents as follows:

> Since […] birth, I've been baptised—all the traditional stuff. My parents sought who I should hang out with; who I am today is on the background of what they taught me. Not to party too much; not that I'm planning to. And all that kind of stuff.

Richard's experience reflected strong cultural conditioning. This led to the desire for him to pursue the same career as his father. Richard was designated to take over the farm from his parents.

Katlego also grew up in a rural region, but the emergence of his pre-university Discourse occurred under different socioeconomic conditions when analytically juxtaposed with Richard's. Katlego stated:

> I grew up in a poor family. So, it was very difficult growing up. Ja, everything—we had to figure everything for ourselves. So, we didn't have water. We had to fetch water somewhere which was far from [our] place. On the other side, I was supposed to be study for my matric, so it was difficult.

Unlike Richard's access to his expert agricultural Discourses, Katlego's identity was partially shaped by material and financial struggles that constrained access to expert scientific epistemologies. Katlego revealed:

> Mom was the breadwinner since my dad lost his job while I was in Grade 12. So, my mom was actually the helper. Ja, she is a domestic worker".

Even though Katlego's father was unemployed, his agency influenced his son's decision to study the natural sciences in higher education. Katlego stated:

> In grade 10, when you choose a stream that you do Science, Commerce and History, in the beginning, I chose History because my sister done Science and failed more times. So, I was having that in my here that if I do Science, then I would fail. So, in the first two terms, I was doing a History stream. Then my father came to me that if they are passing, then why not you? It's then I started working hard. My father, trying, by all means, getting me tutors and stuff. That's why I end up reading in University of Pretoria.

To contrast agential Discourses in the home, while Richard was exposed to international farmers and businesspeople, the cultural properties of Katlego's home emerged partially from the agency and Discourses of a domestic worker and unemployed father. Be that as it may, Katlego's father, who was not a scientist, tried his best to direct his son towards the sciences. He motivated and encouraged him to convince his son that he could succeed in this field of study. Significantly, the failure of Katlego's sister in school also prompted his determination to overcome academic hurdles.

Siyabonga came from a working-class home. He was raised by a single mother. He described his pre-university Discourse as including the following agential experiences:

> My father is in Gauteng working in [a] firm. And my mother, she is volunteering in a kindergarten. She doesn't have a complete pay slip. They just thank them at the end of the month. I can say the real breadwinner was my father.

Having grown up separately from his father and under the wings of a mother who was not fully employed, Siyabonga's access to expert scientific agency was constrained. Siyabonga's mother, unlike Aldoy's, could not participate in scientific discourses that were affiliated with her son's scholarly ambitions. Neither was she able to support him with engaging the content of his studies directly. Siyabonga's physical separation from his father further constrained his access to scientific discourses through paternal agency. In Siyabonga's home, there was limited access to scientific agency and cultural properties.

Shaka came from a rural township in South Africa. By engaging Shaka, it was discovered that he lost his father and a stepfather in his short life. Like Siyabonga, Shaka did not have access to paternal agency in the home. When asked to describe his upbringing, Shaka responded as follows: “It was hard because I grew up with a single mother”. He adds, “[S]he is a domestic worker”, indicating his socioeconomic status. Shaka’s mother’s agency was constrained in enabling his participation in scientific discourses. Nevertheless, Shaka praised his mother for raising him, paying his school fees and doing the best to ensure that he had better prospects to succeed in life than she does. He was also motivated to help her escape poverty.

Mary’s case echoed Richard’s agrarian origin. She, too, was raised on her family’s farm. Yet, where international commercial exporters shaped Richard’s pre-university Discourse, Mary was raised by her now-deceased grandfather on a smallholding. She recalled: “My grandfather […] inspired me to do agriculture and also vet—veterinarian”. Mary’s grandfather raised crops and livestock. Unlike Richard’s parents, his produce and most of his cattle were to feed the family. When pressed on what truly motivated her to pursue studies in the natural sciences, Mary re-emphasised her grandfather’s agency in forming her pre-university Discourse as follows. She stated:

> What truly motivated me…Well, I will say my grandfather because he played a big role. He play—yoh, my grandfather, he would just sit there and tell us about all the cows he fed, tell us about all the cows he, you know, he was milking and everything. So, that influenced me to do better, to [try to] have a degree in agriculture and stuff.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

Students in this cohort emerged from South African townships in or around cities. Townships were created to provide the pre-democratic government of South Africa with quick access to cheap labour. Due to their demarcated borders, townships were effective structures that separated African people from cultural communities privileged and empowered by the Apartheid government. Most of the inhabitants of South Africa’s townships were working-class people. However, some entrepreneurial residents accumulated wealth through establishing businesses.

Violet came from an Indian township in the western region of South Africa. She illustrated the efficacy of agency in her pre-university Discourse by discussing her parents and her grandfather. When asked to recount her upbringing, Violet stated: “[M]y dad’s a paramedic. My mom’s a nurse. My dad studied at UKZN, and my mom studied at a university in Cape Town for nurses”. Violet was exposed to the scientifically affiliated Discourses (Gee, 2015) of her parents in the structure of her home. A tragic agentic experience also shaped Violet’s emerging Discourse as a

scientist. Her grandfather committed suicide. This trauma motivated her to pursue studies in chemistry in the hope of treating depression.

Like Violet, Denel grew up with both parents. Her mother and father studied science. Their agential influences contributed to Denel's budding identity and Discourse as a scholar. Even though Denel's parents studied science, their agency was described as constraining in the following declaration. She stated:

> I grew up in a very protective home. Yea, because my parents really just like sheltered me from the outside world. They never really wanted me to do a lot of things, so I was always like home and stuff. So, I'd really say that I was always home, and I never did much…so protective home, yea.

In Denel's description of her relationship with her parents, there were observable enabling and constraining effects on her pre-university scientific Discourse. On the one hand, she had access to their experiences of studying and working with secondary discourses around science. On the other hand, her parents' overprotection constrained her curiosity about the social and natural worlds. Curiosity is an essential principle for scientific inquiry.

Nemo did not attribute any significant agential and cultural influences to his parents. Nemo emphasised his personal agency as the primary force in his passion for studying science. Chabi, like other participants, did not live with either of her parents. She was raised by her grandmother. Chabi's mother was a domestic worker. In reflection, Chabi observed: "My grandmother raised me, and my mom was staying in Johannesburg, Alexandra, and she was a domestic…she was a domestic worker. And my granny wasn't working". Chabi's pre-university Discourse, as shaped in the home, constrained exposure to expert secondary scientific discourses.

Faith's pre-university Discourse mirrored that of Chabi. She shared the following insight:

> Well, first of all, I was raised by a single mom. I lost my father at the age of seven. So, my mother had to raise six kids, including me. So, it was hard for her to do everything on her own. That's why I'm saying I grew up the hard way. And then, in terms of discipline, I had to learn to be disciplined in order to get where I am because it's not that much easy to grow up without a father—having your mom to be the father and the mother at the same time she had to go all out to make sure that I get what I want.

4.2.3 Educational resources and access to literacy practices

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

This study aimed to unearth knowledge about educational resources that students may have been exposed to in the structures of their homes and which shaped their pre-university Discourses. Participants had varying and disparate access to educational resources in the structures of their homes. However, it must be added that within cohorts of participants, varying levels of access to educational resources in the home were evidenced. Larry described access to educational resources, via the agency of his mother, as follows:

> My mom used to read to us when we were very small. She encouraged us to read. I do read a lot. We do have a home computer that is for all the general use. And besides, everyone has got a smart phone. We do have a lot of books. And I do enjoy reading a lot.

Like Larry's cultural experience in the home, Ink's case exemplified a pre-university Discourse that was inclusive of educational resources. She stated:

> We have a lot of bookshelves—a lot of books in general. We have computers and access to [the] Internet. So […] I would say we have a lot of access to resources in general.

Ink suggested a more significant influence from educational resources in her home over family agency in her early scientific Discourse. She resolved: "I don't think my family life did [influence my decision to study science]. I found a lot of my interests just by reading or seeing programs on TV that had a big influence on my life".

Aldoy revealed the following glimpse into the presence of educational resources in his home. He states:

> Ja, we had books. Many—well we were *home-schooled,* so we had big book—I can't remember the name, but it's a book about many stories, some with historical, others with scientific and discoveries and where they came from.

Kim described access to educational resources in her home. When asked if she grew up with access to educational resources, she noted:

> Ja. We have a home computer. I have my own laptop. I got it recently, last year for matric, mostly because I did all my projects and stuff on there. We have access to Internet. I think unlimited WIFI. There are a couple of books, but not as many, as there were in the olden days. We use more of the Internet. Ja, I'd say that's about it.

Rural cohort (Richard, Katlego, Siyabonga, Shaka, Sara and Mary)

Students from this cohort emerged from rural domains in South Africa. All the participants, apart from Richard, originated from either working or lower-middle-class families. The first participant's experiences that will be shared from this cohort are from Richard. This is because, as previously asserted, Richard shared characteristics with the Discourses of students in the urban-suburban cohort (Larry, Ink, Aldoy and Kim). Richard's parents were wealthy farmers. By describing access to educational resources in the home, Richard noted: "We had loads of books. Up until grade 10, we actually invested in a little computer centre". Contrarily, Katlego and Siyabonga indicated disparate access. When asked if he had books or access to educational resources, Katlego responded by saying: "Not really. But in school, there was a library. In grade 12". Katlego and Siyabonga's access to educational resources, as components of their pre-university Discourses, was constrained.

Sara's access to literature differed. Her father was a former teacher, and she was exposed to his Discourse around education. When asked if she had access to educational resources in the home, she responded by saying, "Ja, ja. There are computers and books". Shaka described little access to literature and educational technologies in the home. When asked about books in his mother's abode, he stated: "Other than textbooks, my friends had textbooks by Steve Harvey. It's titled *Think Like a Man*". Mary was also asked about access to literature and other educational resources in her home. Acknowledging her parents' agency, she observed that: "Both my [them] are teachers so they would give me books to read."

4.2.4 Local communities

This study aimed to access students' experiences from areas that are considered urban and suburban, urban townships and rural structures. Like families, community structures are efficacious in shaping the primary Discourses of youth. Students' home communities constitute Discourse communities. Discourse communities share spaces of communication and a "world of meanings [connected] through interpretation" (Zubkova & Kirillova, 2019: 68). Gee's (2012) theory of sociocultural discourses help conceptualise the influences of communities on individual Discourses. A sociocultural approach to Discourse emergence (see Section 3.4.4) holds that people are apprenticed into multi-modal practices by communities (Gee, 2012). Distinct cultural communities employ peculiar literacy practices that meet the needs of the members. In this context, it is acknowledged that not all cultural communities utilise the same literacy practices, have equal access to the same scientific tools or share epistemologies.

4.2.4.1 Resources for scientific inquiry

In this section, students' access to scientific artefacts and tools in their communities is discussed. This study refers to devices that are employed either in laboratories, online spaces, or in the classroom for argumentation and experimentation by artefacts and tools. These devices constitute part of scientists' Discourses (Gee, 2015) as they are incorporated into the ways agents argue, deliberate and generate new knowledge.

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

Larry did not identify his local community as influential or enabling in his Discourse development as a scientist. Neither did he mention accessing scientific or educational resources in this domain that enhanced his pre-university scientific Discourse. He observed that his community was "not very close" and that "everyone more or less keeps to themselves". Like Larry, Ink did not attribute much influence from her community's resources in her pre-university Discourse. Inversely, Ink attributed morphostatic (see Section 2.3.4) qualities of her community, including crime, as being motivational in her pursuit of studies in the natural sciences. She stated: "I live in Kempton Park, and there is a lot of crime". While crime is a societal illness, Ink approached it as a structural challenge to eradicate academic projects.

Aldoy and Kim did not attribute significant structural influences from their local communities on their pre-university Discourses as scientists. Kim described her separation from community resources as follows:

> There's a lot of old people that live there. I haven't really met a neighbour that's my age. There's also a bunch of old age homes around us.

Rural cohort (Richard, Katlego, Siyabonga, Shaka and Mary)

Growing up on his parents' farm, Richard was immersed in scientific resources from the early phases of his primary Discourse. Describing resources in his community, Richard reflected as follows:

> I must say the community, they actually eventually brought my interest to plants and so on. And given that we have the exporter and so on with the nuts, and the people being consulted for the farmers and so on, they quite brought my interest to the plants and the science of the plants.

Katlego's pre-university Discourse contrasted with Richard's in terms of access to artefacts or knowledge resources. When pressed to discuss the scientific resourcefulness of his hometown, Katlego stated:

> We don't have things like libraries, many things. We don't have facilities in our community—even the nearby schools. But my school was better. But not in that way. But the near schools don't know anything: even History, nothing.

Siyabonga characterised his pre-university access to educational resources in his hometown in a manner like Katlego's journey. His experiences were in an environment that was predominantly void of the necessary tools and knowledge repositories essential for scientific argumentation. He stated:

> Actually, go to my school, we didn't have labs and stuff where we could do experiments. They would just tell us do a summary of experiments they saw on YouTube and stuff. Then on questions, we just think. When it comes to questions, you just think about what's possible.

Shaka and Mary emerged from communities with a shortage of artefacts employed by scientists to reason, experiment and innovate. Shaka described his hometown as follows:

> Moloto is a place is KwaMahlanga. It is mostly dominated by nyaope and crime. So, growing up in Moloto is very difficult because even at schools, you do not have resources.

Mary's home community did not offer her pre-university Discourse much access to scientific tools. When requested to describe the quality of her hometown, she said:

> Worst quality, the kids at my age—many teenagers—getting pregnant. Some of them drink alcohol at a young age. So, that was the worst. And some of the schools, they would just go there, just an hour and go home. So, that was the worst.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

When asked to describe educational resources in her community that enable scientific inquiry, Violets stated:

> Ours was more like the park environment. We, everyone, has WIFI and stuff. But we only have one resource centre in Stanger.

Denel was from a township on the outskirts of Pietermaritzburg in South Africa. She identifies the city as part of her community. When asked to describe its access to educational resources that possibly enabled her development as a young scientist and her pre-university Discourse, Denel included rural and urban experiences by stating:

> I feel like in the CBD; they obviously have everything. When I lived in Ladysmith [for] that time of my life, if I was really sick, I would have to go to PMB to actually see an actual specialist. So, I feel like they [in Pietermaritzburg] have all the resources to just help people cause they have a lot of equipment and stuff that people in small towns don't have.

Nemo attributed little influence or academic coaxing from his community's resources towards his scientific orientation. He maintained: "[T]hat [studying science] was completely my choice because it's my passion for animals and plants that got me into it". When asked to describe her access to resources in her hometown, Chabi, who lived in the city of Pretoria and on the outskirts of town, shared the following:

> I'd say it's rural, because even the schools that are there, they don't have many resources, I can say, we don't have computer classes. So, I'd say it's rural.

Faith's community straddled an urban and rural area like Chabi's. In terms of material and scientific artefacts, there were not many that she could incorporate into her Discourse as a budding scientist. When asked if her community possessed scientific resources, Faith said: "No, we don't. Usually, we have to go to other places to get that kind of information". Faith bemoaned the poor Internet connectivity and the lack of access to services at home as follows:

> Well, it has its own bad … disadvantages because when you are given school assignments you have to write them, you need to go to the Internet café. You have to spend money to go to town. You need to spend money for the services and the facility. It's a disadvantage for us because we have limited information due to that.

4.2.4.2 Access to scientific agency

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

In this section, students' access to scientific agency in their local communities is considered. By scientific agency, participants' access to people who influenced the emergence of their pre-university scientific Discourses analysed. Scientific agents may be community, school and family members. While Larry did not attribute any significant agency to his community that shaped his scientific Discourse, he had direct access to scientific agency in medical communities through his father. Larry's father was a medical doctor, and Larry's goal was to pursue the same career path. Larry described the significance of his father's agency in his pre-university Discourse development by reflecting on his love for science as follows:

> I definitely think it is exciting because my dad is a doctor and he obviously knows that subject well. So, he was able to tell me cool things, and I was able to tell him cool things. But my parents have never, not in any regard, pushed me to study a specific subject. They have always been happy with what I wanted to do.

Ink attributed minimal discursive influences from her community in her pre-university Discourse. Noticeably, crime from agents in Ink's community motivated her pursuit of scientific study. She articulated the link between criminal agency and her Discourse as follows: "I live in Kempton Park, and in Kempton Park, there is a lot of crime. So, in that aspect, I would say my community has influenced me to pursue a career where I can serve criminal justice".

Kim expressed a divorce between her scientific Discourse and the agency of predominantly senior citizens who were her neighbours. In her home, however, Kim was exposed to the agency of her parents, who participated in secondary discourses that mirrored her own interests in physiotherapy. While Kim's father encouraged her to pursue the business side of the sports industry, she diverged from his preference for her career path. She stated:

> Dad was, he was pushing towards a business degree because obviously, with that, you can do a lot. And you can open your own business and do anything, basically. But I haven't been business inclined, ever. It doesn't interest me. Not even accounting. It's not similar, but I've never been interested in that, and I've always preferred the sciences and even when I chose subjects in grade 10. I chose physical science, biology and geography.

When asked about possible exposure to scientists or agency in his community that shaped or influenced his scientific identity, Aldoy responded negatively. Aldoy's construct of community, like other participants in this analysis, revolved around his school and family (see Section 4.2.3).

Rural cohort (Richard, Katlego, Siyabonga, Shaka and Mary)

Richard was surrounded by scientists and other farmers while growing up on his parents' farm. These interactions shaped Richard's pre-university Discourse. His entire upbringing was immersed in the Macadamia nut community. When asked if his family influenced his passion for science, Richard responded as follows:

> Absolutely. Especially on my father's side. They're all engineers. I would say we have a few scientists in the family. We really investigate stuff and talk quite scientifically orientated too, as we enjoy the practice and so on.

Katlego's exposure to scientific agency in his community was constrained. He was not exposed to farmers or scientists in significant interactions during his pre-university Discourse phase. Be that as it may, he remained motivated by community members regardless of the socioeconomic hardships they faced. When asked to discuss his motivation and interests in science, Katlego said:

> It's the background of my community and my family. That love for science in my community and family. And then if you can know and realise that Science students are highly rated in high school. So, if you are doing History, exhibitions and things, you are not considered. So, I wanted to be part of those things. So, I wanted to do Science.

When Siyabonga was queried about possible agential influences from his home community, he referred to technological access. He said:

> Nah, computers, I am actually exposed now to computers. We used hardcopies to study and stuff like that. Then I only got a phone this year. I didn't have a phone. I got a phone this year. I wasn't used to computers and stuff.

The researcher's interpretation of Siyabonga's linkage of communal agency to technology is they did not have access to devices that were essential for learning. Computer technology is ubiquitous in contemporary higher education institutions. Siyabonga was unable to draw on the agency of his community members as he attempted to incorporate technology into academic strategies. Siyabonga was asked to describe the quality of his community. This was what he shared:

> The worst thing is where we used to get water from there was always a queue. So, we'd like … if I was supposed to … my timetable says I would start studying at six. So, when I come to school I would go to queue for water, but the things is, if there's too many people there I would have to wait until like, four AM still in the queue.

While Siyabonga's case is not unique in this case study, it reflects the challenges many first-year students in South Africa undergo.

Shaka's pre-university Discourse was shaped by constrained access to scientific agency. Interactions with agency in his community were characterised by social breakdown and dysfunctionality. Despite agential constraints in his community, Shaka disclosed that a group of teachers in his school paid for his registration and tuition fees at the University of Pretoria. In this example, Shaka's community members' agency enabled his entrance into higher education study. He stated:

> A lot of support I got from my teachers. Since they saw potential in me. So, I didn't have money to come this side, so my school actually donated money for me to come to study—due to my results.

Mary, who also emerged from a rural area of South Africa, reported that she did not interact with any scientists in her community. There were no science fairs in her school or hometown.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

Violet made minimal and indirect access to scientific agency in her community. When asked if she had access to scientists in her hometown that influenced her primary Discourse, Violet said "never". When queried as to whether her community ever had science fairs or expos, Violet responded affirmatively. She reflected on this experience as follows:

> Yes, we did have one. It was a long time ago, though. In primary school. There was a guy. He's a scientist. I'm not sure what he does, but he did experiments and stuff for us.

Denel's experience was similar to Violet's. When questioned about possible access to scientists during her pre-university Discourse phase, her answer was: "I don't remember". In addition, and mirroring Violet's Discourse, Denel participated in a science fair during primary school. She described these experiences in the following narrative:

> One year, I was in primary school, I think. It was about whose taller between girls and boys. And then, one year, I did…one year I actually dropped out. I just couldn't take it. I was doing a whole study, method type of thing with an app or something like that. But I can't really remember.

Chabi attributed minimal influences from scientific agency in her community in her pre-university Discourse. She viewed the agency of community members as constraining in her attempts to develop as a scientist. Chabi described the people in her community as follows:

> They don't know how, like, how people work so hard in the world […] they just…enclosed in that place and they don't want to explore, they just in a comfort zone. Which is, yeah, it's very disadvantaged.

Chabi's construction of her community as an enclosed system with little inspiration mirrored that of Nemo. Nemo relied primarily on his inner-motivation and personal agency instead of drawing on the agency of his parents, community and school (see Section 4.2.3) to cultivate his Discourse. While Faith's community was similarly resourced compared with the hometowns of the other participants in this cohort, she evidenced a greater valuing of scientific agency in this domain.

Faith values the scientific agency of traditional healers in her community. These individuals work with natural herbs and counsel community members in physical and meta-physical matters. Faith informed the researcher that her grandmother was a traditional healer. Being interested in discerning a possible connection between Faith's grandmother's vocation and her future aspirations among expert, secondary discourses, the researcher asked her which career she wants to pursue. Like her grandmother, Faith responded by stating: "Medicine".

4.2.5 Schools

After human homes and the geographical locations where people live, schools have immense powers in shaping students' pre-university Discourses. In addition, schools expose students to expert secondary discourses that are affiliated with professionalism (see Section 2.5.1). In the presentation of data that follows, insights are shared into structural and agential characteristics of students' schools. As in the example of students' homes, the participants of this analysis emerge from pedagogic environments with incongruent access to scientific resources and communicative modes essential for scientific inquiry and experimentation. As a note: The agency of teachers and peers in students' schools was evidenced in students' narratives around their school's resourcefulness. Most of the participants of the analysis affiliated their schools as being part of their communities.

4.2.5.1 Scientific artefacts

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

Larry attended multiple secondary schools. He describes each of these institutions as equipped with technological artefacts in varying capacities. He recalled:

> Our schools didn't necessarily have the Wi-Fi. We changed schools because the schools had issues. The first school didn't have any … it was more of a farm school. They didn't really have access. The second school was in the same area. But then the third one had access.

Larry described his schools' access to the Internet as essential to modern learning in the preceding reflection. Access to the Internet and his schools' technological capacities appear to have been valued variables in Larry's family. His parents shifted his schools to ensure he was equipped with necessary artefacts and connectivity. When queried about the presence of science resources in his most recent school, Larry reported: "We had a science lab". When pressed as to whether his school employed technology for scientific instruction, Larry responded: "Not to the full extent. There was once or twice when the teacher would use a projector; that's [a] very few times". Larry's exposure to scientific artefacts that shaped his pre-university Discourse is unique in this

case study. This is because, unlike many of the participants of this study, he attended multiple secondary schools with disparate levels of access to scientific artefacts.

Ink's reflection depicts a secondary school that was well-resourced with scientific artefacts. She provided the pursuing descriptions of this social structure:

> A lot of classrooms used smartboards, where they could write on the board and have an interaction in class […] where students could come up and give their answers and show the class their thought patterns. We also had a subject called research techniques, where we learnt how to use the computer and programs associated with the computers.

It is apparent that Ink attended a school that enhanced the awareness of the roles of technology and reasoning in her pre-university Discourse. Ink's exposure to "research techniques" through computer technology demonstrates her membership in an educational community that values intersections between learning and technology.

Aldoy was partially home-schooled by his mother. She also taught his younger brother. Aldoy's mother's agency and home were central in his description of the construct of "school". In terms of forming his pre-university Discourse, being home-schooled by his mother was a crucial characteristic of Aldoy's identity as a scientist. Aldoy's reflection reveals, in addition to a close relationship with his mother, that the structure of his home provided him access to necessary scientific artefacts. By being home schooled by his mother, Aldoy's pre-university Discourse is distinguished from all the other study participants.

Kim depicts a well-resourced school. She identifies her school as a part of her primary community. In describing its material-resourcefulness, Kim offered the following insights:

> When I was in grade six or grade seven, at DSG, we used to do science expo. You could think of whatever or research an experiment that you want to do. And that's about it. I've only been to that one. But other than that, I did not do a science expo at Girls' High. But they did do science Olympiads and those types of things.

Kim's pre-university Discourse was enabled scientifically by virtue of her access to the artefacts and learning events offered by her school. As an aspiring physiotherapist, Kim detailed her school's resourcefulness in the next narrative:

> I think Girls' High was quite well-equipped with everything. They had a library, also, with lots of books—a couple of computer labs. I think, like, two or three. Quite a few. And also, all the science classrooms were labs—proper laboratories with [inaudible] and burners and everything. And sports facilities, also very good.

Rural cohort (Richard, Katlego, Siyabonga, Shaka and Mary)

Richard was the only participant of this cohort to describe a school that was resourced in a manner that significantly enabled the development of his pre-university Discourse as a scientist. He described his school with an emphasis on technology. When asked to detail his access to artefacts required for scientific inquiry, Richard stated:

> We had a computer lab and so on. The library, I never actually visited it. We had a small library which we started off with. It's quite a new school. I think this year it's five years old. They expanded all the assets and stuff such as libraries and computer labs which are growing by the minute. But yes, they had quite a lot of resources.

Katlego's access to technology and scientific artefacts, which may have enhanced the emergence of his scientific pre-university Discourse, differs from Richard's. His description of access to necessary tools for scientific inquiry, after being asked to address this issue, was as follows:

> What I can say is moderate. But thing that challenge is we don't have people to use that equipment. We have about a half-full laboratory. We have half-full library. We were having computers but unfortunately were stolen because they were not in use.

Siyabonga's discursive access to scientific artefacts was more constrained than Katlego's. He stated:

> Actually, go to my school, we didn't have labs and stuff where we could do experiments. They would just tell us do a summary of experiments they saw on YouTube and stuff. Then on questions, we just think. When it comes to questions, you just think about what's possible.

Within the structure of Siyabonga's school, there was fractured access to technology that integrated course content and his teachers' agency.

Shaka's illustration of personal access to scientific artefacts for the development of his pre-university Discourse mirrored Siyabonga's experience. He said: "So, in Physical Sciences, we did not do experiments. We were just given data". When asked to describe the resources in his school, Shaka stated:

> It did have a library, but … when I was in Grade 12—from Grade 10, 11 and 12—it was no longer a lab. It was used as an office. Books were stored there, scripts and everything. There was no library.

Like Katlego, Siyabonga and Shaka, Mary did not have significant access to artefacts for scientific inquiry. She described her school's possession of such tools in the following reflection:

> Well, it was moderate. It didn't have all things, but they managed to get resources. Ja, like, in experiment—Physical Sciences—our teacher will buy things just for us to experiment and see what was real.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

Experiences of alienation characterised the emergence of Violet's pre-university Discourse as a young Indian female scientist. Integrating structural experiences from her hometown that added to her social alienation, Violet declared:

> I think the worst thing about our community is girls are not really recognised. It's mostly boys. And if you're in an Indian home, I don't experience it, but … but I had many people experience it, the boy does come first. If you had money for education, but you only had it for one child, and you had to choose, they would obviously choose the boy.

This narrative is shared to highlight Violet's perspective that most resources in her community were primarily directed towards boys and young men. Due to her gender, she felt marginalised. While Violet experienced marginalisation, she still depicted her school as being materially possessive of scientific artefacts. In addition to mentioning that she had access to computer and science labs, Violet stated:

> We had a library. We had basically everything besides sports. It was more an academic school than a sports school.

Nemo stated that: "There wasn't a library [at] my school. And most of the work we did wasn't with technology, it was more, the most technology we used was overhead projectors, but that was about it". Hence, as per his statements, Nemo did not have significant exposure to scientific artefacts in his pre-university Discourse to which he attributes substantial impact.

Faith described her school as under-resourced in terms of scientific and sports artefacts. She revealed that it had no computer labs. To access technology, she and her peers "had to go to the other privileged schools just to have access to those things". When asked about access to sports facilities, Faith said: "Since it's a village, you just drew a field, and then you mark with the ashes. Nothing fancy". These structural conditions around Faith's school evidence the level of material resourcefulness embedded in her pre-university Discourse before arriving at UP.

4.3 Educational agency

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

Kim describes her school's agency as directly contributing to her budding Discourse as a physiotherapist. She reflected: "When I was [at school] I spent most of my time on that side of the world. So, I'd come home late from sport". Kim's school provided the initial resources to expose her to sports Discourses. While Kim did not name her teachers or peers, the fact that she spent more time at school than in her community suggests there were strong agentic relationships with them.

Ink attributes strong agential influences to members of her school towards the formation of her pre-university Discourse. She reasons as follows:

> My school and that community there also had a big impact on my life because they encouraged scientific exploration. They encouraged you to ask the why, and how, and where, and when. So, they encouraged questioning, and because of that, I am—I would like to say that I am quite curious. And so, yes, they did have an impact on my career or career choice.

Ink employed terminology reflective of expert scientific discourses used in science faculties. She acceded that agency in her school shaped her passion for the sciences as a potential study domain. Ink shared the following insight: "In my school, we had a few doctors and scientists who I could approach and speak to, but other than that, it was mainly a hard-working group". Ink's school afforded her direct access to the Discourses of expert scientists who influenced her logic and Discourse as a novice scholar.

Rural cohort (Richard, Katlego, Siyabonga, Shaka and Mary)

Richard described agentic interactions in his school to enable his pre-university Discourse as an emerging scientist and farmer. In reflecting on his teachers' expertise, he noted:

> A lot of the staff. A lot of them [are] former engineers and so on. I would actually say with the staff and syllabus … I just want to say the vibe almost; they had a capacity of delivering quite a few [new scientists].

When Katlego was asked to share his perspective of his school's capacity to produce future scientists, he responded negatively:

> As I have already said, that in school we are doing Science in school. But we are doing Science as a subject. We are not doing science so that they can build that love for us in science. As I have already said, we are not having a—we are doing practicals once in a term. Just because in the curriculum, there is a session for practical. So, they were doing practicals for that thing.

Even though Shaka's school's material and agential resources were reflective of Siyabonga's, he had a more optimistic view towards their shaping his pre-university Discourse. Shaka believes his school *can* produce future scientists by referring to the agential successes of former peers. He justified his optimism as follows:

> Because if I could get good marks—and a lot of people got good marks before 2017 and 18. Some of them are at the University of Witwatersrand. So, it does have the ability to produce future scientists.

Like Shaka, Mary views her peers' agency at school as motivational and enabling in the emergence of her pre-university Discourse. She recalled the encouraging influence of her science teacher's agency as follows:

> Our teacher was amazing. Like, yoh. He made me fall in love with Science. I don't know how to express this feeling, but he played a huge role to make me fall in love with Science.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

Violet did not experience her teacher's agency as enabling towards her pre-university Discourse. She stated:

> People actually say, "you can't do it". Especially like teachers from our school. So, for me, I actually proved people wrong because a lot of people said I couldn't make it to university. So, I worked hard so I could make it.

Due to her experiences of agential alienation in school, Violet felt as if she was constantly under pressure to conform to norms that did not mirror her values as a female scientist. She had to be strong to exert her agency and voice.

Denel had a more positive experience of agency in her school. When asked if she thought her school could produce future scientists, she stated:

> I feel like the teachers just took a lot of their time just to make sure that we were well equipped for the exam. Like we understood everything. Like looking at all my friends and the people in the high school and all the marks they got, I think they have the potential to become really great people in the future.

When Faith was asked if her school possessed the capacity to produce future scientists, she responded as follows:

> I don't think so because, for example, in my matric, we were only four people doing science. There were only four. So, I can't, so it was able to produce future scientists because not everybody wants to do science because they can see that there is a lack of resources. So, whenever you are doing science, it's at your own risk. Chances of making it are very slim.

4.4 Tier 2—Discourse interaction

T2 represents the data presentation phase when the researcher accessed students' experiences in the middle of the academic year. T2 is labelled Discourse Interaction due to its mirroring of Archer's (1995), embedding the same concept in her theory of the morphogenesis of agency. In agential morphogenesis, identities take new shapes; they morph (Archer, 1995). For agentic identities to morph, agents must interact with social structures and culture to be exposed to new ontological ways of being. Archer's (1995) theory of morphogenesis applies to students' discursive experiences as they transition from ontological immersion in their pre-university Discourses to *interactions* with on-campus structures, culture, and agency. The ability of students to interact with structures, culture and agency to morph their Discourses in ways that incorporate or modify institutional epistemologies is called a morphogenic experience. Alternatively, when students experience difficulties interacting with campus structures, culture, and agency, their discourses are morphostatic. Where morphogenesis involves the emergence of new agential features, morphostasis is the constrained ability of an individual's agency to morph, adapt and interact in new social environments. Data in T2 highlights how motivational and agentic variables had shaped them in the middle of the year.

4.4.1 Sociocultural interaction

4.4.1.1 Motivation

In this section, motivational variables that students' draw on in the first semester to employ their primary Discourses towards academic success are considered. Enabling and constraining motivational elements are considered in students' experiences.

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

During the T1 phase, Larry disclosed that his main goal in university was to become a medical practitioner like his father. This academic objective constituted a significant part of Larry's Discourse before he arrived at UP. In the T2 phase, Larry indicated that the same factors drove his academic goals and motivation since the beginning of the year. He stated:

> I definitely want to be a doctor; it's my dream. So, I'm motivated to keep that going. I'm motivated by the competition to keep going 'cause it's still there. And, for myself, because I enjoy so much about medicine and stuff, I don't want to do anything else.

Larry did not indicate any significant challenges since the start of the academic year and has adjusted to the university environment. Larry's experience represents a participant's case where their pre-university Discourse could elaborate and interact with academic structures, culture and agency with minimal need for a change in learning strategies. Confirming his discursive capacity to adapt to the university environment with little modification of his learning strategies, Larry stated: "I would say [I am] mostly self-motivational, and I do a lot of the motivating for argument—if it's a group project and we are arguing then I tend to be self-motivational and pass that on to other people to get them motivated for the work".

Diverging from Larry's experience of minimal personal agential adjustment to the university environment, Ink described a series of epiphanies that UP offered her during the first semester. She shared the following insight:

> I think […] the university environment has kind of opened my eyes as to who I am as a proper person. And I am realising that I can't do desk work, or I can't work in a lab. So, I have to now look at my future options and decide is that's really where I want to go. Do I really want to sit in a laboratory every day, working with chemicals?

In initial counters with Ink, she was motivated by possibly becoming a forensic scientist to counter crime in her hometown. Since arriving at UP, Ink's expert Discourse had undergone morphogenesis, meaning it continued to take new shape. Interactions with coursework revealed her interests as well as dislikes in the scientific arena. As she suggested, her motivation focus was changing by considering new "future options". Ink's Discourse involved coping with the rigour of scholarship in the university environment with minimal modification in terms of learning strategies. She stated: "In high school, I had quite a strong basis for argumentative writing. I did advanced English, and that taught me all that I needed to know about argumentative essays".

Like Larry and Kim, Aldoy did not evidence a need to undergo a significant Discourse shift in the university. There were no observable identity adjustments that he had to undergo or that he expressed. At the beginning of the year, Aldoy was not motivated by a career path. Rather, he wanted to prove to himself that, agentially, he could withstand the pressures of university-level by being dyslexic. He confirmed the persistence of this source of academic motivation as follows:

> My main goal was just to prove to myself that I can do this year quite well. Like, do fine throughout the year and be able to cope with it all. Because I am kind of unsure what I want to do. So, there is not really a professional goal yet.

Like the other participants in this cohort, Kim did not evidence a significant Discourse shift. Her goal remained to become a physiotherapist and to enter that stream of study. She admitted that university had coerced changes in her learning style due to it being a new learning environment. She remarked:

> I am used to being taught in class at school, and then you just go home and do whatever the homework is. Now, you kind of need to, like, go through the lecture slides. Go through what you did today. Make notes on that. Make more notes if you need to. Do some research if you need to.

Rural cohort (Richard, Katlego, Siyabonga, Shaka, Sara and Mary)

Like the participants of the preceding cohort, Richard manifested minimal evidence of undergoing Discourse modification since his arrival at UP. He adjusted to learning in the university environment. His central motivational element, which remained with him since the beginning of the year, was to take over his parents' farm. Richard shared that he received a bursary to study at the University of Pretoria. This bursary was from his local farming community. Once he completed his studies, he was expected to return to his community and share knowledge acquired from UP's secondary discourses. Richard stated:

> My main motivation is actually the bursary I have. Um, because, um holidays and so on, when I return, I work for them. Um, it's keeping me quite—my line of thought—in line with the academics and so on and motivates me to finish at the end of the day.

Katlego described the unavoidable challenge and navigation of his Discourse with new ways of being, learning and communicating at the University of Pretoria. The structural shift to UP had undeniably shaken Katlego. He admitted he had no choice but to undergo Discourse modifications and that academic survival was motivating him. Katlego shared his path in the first semester in the following account:

> Ja. Everything change a lot. In the beginning, I wasn't that person who can maintain pressure, but ever since I came here, everything was just pressure. Even when I started those things of cross-nighting—that I didn't do in high school, but here I was forced to do them because I wasn't having time.

Like Katlego, Siyabonga described having to modify and adjust his Discourse to adapt to UP's new ways of learning. Unlike any other participant, Siyabonga used a symbol to describe a motivational element in his first-semester experience. When asked to identify anything that drove him to succeed at UP, he stated: "Cars". The researcher was amazed and asked Siyabonga to explain why he was motivated by cars. Siyabonga remarked:

> Ja. I love cars very much. So, what I usually do, in the morning, I watch videos of cars to be motivated when I get to school. Ja, that's how I do.

Siyabonga divulged that when he finished university, he would like to get one of the cars in the videos he watched, especially an Audi. Siyabonga's desire to own an Audi motivated him to work hard and do the best possible with his studies.

Shaka disclosed that he was motivated by two key variables at the end of the first semester. From a discursive perspective, Shaka had discovered that he wanted to adopt the Discourse of veterinarians. He stated: "I want to become a Veterinarian Scientist, so I know I won't get easy there, so that's why I am working hard". In addition, Shaka revealed that he wanted to change the structural conditions at home. He was concerned about his mother's wellbeing. Shaka said: "I want to support my Mom financially". Even though she was in a different town, Shaka remained concerned about his mother and was motivated to succeed in his studies to help her.

Sara indicated she was motivated by the same factors to succeed since the beginning of the academic year. She stated:

> Actually, I think they are still the same. They are still the same factors, ja. I want to succeed, get a job, get married. That's the only thing that I want, I guess.

Sara mentioned that from a disciplinary perspective, she was considering adopting a new Discourse. While currently studying biological sciences, Sara wanted to become a veterinarian in the future. She added that UP had increased her self-confidence. She observed:

> I can see great changes. Like, I am very confident than before. And I think I have a best of life, like, I can adapt easily by now—compared to the previous months and, ja … I am now better.

By mentioning her willingness and ability to adapt to UP as a new sociocultural environment, Sara demonstrates agency that has undergone morphogenesis.

Mary informed the researcher that she was de-motivated. When asked if she was still interested in pursuing her agricultural goals, Mary replied: “Mmm… well, I am not that motivated”. The researcher was interested to understand the causes of Mary’s lack of motivation. In reasoning, she shared the following insight:

> At the beginning, I thought that I could work better under pressure but didn’t work. ‘Cause every time when my marks came, yoh, they were not good.

Mary provided an additional glimpse into her mid-year Discourse. She shared her insecurities at university as follows:

> I don’t really know myself that well. I am still learning about myself. ‘Cause—well, where I came from, we were not allowed to go out to experience certain things. So, I don’t really know myself that well. So, I am still trying to learn more about myself.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

Violet described an appreciation for UP's opportunities in terms of morphing her Discourse into new forms. In acknowledgement of inner-changes, Violet remarked:

> I actually changed a lot after coming to university. I was like a really quiet child, and it was really hard for me to make friends. But once I came to UP, I started opening up and making friends and interacting with other people with different races, which I was not really used to because I come from an Indian community.

Violet’s willingness to embrace the diverse cultural properties on the Mamelodi campus indicates her desire to adapt to the university as a new structural environment while modifying aspects of her Discourse to fit in. Mirroring one of the motivational goals of all the participants in this study, Violet added: “I just want to have a degree at the end of the day in something that I really like”.

Denel indicated her strong dislike for a core module that she must pass. She divulged that her acute dislike of the subject motivates her to succeed. She stated:

> Um … what motivates me? … I, like, the module I take, like AKR (alternative name), this one professor…he did an entire lecture on plants, and it had to be the boringest lecture of the entire semester. And I was like, I can’t stay in this faculty. I really need to work hard so that I don’t do plants ‘cause I just- I can’t.

While Denel disliked the AKR module, she internalised this aversion and changed it to a source of motivation. In this sense, what might have been a constraining learning experience was converted into one where the participant converted a negative pedagogic input into a motivational output for academic success.

Nemo indicated that he remained motivated by his desire to adopt the Discourse of a zoologist or a veterinarian in the future. He was motivated and cared for animals. When asked to discuss factors that motivate his orientation to science during the T2 phase, Nemo stated:

> So, I want to go into conservation, or zoology, or something that is studying animals. And I've always liked animals. And it's kind of like a voice of the voiceless. So, that's always been my motivation to succeed in this field, I guess.

When asked if he perceives any noticeable changes in his personal and academic Discourses since arriving at the University of Pretoria, Nemo responded negatively, as follows: "Not really, no". By maintaining his pre-university passion for animal life and remaining steadfast in pursuing his academic goals, Nemo's pre-university Discourse was elaborated.

In the researcher's discussion with Chabi, the topic arose as to whether she was motivated by internal or external motivational factors to elaborate her scientific Discourse. Chabi appreciates that both motivational domains influence how she interacts with structures, culture and agency on campus. Her viewpoint ensues:

> I would say it's a self-comb—self-motivation because most people were suffering, especially in Maths. We were not really used to the system.

Chabi admits that while she and other students might experience academic struggles, knowing that they were not alone in the battle was motivational to continue in the struggle to cultivate successful scientific Discourses.

Faith discerned a morphing and growth in her scientific Discourse. Her perspective was that interactions among structures, culture and agency on the Mamelodi campus enabled changes in her personal epistemology. She shared this experience as follows:

> In terms of reasoning capacity, the way I see things now, like, it's a different perspective. It's more like this quiet change. Like, ten percent of what I used to be.

4.4.1.2 Agentic inputs

In this section, students' interactions with significant people who were located on and off-campus are highlighted. Agentic interactions are presented as enabling or constraining students' attempts to exert their personal Discourses and agency towards academic success and their attempts to cultivate their identities as novice scientists. Peer and agentic relationships were considered in this due to known influences which students have on each other as they navigate their educational paths (Karpenko & Schauz, 2017).

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

In T1, it was indicated that Larry could elaborate and maintain his pre-university Discourse upon arriving at UP. Larry's academic confidence was partially boosted by wanting to pursue the study of medicine like his father. As the first semester progressed, however, Larry needed to consult the Mamelodi counsellor for guidance. He shared experiences of this agentic interaction as it ensued.

> I did go to Ms Ida for counselling and guidance on what I might have to do academically to cope, and she told me I mustn't change anything. I've taught myself the coping mechanisms, and the way I study is the way I must continue to study throughout university.

Significantly, the guidance counsellor confirmed that Larry's strategy of navigating his Discourse as a new scientist in UP was effective and required minimal modification and adjustment. Larry also indicated that confidence around his Discourse was strengthened by assisting his peers with academic work. He discussed this strategy as follows:

> I also…um, helping people, I also benefit a lot from that because it tests whether I understand the work or not. So, if people ask for my help or help people like my friends, um, with work and stuff like that, that tends to help me solidify what I know.

Ink, like Larry, admits that she, too, needed to access on-campus agency to enhance her studies and, in turn, increased confidence in her scientific Discourse. When asked to discuss who her education and agentic sources of support were, Ink stated:

> I think, to a large degree, my LST lecturers and tutors. As I said, I came in with previous knowledge of how to write argumentative essays, and my lecturer was quite impressed that I know all these things that he was trying to teach me, but there were also things—or areas—where I differed from what he was trying to teach me. And I would approach him or our LST tutors and ask them for help with editing, with proofreading, where I could fix or improve my essays.

Even though Ink arrived at UP with confidence as an academic writer, she was aware that effective communication was essential for her success. As a result of this awareness, Ink reached out to her academic literacy lecturer and tutor to ensure that she effectively applied conventions that they had introduced her to. Like Larry, Ink adopted a mentoring role in peer interactions. When asked if they supported her, Ink responded:

> They've learned from me; I have learned from them how to—we all have our differences. And we would all like to learn and adapt, as is the way of life, and we learn from each other. And we take bits and pieces from each other to learn and adapt, but for the most part, I had a greater impact on them than they have had on me.

Aldoy disclosed that, when necessary, he consults campus tutors for assistance with his work. He stated: "I went to one of the tutors to ask if my essay is ok, and where I can change it to make it sound better or if there's any grammar mistakes or that sort of thing". In Aldoy's estimation, interacting with the tutor was an enabling experience that helped strengthen his confidence. He remarked: "We got—yeah, we fixed a few things. Like, for instance, with the dyslexia, you write the words three times in a text". The agency of Aldoy's tutor assisted navigation of his dyslexia and boosted his Discourse's confidence. Aldoy conceded that his peers influence his approaches to written argumentation. When asked if his peers enable his communication, he answered affirmatively.

> Yes, they have. Mainly due to—mainly making it better. Try to make it sound more academic. Because it's all about academic, it's not really about your opinion that much, it is more about the facts. Or how is it? Where has the research been done, and that sort of thing?

Like Aldoy, Kim had slowly grown to increase her valuing of agential interactions with peers to enhance her understanding of and communication around course content. When requested to discuss such support or interactivity, Kim responded with the following recollection:

> Um … I—well, I know there's one girl in my class that I, if I'm struggling with something, or if I need help or whatever, then I'll ask her and, like, just maybe get her opinion or see what she says. And, like, sometimes the way she'll answer a question kind of makes me think, like, ok, that's not how I did it, should I change my answer, or should I maybe think of writing it another way or—that's the only way I can think of.

Rural cohort (Richard, Katlego, Siyabonga, Shaka, Sara and Mary)

Richard disclosed that he appreciated and had closer interactions with peers off campus than he did with those he studied with in Mamelodi. After being asked to address agentic influences in his Discourse since the start of the semester, Richard replied by saying:

> Well, I have quite a few postgraduate students, and just the general way they talk and argue, even if it's quite colloquially, I felt that there's quite an influence there. Definitely.

In this declaration, Richard exposed how dialectical interactions with senior peers empowers his Discourse as a scientist. When asked to elaborate on this perspective, Richard stated: "They—in any given argument, they're quite focused on the facts and so on. They never have any subjectiveness to a matter; they only focus on the facts". By interacting with senior peers, Richard could access glimpses of knowledge production at higher levels of study. This agentic exposure enhanced his Discourse as an aspiring post-graduate scholar.

Katlego described experiences of struggling to adapt his Discourse to the learning environment of the university. The combined difficulty of his courses and experiences of alienation from peers compounded his frustration. Katlego's perspectives of drawing on personal and external agency follow. He stated:

> Ja, I can say it is a combination. Because sometimes the module was very tough for me. So, I had to consult some of the people I know. Some they are in university.

Katlego informs the lecturer that he experiences trouble studying and navigating agency, cultures and structures in the university through English usage. He describes a divorce between his home culture and ways of arguing on campus through this reflection:

> When it comes to culture, I don't—when it comes to culture, it doesn't feed into my writing, but it plays a major role in the language that I speak. Even the English that I'm speaking, you can hear that it has that background compared to other people. So, I think culture play a major role in speaking other than in writing.

Siyabonga described a strong aversion to agentic campus interactions. He attributed this personal tendency to his reliance on lecturers for instruction and his introverted character. Siyabonga's reflection follows:

> I am an introvert. I don't like being around people. So, for me to, like, study very effectively, I study alone at around—when it's night actually. You can practice Maths with headsets on, which excludes from people. So, if I have my headsets on, I don't need to like be telling

> people, nah, but you're making noise and stuff. So, in the night there will be many people will be asleep. So, that's why I am effective.

When pressed to elaborate on his aversion to peer and other agentic interactions around his studies, Siyabonga declared:

> I am an introvert. I don't like showing myself to someone like, I am struggling with this. I try hard to figure everything myself. So, I don't think there's people who helped me.

Shaka had a divergent interactive experience on campus when juxtaposed analytically with Siyabonga's. He described an unavoidable willingness to modify his academic Discourse to navigate the university's learning culture. Shaka responded affirmatively when asked if he noticed changes in how he interacted with people in educational contexts. He said:

> Ja, I've seen changes this semester because I've changed a lot. I had some new experiences that I didn't have, so … when I was in high school, I was the type of person that didn't talk to people. I wasn't around crowds. But now I am. Now I love being around people. I have more friends. Cause last year I had a few friends. I even play soccer. I have been more involved in sport activities.

Shaka described how playing soccer and interacting with peers through that mode of communication had positive effects on studies. He reasoned that:

> After doing exercises and you go and study, it's more like a refresher … I don't know how to put it. It's easier to understand things, and you feel happy about studying.

Sara expressed a valuing of agential interactions on campus. Incorporating their input increased confidence in her own discursive approaches to coursework. She noted: "[After] looking at my peers' work […] I felt like I was the only one who wasn't focusing that much". Through peer interactions, Sara developed an awareness that all of them were struggling and could learn from each other. When asked if she was motivated internally or by extrinsic variables, Sara reasoned her viewpoint in the ensuing narrative:

> I think it's actually both of them. Because I compared myself with my peers. So, in a way, they motivated me. And, like, their work motivated me. Although inside, like, myself I told myself that no, I have to really focus too much. So, I think it's both.

Mary described constrained relationships in her academic journey with peers. Her first response to a question about peer inputs into her studies was:

> My friend, she's pretty shy. So, she doesn't talk much. So, most of the time, we spend time on our phones.

Mary's negative estimation of group work and peer interactions was exposed in the subsequent disclosure:

> We had a group work. MLB group work. But then there were certain people who didn't involve us. Every time we had to ask when are we gonna meet? When are we gonna meet? When are we gonna do this? So, we just had to do the assignment last minute.

While the voices of Mary's peers are not included here, what is evident is that in the production of her assessment, she unsuccessfully incorporated their agentic input into her submission. Mary's peers' input was missing in the planning, dialogue and production of the final text.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

The academic environment has opened a freer world to Violet, who previously felt alienated in her hometown. There, her experiences as an Indian woman were characterised by being seconded to boys in school and her community. UP, alternatively, offers social structures, culture and agency that enabled Violet to centre her Discourse as a novice scientist in learning experiences. She reflected as follows:

> [When] you come to UP it's a mixed *inaudible* of people—which is really nice 'cause you get to learn about different people and how they grew up in their culture. And also, I was not someone to like—like people used to take a lot of advantage of me because I'm quiet. But after coming to university, I realised that you can't go on like that. So, I tend to speak up for myself now.

The university environment enabled Violet's Discourse to undergo morphogenesis. Unlike her community, UP did not induce experiences of constraints due to her being a woman. Further, by exposing herself to the cultures of her peers, Violet demonstrated a willingness to modify her scientific Discourse.

In the mid-point of the academic year, Nemo maintained his withdrawn agential approach to his studies. He remarked: "Most of my peers haven't really shared what I want to do. So, it's very minimum of influence on it". Nemo conveyed that he found it hard to share scientific Discourses with his peers. As related to actual course work, Nemo observed that: "I don't mind group work, but I prefer to work alone on particular stuff". He reasoned his preference for agentic peer distance as follows:

> I just like to be solitary, I guess. I don't like socialising and group work. It's not my strong suit.

While Nemo did not appear to be struggling, his reluctance to engage in agential interactions with peers constrained the morphogenic emergence of his new Discourse.

Unlike Nemo, Chabi demonstrated a willingness to break out of her Discourse shell. She was aware that, in her case, she had to attempt to access the agency of others to succeed academically. She stated:

> Getting out of my comfort zone really showed me there's more to life. You have to work for everything. Stop being ashamed. Just do it. People will laugh at you for now, for these two minutes, but then you can be great for the next twenty years, so why not?

Chabi discussed the qualities of her peers and interdependent relationships with them as follows:

> I have friends—I choose friends. I don't just have friends. I choose friends. So, most of my friends are high performers, distinction-types. So, I know my weakest points. So, we balance each other. So, that helps.

Faith described how a peer at UP motivated her to succeed and work hard. His successes propelled her to be disciplined in her approach to the first year of enrolment in her degree. She declared:

> The reason why I came to UP it was because of my friend. He got good results. We got the same results either way, but my Maths results were not that good. So, he's doing aeronautical engineering. As hard as that is, he has motivated me in such a way that, no matter how hard something may be, but if you put your mind and soul in it, you can do it. So that's always pushed me. If he can do it, why can't I?

4.5 Learning-interaction

In this section, students' learning strategies that intersect with the approaches to knowledge development are presented. The purpose of this exercise was to determine if students maintained learning strategies that were features of their pre-university Discourses or if they adopted new discursive moves that they were exposed to in the university environment. The study was also interested in determining if students evidenced a willingness to modify learning strategies as aspects of their academic Discourses.

4.5.1 Individual methods

4.5.1.1 Resource incorporation

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

Larry identified academic, human and technological resources as part of his first year Discourse. In relationship to academic resources that he consulted to enhance understanding of course content, Larry referred to resources received from lecturers as follows:

> The LST [academic literacy] handbook. Ja, I'm using that handbook to guide my structure of the paper and what it needs to look like. As well as if they release an um, structure—what they want—a structure guide, then I follow that quite closely.

Larry valued the agency of his LST academic literacy lecturer. He expressed his appreciation of her resourcefulness in the following disclosure: "Well, I guess, because of the LST class, you could say Dr Fouché because she taught that class. But not directly, like, sitting and helping. Nothing like that, no". Larry did not make specific mention of any technologies that he incorporated into his academic Discourse.

After being asked to identify resources that enhance her studies and enable the growth of her scientific Discourse, Ink referred predominantly to literary sources. Her practices follow:

> I have gone through a lot of Internet articles, like journals, where I've had to read those journals and then supplement them into my argumentative writing. Every now and then, I will read an academic book if I have the chance or other academic articles. But for the main part, it's just, kind of, the guidelines that we've been given for our various projects or assignments is the guidelines that I stick to in order to get the resources read and done.

As with Larry's case, Ink valued the agency of her academic literacy instructors. She reflected on the enabling resourcefulness of the LST staff in the following narrative extract:

> [T]o a large degree, my LST lecturers and tutors [influenced her writing]. As I said, I came in with previous knowledge of how to write argumentative essays, and my lecturer was quite impressed that I know all these things that he was trying to teach me, but there were also things—or areas—where I differed from what he was trying to teach me. And I would approach him or our LST tutors and ask them for help with editing, with proofreading, where I could fix or improve my essays. And I found that that has really helped me. My essays are now—they're fuller—if I can say that.

Like Larry and Ink, Aldoy emphasised the LST study guide as a helpful resource that enabled him to exert his agency through writing. He discussed his incorporation of this tool as follows:

> Usually, to make sure its [referencing] correct. Because sometimes you can forget a full-stop there, or a comma there or that some sort of thing … because sometimes it can get quite intense.

Kim described a preference for academic resources that came directly from her lecturers and modules to study. She integrated official course resources with consulting staff members. When asked to list helpful educational resources, Kim responded:

> Well, we've got, like, the lecture slides and stuff. But if it doesn't make sense to me or if I'm not quite understanding what's going on, then I'll refer to the textbook. If I don't understand that, I'll google it or speak to the lecturers or the tutors or—Ja—I would say my first step would go to—or refer to—the textbook.

Rural cohort (Richard, Katlego, Siyabonga, Shaka, Sara and Mary)

Richard did not make specific mention of material or human resources that were newly incorporated into his discursive approaches to his studies. Indirectly, however, Richard described a morphed development in how he approached notetaking and listening from his pre-university Discourse strategies towards the end of the semester. After being requested to describe a learning mechanism that still worked for him, Richard offered the following strategy:

> Absolutely just [being] active lectures. Staying active in the lectures and so on. Especially consulting—ok that's not quite as consistent. But especially being active in lectures, absolutely.

After being prompted, Richard clarified his perspective of what active listening entails while engaging his lecturer's agency. He reported:

> To not only listen but to, for reference, read the notes on the board, take them down. Everyday. Everyday. Not necessarily on really interesting matters in the syllabus but the core focus on the syllabus. I always write down and so on.

Richard's evolved learning strategies involved increased valuing of lecturers' agency and instruction as resources of knowledge. To facilitate closer pedagogic proximity to his lecturer and course content, Richard had to refine some of his academic literacy practices. These practices included listening and note-taking. Richard added that he started typing and using technology to help with language application. He stated:

> I'm quite using technology as a tool to improving my vocabulary now, mostly. Um, the facts after it, um, I have no other resources that I'm using these days. But definitely for the vocabulary.

Katlego informed the researcher that he preferred to consult YouTube videos to supplement his studies. He discussed their reference as follows:

> I am a person who believes in using those YouTube lessons. And because I have been long using those things, I can now check differences—this thing doesn't work; this person is a buyer or something like those things.

In relation to human resources, Katlego valued the agency and support of campus staff. He declared: "When it comes to writing, I can recommend my lecturers".

Siyabonga informed the researcher that when he wrote and studied, "it's basically pen and paper". He shared his preference in the following narrative extract:

> I am not good with computers. I can't study using digital things. So, everything with me it has to be a pen. Even the past papers, I have to make copies of them so that it becomes a hard copy. Then I study conducive with that. With a phone it's kinda difficult.

Siyabonga continued to draw on his personal agency and cars as a motivational resource. He stated:

> I actually motivate myself. Like I said, I just wake up in the morning and watch videos of cars as my source of motivation. So, in such a way, I tell myself that for me to get this kinda car, I have to be successful.

Shaka preferred to watch YouTube videos. This learning strategy was observed among numerous participants in the study. He explained his learning approach by noting:

> Watching video lessons always work. Watching video lessons always work. And I am type of solitary learner, so I just have to have my own textbook in a room, then study. That has always worked for me.

Shaka informed the researcher that he was coerced to consult human agency for academic support even though he studied solitarily. His strategy of accessing human resources for academic purposes was articulated in his reflection:

> I started to initiate with more students with my lectures. Ja, mostly with my lectures. Even before I attended my lecture, I went for Chemistry consultation. So, while I was in high school, I didn't consult, but I perform good. But in order for me to perform good here, I must consult.

Sara made minimal mention of consulting either human or material resources to enhance her studies. She did, however, acknowledge the inputs of peers into her writing. Neither did Sara refer to using technology for learning purposes.

Mary indicated that she had to use online tools for assistance due to struggles with language at the sentence level. When asked about which online tools she employed, Mary stated: "The Internet, yes. Then I go to Grammarly app—that one, ja. It helped me a lot".

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

Violet believes that human resources have assisted her studying methods. She warranted this view by asserting: "Because being around people you talk more, and you interact more". Here, Violet's newfound appreciation of academic agency, as discovered in UP, re-surfaces. Technologically, Violet utilised various tools. She listed her preferred technological resources in the following statement: "Facebook, Instagram—social media plays a huge role in interacting with people—yeah".

The LST academic literacy curriculum served as a learning resource for Denel. She indicates that the curriculum structure enabled her navigation of expert secondary discourses on campus beyond the LST module. Denel lists additional skills necessary for academic success that were embedded and developed in the LST curriculum: "Time management, and […] the weekly planner and the power hour". The LST curriculum, which is a social structure, enabled Denel's improved navigation of time.

Nemo indicated the incorporation of online technologies for learning purposes. He declared: "I do use the internet to—as a platform of gaining, increasing and applying it. Or adding my own opinion to it". Here, Nemo discussed how the Internet intersects with his writing strategies. Nemo continued to evidence aversion to agentic interactions, whether with campus staff or peers. He persisted in identifying animal agency and their possible extinction as a motivational variable in his academic Discourse. Nemo stated:

> I motivated myself because this [Veterinary Science] is something I really want to do. And outside influences as well. For example, extinction of a few species, endangering. I feel, you know, it's motivation for me to succeed in this.

Chabi recalled that through the semester, she used technology as a learning resource. When asked to discuss an educational resource she employed, Chabi referred to Turnitin.

> Turnitin is the first one. The level from high school to university—in university, we use Harvard methods for referencing—in high school, we didn't know it was important to reference a source or information. So, your [upgrade] from high school to university it was huge. In high school, we didn't have IT labs. We didn't have chemistry labs. We didn't have enough substances to make practicals. Ja, that's a big change for me.

Faith informed the researcher that reading was a central resource that aided her approaches to learning and writing. It is a practice that was part of her pre-university academic Discourse. Faith described her valuing and the benefits of reading multiple textual resources in the following reflection:

> I used to do a lot of readings. I still read a lot of books now. So, like, when you read, you can tell there was a mistake here—if you are quite used to the—you can tell there was a mistake here or I'm doing this wrong, I should use this other method right now. So, when you compare the advantages and disadvantages of those things that you read—like, when you criticise one and praise the other, you get to know what you must do right. And what you must not do.

4.5.2 Argumentation and writing

In this component of the analysis, students' approaches to and experiences of argumentation are highlighted. While it is imperative that the reader re-visits the theory and concepts (see Section 2.6) that shape this study's construct of argumentation, it is vital to reiterate, briefly, what is meant by academic argumentation in the context of this study. Argumentation is a discursive practice that scholars apply to enable the generation of knowledge. By virtue of argumentation being constituted of Discourses (Gee, 2012; 2015), argumentative practices vary according to their context of application and the cultural identities of interlocutors. This study highlights how first-year students participated in rhetorical and dialectical argumentation (see Sections 2.6.4-2.6.6). In addition, the analysis was interested in determining how informal logic and logical fallacies (see Section 2.6.3) shaped students' discursive interactions. Informal logic and fallacy principles are acceptable and unacceptable argumentative moves negotiated by interlocutors for argumentative

deliberation. Within this study's construct, any dialectic, rhetorical or written mode of producing knowledge that involves more than one scholar constitutes academic argumentation.

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

Larry described a dialectical and argumentative event in which students' cultural identities and Discourses interweaved with course content. Larry's class was debating ethical issues around medical interactions with cadavers. Larry illustrated how his primary Discourse intersected with dialectical and rhetorical argumentation in the following reflection:

> Because I'm a Christian, certain views like abortion or um … like, quite tense related [issues], I would be more like, well, in that case, pro-life because of what I believe. But also, things like, we had an example of organ donation because of cadavers and things like that, and for me it's fine, but for some people, um—I don't know, my beliefs were that to save other human lives, it's necessary. Especially since this person is dead, but some people were not very keen on it because, well, I don't know why they were not keen on it, but I just know they weren't.

Larry observed development in his argumentative writing since arriving at UP. When asked to explain his self-evaluation, Larry stated:

> I definitely feel like my skills have become a lot more refined, and … I feel like I write a lot better […] like my writing is a lot better than it was in high school.

Larry was asked to specify how his writing improved, and he responded as follows: "Getting my point across, I would say, being more precise with what I want to say, 'cause I used to be a bit vague". In this example, Larry illustrated his awareness that argumentative writing fulfils a dialectical role by persuading the reader of a stance.

Unlike Larry, Ink separated her spiritual primary Discourse from on-campus argumentation. This process manifested in written rhetoric and how Ink approached dialectical argumentation. Ink articulated her reasons for this discursive separation in the next narrative:

> I learnt from a very early stage in my argumentative writing that you have to discard those ideals. Especially if you want to bring in a completely objective essay. While I may be religious, I shouldn't be influencing my essay with those religious beliefs unless that was required of me. So, I learned very quickly to dissociate myself and write objectively as opposed to allowing those factors to influence what I had to say.

Ink admitted that group work involving written argumentation was frustrating in the dialectic and rhetoric domains. Specifically, as related to writing, Ink lamented the reality of varying writing capacities among peers. Differing levels of competency in argumentative writing among peers frustrated her own argumentation, as she detailed in the following narrative:

> I might write in a very high, formal standard. Whereas others will just write colloquially. And I found that very difficult to work together, but in the same breath, I just had to bite my tongue and grin and bear it, you know?

Kim expressed her value of a peer's input into her argumentative writing. She described the value of dialectical interactions with her peer that fed into her written arguments as ensues in the following remark:

> There's one girl in my class that I, if I'm struggling with something, or if I need help or whatever, then I'll ask her and, like, just maybe get her opinion or see what she says. And, like, sometimes the way she'll answer a question kind of makes me think, like, ok, that's not how I did it, should I change my answer, or should I maybe think of writing it another way or—that's the only way I can think of. Otherwise, no.

Concerning her argumentative writing, Kim expressed greater concern for her weaknesses in being persuasive at the sentence level than compared to engaging course theory. She described her struggles by stating:

> If I write, like, a paragraph and it's out of eleven marks, let's say, and I get five, then I know what I did is good. I just need to improve 'cause, like I said earlier, all the silly mistakes, it's probably just that. It's not really the content. It's more the discourse markers and the punctuation and that kind of thing.

Aldoy illustrated growth in argumentation and an appreciation for dialectical interactions with peers. While acknowledging that his degree modules did not formal present the genre of argumentative writing as an assessment, Aldoy, nevertheless, believed his writing capacities had improved. He declared:

> I was always strong with argumentative essays, like I said in the past. Since we haven't done many argumentative essays in the semester, or here in fact … but especially seeing other people's point of view on how they would agree, disagree especially with recent events [helps my own arguing].

When asked to identify on-campus interactions that enable his argumentative writing development, Aldoy referred to his academic literacy module. He stated:

> Usually in LST, when we learn how to do the assignment…or stuff in class, also in the assignment that we had to do in writing an assignment in an academic format…also trying to convey your idea and information in a proper and factual way, without your opinion or having any biased intention either, which also helps quite a lot with the writing.

Rural cohort (Richard, Katlego, Siyabonga, Shaka, Sara and Mary)

Like his peers in the previously discussed cohort, Richard referred to his academic literacy module as a structure where critical observations of his lecturers' and peers' interactions, if not dialectical engagement with them, shaped his argumentative Discourse. He expressed this agency as follows:

> I can't necessarily say there's a direct help and so with it, but LST especially got me in a bit of more academic mindset during writing, as to seeing the examiner's perspective and so on. Um, that's the only way– any other influence that there were.

About his development in argumentative writing since the beginning of the academic year, Richard referred to technology usage. He believes it has refined his application of grammatical rules and conventions emphasised in his academic literacy module. He noted:

> Well, typing any – argumentative or any essay now these days—I'm quite using technology as a tool to improving my vocabulary now, mostly. Um, the facts after it, um, I have no other resources that I'm using these days. But definitely for the vocabulary.

Katlego described an aversion to interactions with his peers. On the contrary, he trusted and "recommended" the knowledge of his lecturers. In describing his learning style that deliberately avoids rhetorical and dialectical interactions with peers, Katlego shared the following insight:

> In university, I just—I am a person who likes to do things individually. I just learn that thing from high school. Even in the university, I have people, but I can't recommend them as my friends. I study alone. I do everything alone. And the place that I can say around the university I use most of the time is the library. Even though, ever since I arrived here, I didn't have access to library books.

Katlego was aware that his capacity to apply English as an academic language has caused challenges that not all his peers experience as intensely as he does. Writing argumentatively was a struggle. Katlego contrasted his argumentative writing struggles with the abilities of some of his peers whom he perceived argue more confidently. He declared:

> I think in—the standard of English and the standard of writing. In high school, they always give us the benefit of the doubt. So, in the university, they master all. Because there are people who are speaking English—there are people who grew up in English. There're people who know English—every part of English they know how to write.

Siyabonga expressed an appreciation for the ways his LST academic literacy module empowered his argumentation writing growth. He differentiated between the culture of writing in his secondary school and the rigid conventions of written argumentation in higher education by sharing the following thoughts:

> Actually, I can say I've seen growth actually. 'Cause the way in high school they were teaching, it's kinda different than here. What I've noticed, like, the knowledge we had from high school, I could say it's a bit useless here in varsity. 'Cause, in LST, which is English, when we are writing the essays and stuff, the way we used to write in high school, you might get a zero out of the total.

When asked if his peers influenced his written or dialectical argumentation strategies, Siyabonga responded negatively. He stated:

> No, they don't, actually. I have a friend who actually doesn't study that much. He is kinda intelligent in a way of he grabs during lectures. While I am a person who have to go extra mile and reading textbooks. So, I would say everything I would do it myself actually.

After Shaka was asked if he participated in dialectical argumentation that fed into his argumentative writing, he responded affirmatively as follows:

> Yes, a friend. We are classmates. We stay at the same res. Before I came here, I was with her. Sometimes when we are doing assignments for LST, we assess each other. I also assess her's and then she assesses mine. Cause last time she helped me with writing […], and I also did help her, so we've been helping each other.

Shaka expressed his ancestral belief as he participated in rhetorical, dialectical and written argumentation on campus. His ancestors are a part of his academic Discourse. He shared his ontological outlook with the researcher in the next narrative:

> I think there is a link because my ancestors have been protecting me, so there is a link. Because like … from high school, I have been performing well. I think my ancestors were included because there was this time … okay, as Africans, we have different beliefs … during the semester … people from home, I don't know them, but they wanted to make me blind. Since there was a prophet, he told me and my Mom that there's someone trying

> to close my eyes because I've been succeeding all my life … okay, maybe not all my life, but I did go to varsity, and I did perform well last year. So, they told me that my grandfather, my grandfather is more like an ancestor; he passed away a long time ago. My grandfather has been protecting me, so there has been a link for me.

Sara revealed that the sociocultural environment of the Mamelodi campus increased her confidence to participate in rhetorical and dialectical interactions with peers. In her estimation, this was evidence of growth in her Discourse as a novice scientist. Sara divulged the following insights into her dialectical experiences:

> When I came here, I didn't actually have the courage to say what I think. Example, if we were in a group discussion, I really feel like my point isn't that important. And I sometimes feel like that the people—I felt actually—like the people were judging me. But, right now, it doesn't matter. I don't think of those. So, I just say what my opinion is.

Sara informed the researcher that her argumentative writing also showed signs of improvement due to enabling interactions with peers. In addition to on-campus informal logic, Sara stated that principles from her home culture remained active in her approaches to dialectical and argumentative writing. She stated:

> Some of the things, like, there are principles which I follow, and they are against some of the things that can distract me from studying. So, I really think that it contributed a lot, like, my beliefs and principles.

Mary continued to evidence a strong aversion to peer and other agentic interactions around her coursework. When asked what she struggled with during the semester, Mary stated:

> Self-study. Yoh, self-study is so hard. 'Cause sometimes you don't understand a concept, and you are all by yourself. So, you have to Google it … yoh it's a lot of work.

The significance of Mary's disclosure is its indication of minimal dialectical argumentation experiences with her peers around Discourses in her faculty. She admitted: "I don't like group work". When asked how her argumentative writing had improved, Mary replied: "Now I do understand the importance of discourse markers, but I don't know how—which specific discourse markers to apply". Mary and other participants in this study repeatedly mentioned "discourse markers" because they are introduced to the grammatical feature in the LST academic literacy curriculum.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

When asked if she developed in argumentative writing, Violet responded affirmatively. She warranted this stance by affirming that: “I think getting our point across is important—like from what’s right and wrong, ja”. When asked if human or material resources enabled the developmental morphing of her argumentative writing, Violet refers to people by saying: “I think human resources. Because being around people you talk more, and you interact more”. In this declaration, Violet indicated her valuing of dialectical and rhetorical interactions with her peers.

Denel’s experience was similar to Violet’s. Her appreciation for dialectical interactions with her peers was shared in this statement: “I didn’t like study groups. But now I find myself that I have to go to study group so, um, that I just get more out of, like, everything, like, academically”. Dialectic argumentation necessitated academic changes to Denel’s Discourse. She described these changes as follows:

> I had to try and stop being shy, so I could just get help and just, like, talk to people and get to know people so that I move forward ’cause I can’t do it alone. So, I have to, like, obviously know somebody; I have to talk to somebody.

The agency of Denel’s lecturer featured in her discussion around developments in her argumentative writing. Of this agency, she observed:

> I feel like she has had an influence on that ’cause, like, we’ll do an assignment, and then she’ll mark it, and she’ll come back to it, and she’ll mark and, like, write what’s wrong with a sentence, and like, what’s missing with it. She allows us to take it back and then go and fix it. So, I think that has really helped.

Nemo’s case continued to fascinate. He was possibly the most withdrawn of all the participants, more than Siyabonga, who was also reserved in temperament. When asked how, if at all, his learning strategies changed since the beginning of the year, Nemo stated: “Taking notes in class and then revising it at home. And study notes […] basically”.

The significance of this statement is its absence of the agency of peers or family members. Out of curiosity, when the researcher asked Nemo to mention an academic strength, he responded by saying: “I can study fine on my own and succeed on my own academically”. In addition, Nemo’s interactions with course content consisted of solitary modes. However, since the beginning of the academic year, Nemo maintained his passion for animal life. The agency of animals remained at the centre of his academic Discourse as disclosed in the ensuring perspective:

> I want to go into conservation, or zoology or something which is the study of animals. And I've always liked animals. And it's kind of like a voice of the voiceless. So, that's always been my motivation to succeed in this field, I guess.

When asked if his argumentative writing has improved, Nemo states: "Kind of. I'd say a little bit". After being asked to elaborate on how his argumentative writing has developed, Nemo specified his self-evaluation as follows:

> My reasoning in argumentative would be a little bit better. So, like, I found a way to—before I couldn't really express my reason. So, I know the reason, but I couldn't explain the reason. So, now I kind of feel like I can.

Chabi reasoned that she had grown as an argumentative writer. She distinguished between writing strategies in her pre-university Discourse with new modes of writing that she acquired at UP. Her discussion on this matter follows:

> Yes, definitely I have grown. From high school—ok, for example, in high school, when we are doing researches, we not focussing on the main idea. We just go to Internet, copy someone work, didn't know about plagiarism. You didn't put your own point of view. You just copy someone work and then not reference properly. So, now, I know how I have to research. I have to read article, analyse them, give conclusions.

When asked to identify agential interactions that enabled her argumentative writing, Chabi referred to her lecturers in Mamelodi. Of their input, she says:

> My LST lecturer helps a lot. How to write your main sentence, how to differentiate between a main sentence and a topic idea. Yes, how to put your facts. How to use discourse markers. How to construct a sentence. Those are such little things we didn't realise we are doing wrong while I was in high school.

Chabi's experiences of dialectical and rhetorical interactions among peers were not favourable. She expressed her strong aversion to "group" dialectical tasks as follows:

> I hate group work. I hate group work because I like doing things, or working, whenever I want to. Whenever I feel like doing that. Because sometimes, in group work, some people will just sit there, expect you to give all the facts. Just because they will take advantage.

In Chabi's perspective, group work did not represent dialectical opportunities to create knowledge. Rather, she experienced them as imbalanced presentations of data and the viewpoints of interlocutors.

Faith exuded confidence concerning the emergence of her argumentation Discourse and argumentative writing. She described the continuous morphing of her epistemic and ontological orientations in the university environment as follows:

> In terms of reasoning capacity, the way I see things now, like, it's a different perspective. It's more like this quiet change. Like, ten percent of what I used to be.

When queried as to whether her logical argumentation capacity growths were mirrored in her writing, Faith agreed. She responded:

> I think so, 'cause back then, before I came to varsity, I used to write sometimes when I got bored. But now, when I do it, I feel like I am more advanced. I can, like, write anything now. Without needing any kind of motivation or something.

After being requested to elaborate on her discussion of her new approach to argumentative writing, Faith asserted:

> Back then, when I was still in high school, I just used to write what came into my mind at that particular time. But now I need to check as to whether what I'm saying is in according to what I want people to read. Like, is there any message in what I'm writing? Who are my targeted audience? Stuff like that. 'Cause back then it used to be like, ok, this is what's in my mind. I'm going to write it. But now, I need to check as to what I'm writing is relevant.

4.6 Tier 3 — Discourse elaboration

T4 is affiliated with Archer's concept of "elaboration" in the morphogenic cycle. It is necessary to contextualise the concept of "elaboration" as employed in this data presentation section. "Group elaboration" is T4 in Archer's (1995: 194) morphogenic cycle. Elaboration follows socio-cultural *conditioning* of groups (T1) and group *interaction* as presented in T2 (Archer, 1995). During processes of social elaboration, which Archer (1995: 185) also terms cultural morphogenesis, structures, culture, and agency intersect to produce new forms of social entities. In the context of the current analysis, new and emergent social entities include students' argumentation Discourses. It is, however, vital to note that morphostasis, which is constrained emergence of new Discourses due to incongruent structures, culture, and agency, also occurs in learning environments (Archer, 1995). In the current analysis, students experienced morphogenic and morphostatic experiences in relation to the emergence of their argumentation Discourses.

4.6.1 Discourse motivation

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

At the end of the academic year, Larry indicated that he was still motivated by the same factors to succeed. His Discourse as an aspiring doctor was enhanced after being admitted to study Medicine at UP. Larry shared his views on motivation in the third tier by stating:

> I think I'm still motivated by the same factors because I've gotten into Medicine now. Now I'm just motivated by the fact that I need to secure that spot and then get into Medicine and maintain my current standing so that everything goes smoothly.

Larry indicated that his motivation stemmed from extrinsic and intrinsic factors as follows when asked about his sources of inspiration. After introspection, Larry declared:

> I think it would be a combination of both. I think I am very self-motivational when I am by myself. I do think it came from other sources like hearing I got into Medicine and getting a bursary, and things like that, that definitely boosted my confidence and motivation.

Ink maintained the stance that her pre-university Discourse was equipped with strong argumentation capacities, including writing. She did, however, acknowledge that she was motivated by new ways of approaching and developing knowledge in the university. She described the morphing of her academic attitude as follows:

> I've recently tried to change up my study methods in terms of absorbing information, taking it in and then applying that information to what I'm learning or to, say, for instance, projects or assignments or tests that I'm practising.

Aldoy indicated that he achieved his personal academic goal of discovering if he could succeed in the higher education library while coping with challenges arising from his dyslexia. He was motivated by his emergent realisation that he could succeed in studying at university level. Aldoy revealed that becoming aware of his academic strengths motivated him to consider new professional Discourse options. He discussed this perspective in the ensuing reflection:

> I wouldn't do [in the medical frontlines] because I don't do well with meeting too many new people. But with medical science, you're behind the scenes in the hospital, and you get all the samples; you need to do tests on them. Tests for whatever disease, virus or toxicity. I would like to do that.

Xenophobic events and argumentation that developed among peers on campus motivated Aldoy's belief in his capacity to interact dialectically in the university environment. He declared that argumentation events around contemporary South African challenges on campus with peers enabled his rhetorical and written argumentation in the next narrative:

> People have different morals and different values and, therefore, different arguments. So especially with recent events [violence against foreign nationals], some people will side with both sides of the argument. And especially with writing you have to be able to convey your idea properly and also in a nice way so as not to offend the other person if possible … but also to bring facts forward and that has definitely helped a lot.

Kim described a demotivating experience that shook her Discourse as a budding scientist. For the entire year, Kim's goal was to be accepted into the physiotherapy programme at UP. To recall, her parents work in this industry. Kim was rejected and had to choose a different Discourse path related to her academic and professional future. She described her recent experiences as follows:

> I found that I've almost lost focus this semester. It's like I feel like I'm not working towards any goal. 'Cause in the beginning of the year I wanted to do physio and now the—what do you call them?—the results are out that—so I haven't been accepted for physio next year. So, I was kind of obviously upset about it because that's what I so badly wanted to do.

Kim's acceptance into the Dietetics degree coerced her to elaborate her Discourse in ways that diverged from her pre-university academic goals. As she revealed, her Discourse was shifting from the physiotherapy domain to dietetics.

Rural cohort (Richard, Katlego, Siyabonga, Shaka and Sara)

Throughout the academic tiers, Richard indicated strong motivation based on his affiliation to expert agricultural Discourses off-campus. In addition, Richard was motivated to successfully pass his first year to fulfil all requirements for a bursary he received from his home community. He discussed his motivational shift as follows:

> The new factor is finishing this year [successfully], but the motivation throughout the year actually gave me quite perspective to my studies, and so on, was working in the holidays, and so on. Seeing where my degree will take me, and so on, it was my motivation.

Concerning his holidays, Richard received motivation by actively participating in agricultural projects. He provided the insight that ensues:

> Well, my future career is junior technical advisor. So, we shuffled it between the processing centre and doing consultation for farmers, and so on, which is in the field.

Intersecting experiences in the structures of the university and farming domains enabled, albeit in challenging ways, Richard's attempt to develop his Discourse as a scientist and farmer.

Katlego's motivation had taken a knock since the beginning of the academic year. Pressures and new ways of learning, communicating and being isolated him to an extent. He revealed insights into his academic battles through the following disclosure:

> You know, at the beginning of the year, I never thought, here is difficult than in high school because you face traumas and stuff. You are alone, no one to cry to because, even when you are telling them at home that here is tough, they say, but you managed to pass high school; therefore, even there you can pass, and they don't know that […] the situations are different.

Katlego revealed how it was difficult for him to interact with agency on campus in ways that enabled him to elaborate his Discourse as a novice scientist. He detailed how his motivation was affected through difficulties in modifying and adapting his learning style to campus-based strategies as follows:

> Regarding the matter of motivation, I think I perform, but I don't perform the way I expect myself to perform. The reason being I don't have a clear goal of where I want to go. So, I don't; I don't get much motivated. Because I don't have the end goal. I don't see myself where I'm heading to.

Katlego's divulgence of experiencing a sense of aimlessness in the university described his discursive challenges. He could not elaborate on his scientific Discourse due to difficulties in integrating his studies with future, expert Discourses.

When Siyabonga was queried about motivational variables that drive his approach to his studies, he declared:

> It's still the same factors. I want to add—to change—how can I put it? To change the situation that we are having at home so that it could be better now.

This divulgence revealed that Siyabonga's family's wellness remained a central component of his scientific Discourse at the end of the academic year. Siyabonga added that academic challenges also motivated him, irrespective of their level of difficulty. He stated: "I don't give up easily now".

Siyabonga indicated he had the determination to remain motivated as follows: “I didn’t do well in one of my modules. So, it encouraged me to not give up and try my best”.

Shaka also mentioned his desire to improve conditions at home as sources of motivation in his academic Discourse. When asked if he was still motivated by the same variables to succeed in T3 when compared with T1’s experiences, Shaka responded:

> They are still the same, ‘cause I know deep down that my mum wants to see me successful. So, even though she doesn’t tell me, but I know I must change the situation at home. So, that’s been a motivation.

Shaka added that there were intrinsic motivational variables that prompt agential actions around his scholarly Discourse. Two of these variables included his observation of homeless people and new approaches to assessments. Shaka added the following disclosures around motivation:

> While I am at res, at Hatfield, there are a lot of people that are homeless. So, I don’t wanna end up like that. So, that’s why I keep on studying. And then my other motivation is that on my first Chemistry test, I perform good—oh, the first one was a common test. The second one was semester test. Then I failed the semester test. Then that’s where the motivation came from.

Sara thrived in the academic environment during T3. In her pre-university experience, she was rejected by peers in her home community due to her ‘mixed’ racial identity. She was subsequently sent to a boarding school by her parents. The Mamelodi Campus of the University of Pretoria, unlike her hometown, continued to serve as a safe and enabling social structure towards her studying and argumentation throughout the academic year. In peer structures, Sara felt accepted and reported being motivated by her classmates’ agency. Suhlmann, Sassenberg, Nagengast and Trautwein (2018: 16) argue that students’ academic success relies on a strong “fit” between their identity, self-construal and university norms. When students experience that they belong in universities, their epistemic development is enhanced (Suhlmann et al., 2018). While Sara did not specify a career and degree structure she preferred to enter, she expressed a newly-developed awareness of degree and career paths she considered pursuing. This awareness emerged partially due to her having successfully made it to the end of the structure of the curriculum of the extended degree and the possibilities this success presented in terms of future disciplinary pathways.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

Violet revealed that her family's agency motivated her to succeed as the academic year came to an end. She summarised motivational variables in her end of year Discourse by integrating her agency, that of her family and the world, as follows:

> I like studying. I do want to succeed in life. I want to make my parents proud. And I just think that I want to make a difference in this world, somehow. I'm very, how do I say… I'm very motivated. I'm motivated all the time. Even if something brings me down, I just put it across, and I'm just really motivated.

Reflecting on extrinsic motivational factors that enhanced her academic Discourse, Denel mentioned her mother. She expressed the value of her mother's agency by sharing the following insight with the researcher: "I think what's motivating me to study is my mom". Denel indirectly connected her personal and academic Discourses in the university with her sense of motivation. She expressed an awareness of dual morphing of these two Discourses but struggled to articulate her perception of change as follows:

> I don't think I feel like the same person, but I don't know how I've changed. But I know for a fact that I'm not—I can't say for sure that I've stayed the same. I feel like a part of me has changed.

Regardless of the difficulty Denel experienced in describing her emergent Discourse, she admitted that most of the time, she had to be self-motivational on campus. This was because, as she declared:

> I struggled to finish some of—we had this one assignment, and we just had to keep adding sources to paragraphs, and I just didn't want to do it. And at one point, I just had to do it; I didn't have a choice.

Nemo indicated that having made it to the end of the academic year motivates him to keep pushing. He stated:

> I think, now more than ever, I am—the fact that we are almost done with our first year—next year we can choose where we want to be and kind of like go into what we're aiming for—is definitely a big factor.

Even though Nemo maintained his reserved composure, he expressed the perspective that his Discourse had grown through immersion in the Mamelodi campus. His confidence in his academic abilities and motivation interplayed with and propelled each other. Nemo observed:

> I think being here has given me the opportunity to be more myself. To be more independent in the choices that I make, and more confident in the things that I say or that I do. I'm more confident in myself, as a person and as a scientist, with the decisions that I make regarding academics or any personal decisions I make in my life.

Faith informed the researcher that her motivation levels were low. She stated: "Honestly speaking, I don't even have any motivation at the moment. It's tough". When pressed on why her motivational levels are low, Faith responded by stating:

> I don't know. I feel like this [higher education] is too much. It's not what I expected. I knew it was going to be tough, but I didn't expect it was going to be this tough.

While Faith conveyed that her academic motivation took a knock, which in turn constrained the elaboration of her scientific Discourse, she exuded optimism that displayed at the end of the year as follows:

> I am always positive. Regardless of the situation, I am always positive. Even though the work is overloading and all that, but I am always positive that if someone is able to pass this module, why can't I? Although it's difficult and all that, why can't I pass it? So, I always have that positive attitude towards everything.

4.6.2 Agentic inputs

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

When Larry was asked if there were any individuals who he would identify as significantly shaping his scientific Discourse and his approaches to arguing, he singled out his academic literacy lecturer. Larry noted:

> Our LST lecturer, she definitely helped us in terms of getting on to university writing from now until—from the beginning of the year—up until now. But seeing as classes have come to an end, I think that's been the only sort of influence.

Larry informed the researcher that the off-campus agency shaped and motivated his agentic approach to elaborating his Discourse as a scientist. He shared that:

> My parents are very good sources of motivation. My girlfriend too, but they are very standard, so it's not over the top. 'Cause I think they all know I am very motivated, so they don't wanna kind of overdo it.

By way of feedback to her writing, Ink acknowledged agentic input from her LST lecturer as an enabling mechanism towards her Discourse development. She said:

> When we hand in […] reading reports or the different essays that we've written […] and receiving feedback from the lecturer saying, this quality is above average, or your peer assessments come back, and you're getting 90s for your peer assessments or just people commenting and saying, wow, you know, this, this writing is really good.

At the end of the academic year, Aldoy continued to rely primarily on his mother's agency to cope with learning. To navigate the rigour of his studies as well as his dyslexia, Aldoy disclosed that: "[O]ne thing that I've always done is basically teach my mom the stuff I learn because I learn best that way by teaching someone else".

Kim reported, as follows, that she continued to prefer working solitarily in the library or online spaces. She stated: "I don't really use people as sources 'cause, mostly 'cause I don't really know anyone that would have the information" [she needed]. Kim elaborated on her solitary academic Discourse by noting:

> I don't really compare my stuff to other people's stuff or their work to my work. But, yes, because if we're going through a memo in a class, or whatever, then my answer will be right, and someone else's will be wrong, or the other way around.

While Kim's scientific and academic Discourses did elaborate, in the sense that she had embraced Dietetics as a new field of study, her openness to peer interactions was constrained. In this context, the elaboration of Kim's Discourse, specifically as incorporating peer agency, was limited.

Rural cohort (Richard, Katlego, Siyabonga, Shaka and Sara)

Richard described a preference for self-reliance, like Kim, during on-campus curricula interactions. He stated: "I would say having to actually do a project took a lot of motivation on my side to engage in the action, and so on. So, it would be self-motivation". However, it must be noted that Richard had continuous interactions with agency on his parents' farm, his hometown farming community and the scientists who work there. Richard's Discourse elaboration is an example of a novice scholar who equally draws on personal and academic agency and structures as a learning strategy.

Katlego isolated himself from on- and off-campus agency as he attempted to succeed academically. In relation to his mother, Katlego stated:

> I am independent. I live alone. I don't have to go to mom and ask her and all those things like that.

Katlego evidenced agential distance with community members at home as in his relationship with his mother. The researcher sensed that Katlego missed home, but the agents in his community could not participate in the campus discourses that he had to master. He discussed their constrained agency as follows:

> So, I had to consult some of the people I know. Some they are in university and some [are at home]—every time when I told those people [about my struggles], they didn't say much because they were always saying that we believe in you.

Katlego's case is an example of a student who has difficulty accessing on- and off-campus agency to elaborate his Discourse. Due to his tendency to withdraw from social interactions, compounded by learning difficulties, Katlego's Discourse's morphing into new forms was constrained.

Siyabonga, like Katlego, preferred to study in solitude. He had maintained this stance since the researcher's initial encounter with him at the beginning of the academic year. Siyabonga described his aversion to peer agency interactivity by stating:

> I am an introvert. I don't like being around people. So, for me to, like, study very effectively, I study alone at around—when it's night actually. I am effective during the night. So, during the day, I won't be saying I am studying, actually.

Of note, Siyabonga reminded the researcher that cars, especially Audis, were at the top of his academic motivators. He stated:

> I actually motivate myself. I just wake up in the morning and watch videos of cars as my source of motivation. So, in such a way I tell myself that for me to get this kinda car, I have to be successful.

Shaka indicated that he had no choice but to alter his discursive interactions with the academic agency. He described shifts he has had to make in relation to his approach to classroom interactions in the following reflection:

> There were key changes. Huge ones. 'Cause at the first time I was the type of learner that I didn't want to study in the class, like, I hated homeworks. I was the type of learner that after classes I would go home and study alone, but ever since I started writing tests and I saw my marks, I was impressed, and I started to—to what is it? To initiate in class. To do all activities in class. And I change a lot.

While Shaka opened up to agentic inputs into his scientific Discourse, he maintained previous learning strategies, inherited from his pre-university Discourse, as discussed in the ensuing narrative:

> Watching video lessons always work. Watching video lessons always work. And I am type of solitary learner, so I just have to have my own textbook in a room, then study. That has always worked for me.

Sara described a willingness to access an on-campus agency to enhance her understanding of course content and her scientific Discourse. When asked about whom she interacted with, Sara stated:

> Anyone at the department[s], whether a lecturer or a tutor. Yeah. Just anyone I find at that moment.

Mary revealed that she continued to study and work in solitude. She also informed the lecturer that she was struggling academically. She stated: “I’m still doing it [learning] the same”. Unlike her peers in this cohort who wilfully accessed peer and staff agency or tapped into these resources due to need, Mary’s pre-university Discourse, which involved working alone, was elaborated in T3.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

As Violet progressed from T1 to 2, there was evidence of morphing of her shy and generally reserved academic Discourse to an open personality that embraced agentic inputs. Reflecting on this morphing of her Discourse, she said:

> I think that there is a huge change in my personality because when I first came to university, I was a very quiet person. I used to never socialise much with people. It takes me a lot of time to warm up to people. And once I came to university, I started interacting more with people, socialising more, and I actually made a lot of friends.

In describing the new ways she interacted with peer relationships, Violet stated:

> I don’t study alone. I study in a study group with my friends. It does make a huge difference because what I don’t know, they teach me. And what they don’t know, I teach them. And it’s really boosted up my marks.

Violet’s parents’ agency and the well-being of the world featured in her T3 academic Discourse. She declared: “I want to make my parents proud. And I just think that I want to make a difference in this world, somehow”.

Denel exposed aversion to agentic inputs from peers and staff at the Mamelodi campus. She stated: “I don’t remember getting any help or motivation to do any writing… no”. In articulating her mother’s significance in her academic Discourse, Denel observed:

> She’s always just pushing me because she just always says she doesn’t want my other family members [to influence me negatively].

T3 marked the first engagement with Nemo that he articulates a willingness to incorporate peer agency. Due to the increased pressures of the academic year, Nemo divulged his new awareness as follows:

> Being surrounded by people that are new and that I didn’t know from high school has given me an opportunity to […] develop myself more into the person I feel I am, and not the little box that high school shoves you in

Nemo’s relentless persistence in maintaining an independent academic Discourse was revealed in the ensuing thoughts around interactions in UP. He believed it had been enabling, as he explained in the next narrative:

> To be more independent in the choices that I make, and more confident in the things that I say or that I do. I’m definitely more confident in myself, as a person and as a scientist, with the decisions that I make regarding academics.

Living at home with her grandmother, Chabi struggled to navigate and incorporate agency in ways that elaborate her Discourse as a novice scientist in developmental ways. The very process of traversing the home and campus domains caused pressures that affected her negatively. Chabi indicated that she had to wait until her family went to sleep at night before studying effectively. This was because her home, located in an urban township, was small and accommodate many family members. Due to the noise levels in her home, the most conducive time for her to study was after everyone had gone to sleep. However, her motivation was embedded in her home and family, as she stated: “I want to add—to change—how can I put it? To change the situation that we are having at home, so that it could be better now”.

Faith disclosed that she accessed multiple agentic inputs to enhance her scientific Discourse. Some of her methods, for example, in communicating with peers, involved communicative technologies. She reasoned:

> On my WhatsApp we’ve got study group. We post questions, we answer them. We even do video calls doing certain problems.

Faith's LST academic literacy lecturer featured in her agentic inputs. She mentioned her agency by stating:

> My LST lecturer, Mrs Rahool. She has been so—I don't know how to put it, but she's helped me a lot. When I first came here to UP, I thought I was—my grammar was perfect and all that. But when she started to introduce this module, I started to see things in a different perspective. I needed some kind of foundation for my language. And she was there to provide that.

4.7 Learning interactions

In this section of the study, students' learning interactions in T3 are highlighted. Their interactive experiences are presented according to individual, academic methods, methods of incorporating educational resources into scientific Discourses and approaches to argumentative writing.

4.7.1 Individual methods

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

Larry indicated a personal Discourse shift in his approach to his studies. To reiterate, by T3, he discovered that he had been accepted to study medicine. After being asked to describe a change in his learning methods, Larry shared the following insight:

> In the beginning of the year I, with university work I—when I was in matric, I did a lot of past papers and things like that, and I don't know if that helped this—when I got to university, I kept a pretty consistent method of studying that involves a lot less past papers. So, that's the only thing that's changed.

The researcher asked Larry which methods he still applied that enabled and strengthened his Discourse as a future medical practitioner. Larry provided a brief description as ensues:

> I kind of brute force it. So, I go over it once or twice, and then I try to commit it to memory. And then I will go over the things but go over a section and look at it, and if I've gotten anything wrong anywhere through, or if I forget something, I start from the beginning of that section and go through it again.

While Larry's method enabled him to succeed, there was an indication specifically related to these study methods as a strategy for navigating the curriculum; there was no significant Discourse shift. As he stated: "From the beginning of the year to now, I haven't changed much of my study methods".

Ink was aware of a morphing of her approaches to learning. She stated:

> I am changing. I realised that my study method wasn't a reliable study method to work with. I can't just synthesise all the information and hope that it goes into my brain. I have to spend hours on it and make mind maps or something to make the connection between the work.

Ink's Discourse presented additional evidence of morphing through her awareness of differences between her approaches to knowledge presentation and learning. She shared an example of such awareness in an interaction with a lecturer as follows:

> I came in with previous knowledge of how to write argumentative essays, and my lecturer was quite impressed that I know all these things that she was trying to teach me, but there were also things—or areas—where I differed from what she was trying to teach me.

Even though Ink acknowledged epistemic differences with her lecturer, she informed the lecturer that she had adapted her learning approaches by incorporating their agency (advice) in her emerging scientific Discourse.

To cope with his dyslexia, Aldoy continues to attempt to balance interactions with his mother, on-campus agency and his mental health. When asked about possible new approaches to science that shape his Discourse and learning methods, Aldoy states:

> I do more exercise now, so I have more energy slash motivation due to exercise and dopamine levels.

While Aldoy's mother remained the primary educational agent in his first-year journey, he admitted to appreciating "seeing other peoples' point of view on how they would agree [and] disagree", as he argued in learning interactions.

In relationship to her personal approach to learning, Kim suggested morphostasis as follows:

> In the first semester, I found that the way I was doing things was working. And, like I said, my second semester is—I'm finding it a lot more harder, so I've just kept everything the same, and the way I do things where I get through everything—I've kept it the same because I found that it worked for me. So, I haven't changed anything.

Kim added that getting rejected from acceptance into Physiotherapy caused a significant Discourse shift. This epistemic and professional re-alignment manifested in her T3 learning methods. She shared the following perspectives:

> [N]ow that I was not accepted, I need to look at something else. So, luckily my second choice is dietetics and I got accepted for that.

The stress of having had to shift her preparation from one degree to another filtered into Kim's actual approaches to learning as the academic year came to an end in Term 3. She suggested that her approaches to time-management were evidence of a new approach to learning. Her discussion of time follows:

> I find that like I'll usually waste a lot of time doing everything of, like—the most random things—instead of studying. So, when I get home, I finish all my homework, all my assignments that are due today or tomorrow or whatever. And I just do everything now while it's—while I still have a lot of time. Tomorrow I'll have time to do something that's due only next week, or I'll have time tomorrow to study for the test on Friday, or—I find that if I do things now, I'll have more time to prepare for something that's more important. So that's basically [something new] I've been doing.

Rural cohort (Richard, Katlego, Siyabonga, Shaka, Sara and Mary)

Richard claimed that his approach to learning since T1 had changed. When asked to speak about this experience, he states:

> It's radically changed. Well, not necessarily the approach but the amount of hours and actually filtering the content of what would be important definitely changed.

Richard was asked to clarify what he means by "filtering" course content. He explained his method as follows:

> Actually, knowing and identifying what to learn for an upcoming test, and so on, within a module, and so on—basing that on what we've discussed in lectures and tutorials and not studying unnecessary work at the end of the day.

Richard's declaration highlighted his awareness that knowledge in higher education was generated actively through dialect and rhetoric. This awareness enabled the morphing of his Discourse through modifying his learning methods.

Katlego stated: "At the beginning of the year, I was using the method I was using in high school". This method was based on being continuously being advised before tests and assessments about the scope and content. However, at university, Katlego had been coerced to change his methods. He said: "Here, you have to prepare for yourself. You have to make appointments for you to consult and stuff". Katlego was referring to the office hours of lecturers that he was not

accustomed to. Working with more rigid agential relationships in the university morphed his academic Discourse towards increased self-reliance.

Siyabonga continued his strategy of studying at night. He did not evidence much change from this autonomous strategy. When asked to describe his practice, he stated:

> Right now, I am studying at night like I did before. Each and every night, I study for a specific module for an hour or less. And I am still using that method even today.

When asked if he had increased interactions with peers around his studies at all, Siyabonga stated affirmatively. After being pressed to describe how they assist his studies, he said: “They have shown me ways to write which I found good”. The researcher was persistent and asked Siyabonga about specific ways that his peers assisted him, and he responded as follows: “They’ve told me that before I write, I should think about what I’m gonna write”.

Shaka indicated that he had to alter his study methods. He stated: “Before we wrote tests last semester, I didn’t complete all the homeworks that we were told to do”. This negligence affected his marks, and seeing his peers succeed motivated him to be more serious about his modules. Shaka continued: “This time, I work through problems before coming to class”. When asked if there were previous learning strategies that he continued to employ from his pre-university Discourse in T2, Shaka stated: “Watching video lessons. I can’t survive without video lessons”.

Sara stated that she had detected a developmental morphing of her Discourse since the beginning of the academic year. When requested to describe this change, she responded by saying:

> I can see great changes. Like, I am very confident than before. And I think I have a best of life, like, I can adapt easily by now—compared to the previous months and, ja… I am now better.

Sara’s optimistic outlook emerged from increased willingness to interact with her peers in dialect and rhetorical interactions. Sara acknowledged her home culture’s efficaciousness in her academic Discourse in T3 by reflecting:

> There are principles which I follow, and they are against some of the things that can distract me from studying. So, I really think that it contributed a lot, like, my beliefs and principles.

Mary made minimal references to interactions with the agency of her peers and the cultures of her disciplines at the University of Pretoria. When asked if there were peers and other agents on campus who enhanced her Discourse as a scholar in T3, Mary responded negatively. When queried about whether she was motivated by intrinsic or extrinsic factors which enable her study, Mary made a vague reference to a motivational speaker she heard at the beginning of the academic year. It was difficult to determine how this individual's influence intersected with her studies. In addition, when asked who he was, Mary responded: "I forgot. I even forgot the guy's name". Mary's incorporation of peer, instructor and professional agency through the academic year remain constrained. Due to these constraints, her emerging Discourse as an argumentative scholar was restricted.

Urban, township-emergent students (Violet, Denel, Nemo, Chabi and Faith)

Violet reported a morphing of her scientific Discourse through modifications of agential interactions by overcoming shyness. When asked which agency enhances her learning, Violet responded by saying: "Lecturers and tutors. Mostly LST". Violet added that self-motivation was central to advancing her learning as follows: "I think I am mostly self-motivated. I just think of the end goal and, ja, it's mostly me". Even though Violet had self-motivation, she embedded peers' agency in her method of learning as articulated in the following narrative:

> [Group work] make[s] a huge difference because what I don't know, they teach me. And what they don't know, I teach them. And it's really boosted up my marks.

When asked if there were any modifications to her personal learning methods, Denel replied: "No". The researcher asked her to describe methods of learning that she continued to employ. Denel's response follows:

> I use a weekly planner, and I just highlight whatever I've done. Every day I use different colours. Every Wednesday, I use purple; every Thursday, I use yellow or something. That's how I work. And then, ja, I still use colours when I study; I use mind maps. I always write notes. I can't study without notes. It's still the same.

Nemo acknowledged changes in his Discourse concerning his approaches to learning and science. When asked if working his way up until the end of the academic year had generated any changes in his orientations, he responded affirmatively, noting that: "I have started making more in-depth notes in class. Then when the time comes to study for a test, I have less work to go through because it's already sunk in, and it's in detail enough for me to just scan over that paper a few times". Concerning his motivation and what was driving him to succeed, Nemo remarked: "In addition to wanting to pursue veterinary sciences now more than ever, I am—the fact that we

are almost done with our first year—next year we can choose where we want to be and kind of like go into what we're aiming for—is definitely a big factor". Indicating a break from his preference for solitary study and incorporation of peer agency into his Discourse, Nemo shared the following disclosure:

> I have a very strong group of friends now. Better than in the end of the first semester. And we're definitely very solid, and each of us contributes something different too—we do a lot of our homework and a lot of our tutorials together. We discuss them as a group because a lot of us think differently.

Chabi[4] expressed a newness with respect to her studies in the natural sciences at the end of the academic year. She declared: "From what I have realised […] I have improved from before". When asked to clarify what she means by "improved", Chabi responded: "For example, my marks, they have improved. That's what I can say". Chabi appeared withdrawn, and the researcher attempted to find out what was motivating her at this endpoint of the academic year. Chabi simply replied: "Call it self-motivation". When asked if she continued to draw on her home culture, Chabi replied that she did not. The pressure of the first year had seen her withdraw from supportive structures and agency on campus. Due to this withdrawal, her access to the culture and agency of her lecturers was minimised in her orientations to science and argumentative writing.

Faith exuded an enthusiastic attitude towards her studies at the end phase of the academic year. When asked if there were any changes towards her understanding of science and her learning approaches, Faith responded affirmatively, observing:

> My approach to certain situations has changed. I feel like I am more mature than before. So, it means my decisions are more mature. There are certain things that I am like if it was during the first month, or maybe if it was during January, I would have taken this decision, but now it's totally different.

Due to the intensity of the extended degrees curriculum, Faith had learned to access strong characteristics of her personality and personal culture to aid her studying.

[4] There was a serious event that occurred which affected Chabi. As a result, the researcher had to handle this case with extreme sensitivity.

4.7.2 Resource incorporation

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

Students' capacities to employ multiple technological and additional learning materials for academic success constitutes part of the first-year Discourse. When asked to identify resources that he had drawn upon to enhance his learning and arguing, Larry shared the following insights:

> We use Google Drive to access—to pool—all the knowledge in group projects. We use that. I'll use Google scholar to find the knowledge. But […] I don't really go to the libraries and things like that, as much for certain projects than we did for the rest.

Additional resources that Ink navigated to advance her learning included online platforms. She expressed these resources as enabling the developmental morphing of her scientific Discourse as follows: "I have gone through a lot of Internet articles, like journals, where I've had to read those journals and then supplement them into my argumentative writing. Every now and then, I will read an academic book if I have the chance or other academic articles". Ink saw value in the resources that were accessible in the library. This appreciation emerged due to her enjoyment of being online and having a wide array of texts at her disposal that advanced her written argumentation. She said: "There's a lot to be read in the library. There's a lot of sources, examples—just how journal articles are set out […] I can follow the same structure. And at the same time use those as sources for my assignment". When asked if she used hard and soft copy journals, Ink expanded on her strategy as follows:

> I access databases. It's a lot easier to get the information through the Internet or through a database, as opposed to finding hard copies. Also, hard copies tend to be limited. So, if someone else has the journal that I need, I can't get it. So, I'd rather go through a database where everyone has access to that.

When requested to describe resources that he accessed to enhance his Discourse as a novice scientist, Aldoy referred to future plans. He stated: "I am trying to look for job shadows to see if I would like to do that. Do I like microbiology that much?" Aldoy's goal, which stemmed from his pre-university Discourse, revolved around determining his academic strengths while juggling dyslexia.

After Kim was queried about possibly accessing resources that aided her arguing and knowledge acquisition, she stated:

> I visit the library often, and most of my resources are the books here. And journals, a lot of them are online. I know there's a—it's called ResearchGate—I don't know if you know it. I use that very often, and I get emails about different sources and stuff and all of that. So, I do use that a lot. And that's about all.

While Kim was comfortable accessing data sources through online platforms, her narrative indicated that since T1, her preference for working solitary on campus had persisted.

Rural cohort (Richard, Katlego, Siyabonga, Shaka, Sara and Mary)

Richard informed the researcher that he had incorporated the application of new resources into his academic Discourse. He described his new applications as follows:

> I am not sure what the website is—and I used quite a lot of EndNote to help me with my referencing. And just to, in the academic writing, reference correctly at the end of the day.

The researcher followed up on Richard's application of EndNote and asked how he learned about this learning resource. Richard stated: "It's a former student, which is now—well would be—my future colleague. He introduced me to it". It turned out Richard had been exposed to this former student who had completed his PhD at the University of Pretoria in his hometown and farming community.

Katlego informed the researcher that past exam papers were resources he incorporated into his learning strategies. In addition, he stated: "I'm also using YouTube videos. Because I'm that kind of a student that if I see things, then I won't forget them, rather than reading them". This statement is significant as reading is ubiquitous in the university environment. Indirectly, Katlego indicated morphostasis of academic Discourse that involved reading. In addition, Katlego's persistence in learning from YouTube videos as he did during his pre-university Discourse phase indicated constraints in his willingness to incorporating new learning resources into his emerging, scholarly identity.

Inversely, Siyabonga indicated there was more reading in learning resources he consulted. He remarked: "Right now, I am reading more than I did before. And I understand some contents more". When asked if additional resources he employed to study, Siyabonga stated: "My cell phone and laptop sometimes". The researcher asked him why he incorporated these tools into his learning strategies, and Siyabonga observed: "They help me to understand some things better". Siyabonga was struggling to adapt to the culture of using technology for academic purposes. He preferred "pen and paper". In describing his difficulties in navigating the campus's online learning management system, he said: "I am not good with computers. I can't study using digital things. So, everything with me it has to be a pen. Even the past papers, I have to make

copies of them so that it becomes a hard copy". With online learning becoming ever more ubiquitous, Siyabonga revealed how this aspect of higher education was an additional hurdle he had to overcome to demonstrate competency in academic writing and argumentation.

Shaka informed the researcher that working in the veterinary clinic at the Mamelodi campus was an inspiring resource for his studies. When asked about resources he tapped into that advanced his studies, Shaka stated: "At the veterinary clinic. I've always wanted to be an animal doctor since Grade 11". Interacting in the veterinary clinic at the Mamelodi campus enabled Shaka's exposure to Discourses of that domain.

When asked if there were social structures on campus that enabled her argumentative development, Sara indicated that she valued the library and the classroom resources. She detailed how she drew on the powers and activities of these structures through the following response:

> Reading some books in the library can really expand your vocabulary and how you structure your points. So, I think that's a place where, or maybe in the classroom, like when other learners are talking or doing like I can relate to how they're thinking. And if I think they're better than me, that motivates me to do better.

In the final phase of the academic year, time as a resource had impacted on Mary as it had many other participants. The first structure she referred to when asked if she had experienced any growth or changes in her epistemic strategies, was: "Last semester I used to like prepare for a test, just the day before the exam. So now I have to prepare like maybe three days before. So yes". Concerning assessments as social structures, Mary added: "At the beginning, I thought that I could work better under pressure but [it] didn't work. 'Cause every time when my marks came, yoh, they were not good. But now they are very good". When queried about new strategies she may have started applying since the beginning of the academic year or second semester, Mary did not verbally provide specifics. However, she revealed that working in online learning structures had been difficult. She appeared relieved that, even if temporarily, she did not have to interact in that domain during the vacation. Her views of online assessments were as follows: "Last semester we had like, many online tests, so that drained me and took a lot of time. So yes, this semester, we don't have a lot of online tests. So, I'm really coping with what I'm doing and studying".

4.7.3 Argumentation and writing

Urban, suburban cohort (Larry, Ink, Aldoy and Kim)

When queried about possible argumentation interactions and writing experiences that shaped his scientific Discourse in T3, Larry stated: “I am not really sure I have grown. I don’t think I’ve really had the opportunity to expand that sort of area”. This statement caught the researcher by surprise, as Larry performed exceptionally well across modules and the three tiers. He added: “I think I have stayed more or less where I have been since the beginning of the year”. While Larry did not recognise enhancement of his scholarly Discourse as related to argumentation or specific writing practices, he was aware of conventions that distinguished writing from his pre-university Discourse and that of higher education. Larry observed:

> In school, they want you to—there’s a lot of—they want you to have a plot and that sort of thing. University-level writing is straight to the point. Very, this is what’s going to happen, you give everything away in the introduction. You explain everything else throughout the rest of the passage. Whereas school writing, there is a lot of explaining and introducing of other stuff.

Larry described aversion to dialectical and rhetorical interactions in peer groups. He experienced them as constrained opportunities for peers to share knowledge through dialectical reasoning equally. He stated:

> Group work works as long as people do tend to do their work properly and as they’ve been told. It’s a little bit difficult sometimes when you are working with people who don’t do what they need to do, or they do it last minute, which causes a lot of unnecessary stress and problems.

During the T1 phase, Ink informed the researcher that she was confident in argumentative and academic writing. Her perspective at the end of the academic year was that her argumentation through writing had solidified by complementing it with extra reading. She stated:

> I have gone through a lot of Internet articles, like journals, where I’ve had to read those journals and then supplement them into my argumentative writing. Every now and then, I will read an academic book if I have the chance or other scholarly articles. There’s a lot to be read in the library. There’s a lot of sources, examples—just how journal articles are set out […] I can follow the same structure. And at the same time, I use those as sources for my assignment.

Ink revealed her increased appreciation of the significance of structure for argumentative writing. This awareness was cultivated through independent reading and interactions with her academic literacy curriculum. She observed:

> I think there's a large role that structure has had on my academic writing. I had a very basic understanding of how to set things up. And I have been taught now the correct structure, the correct format. And all those other little factors that influence the structure of the essay.

Aldoy did not discern significant development in his argumentative and academic writing skills since arriving at UP. This was because, like Ink, his view was that his pre-university Discourse was competent in these practices. He reflected on this matter as follows:

> I was always strong with argumentative essays, like I said in the past. Since we haven't done many argumentative essays in the semester, or here in fact…but especially seeing other people's point of view on how they would agree, disagree [helps writing].

When pressed on possible new written discursive strategies he employed, Aldoy informed the researcher that he used multiple resources to enhance his written argumentation, including the LST study guide. His disclosure follows:

> New ones are usually the LST book for referencing. Usually, to make sure its correct. Because sometimes you can forget a full-stop there, or a comma there or that some sort of thing…because sometimes it can get quite intense. Especially with the previous assignment because there's a lot of resources. And also just trying to use discourse markers more.

Kim expressed morphostasis when asked about emergent development in her argumentative writing. She informed the researcher:

> I think it hasn't really changed. I'm maybe still at the same level as I was in the beginning of the year. But I think now, after—well now we're almost through the year—I think now I have a bit more knowledge. If I had to, I could apply it, and I could do it, but I don't apply it.

Kim explained her sense of argumentative morphostasis due to minimal dialectical interactions with peers or awareness of argumentation features in her writing. Due to the persistence of her pre-university Discourse's tendency to work solitarily, Kim hesitated to draw on-campus agency in her argumentative writing. Her experiences reflecting agentic and dialectic distance in T3 follows:

> I don't really do much writing other than assignments and all of that. I haven't spoken to people about any information or getting information for assignments or whatever. I haven't spoken to—I don't really use people as sources 'cause, mostly 'cause, I don't really know anyone that would have the information.

Rural cohort (Richard, Katlego, Siyabonga, Shaka, Sara and Mary)

Richard's interactions with the researcher suggested that his development in applying academic literacy practices for knowledge development had morphed primarily at the sentence level. Richard mentioned technologies that assisted his refinement in writing in the following reflection:

> I am not sure what the website is—and I used quite a lot of EndNote to help me with my referencing. And just to, in the academic writing, reference correctly at the end of the day. In regards to language, I didn't change much.

Richard's dialectical interactions with the academic literacy tutor do not reflect argumentation in his disclosures to the researcher. As in his accessing of websites, the tutor helped Richard formulate his thoughts predominantly at the sentence level. Richard shared this interaction with the tutor's agency in the ensuing recollection:

In the actual writing, and it goes through all my subjects, my LST tutor helped me quite a lot. Language and the actual structure of the academic document was incorrect. So, ja, that quite helped me in the sense that she helped me with sentence construction—I don't like discourse markers and all that—so, she helped me to synthesise correctly, and so on.

Katlego described argumentative writing as a battle. When asked about possible growth in arguing through language, he states:

> I think I fought this thing alone. I can't really recommend somebody and that he or she helped me because I was fighting this alone. Even now, you can see I'm always alone.

Katlego had a strong dislike for group work. He did not express the value of dialectical and rhetorical interactions in these structures as related to his academic writing and developmental morphing of his scientific Discourse. However, he valued his academic literacy module. Katlego informed the researcher: "I'm doing a module called an LST module, and it deals with academic English. It's there that I had more opportunities to express myself". Specifically, as related to his writing, Katlego observed growth since his experiences in T1. He described this perspective of developmental morphing as ensues: "I think that from the intellectual part, my writing has changed a lot because even now I look at my first semester's essay and I can't compare that. I see many mistakes". After being asked to identity contrasts between T1 and 3 writing, Katlego declared:

> English in general. The English that I was using there [in secondary school] was just basic. You can see that it has the culture and the background that I'm coming from.

Above, Katlego expressed his awareness of distinctions between how he was introduced to secondary discourses in his school and home community and discursive modes of arguing through writing in universities.

While Siyabonga valued his lecturer's support, he stated that he did not like exposing his potential weaknesses in academic literacy to on-campus agents. He shared this inclination by saying: "I try hard to figure everything myself. So, I don't think there's people who helped me". Siyabonga was struggling to adapt to the culture of using technology for academic purposes. He preferred "pen and paper". In describing his difficulties in navigating the campus's online learning management system, he said:

> I am not good with computers. I can't study using digital things. So, everything with me it has to be a pen. Even the past papers, I have to make copies of them so that it becomes a hard copy.

With online learning becoming ever more ubiquitous, Siyabonga revealed how this aspect of higher education was an additional hurdle he had to overcome to demonstrate competency in argumentative writing. With respect to his personal culture, Siyabonga still drew on his Christian faith. He shared this influence in the following declaration: "What I believe is, whenever I encounter difficulties, I just pray something disappear and stuff". While Siyabonga generated an impression of a solitary scholar who was averse to dialectic interactions, he disclosed that there was a peer who motivated him. He described his peer's agency as follows:

> I have a friend who actually doesn't study that much. He is kinda intelligent in a way of [what] he grabs during lectures. While I am a person who have to go extra mile and reading textbooks.

While Siyabonga's friend required less time and effort to produce academic and argumentative writing, his successes motivate Siyabonga to believe that he, too, could succeed in putting thought to paper.

Like other participants of this analysis, Shaka described developing in argumentative writing at the sentence level. He described this development in relationship to dialectical interactions with his academic literacy lecturers as follows:

> When they consult, they show me how to use some words that I didn't know how to use. So, for example, I didn't know that, um, do you see the word its? I-T- S. So, it can have a hyphen, and the other one cannot have a hyphen. So, they have assisted me a lot in my writing.

About the motivation necessary for her argumentative development, Sara identified internal and external agency. Internally, she stated: "Inside […] I told myself that no, I have to really focus too much". Concerning her peers' agential motivation, Sara acknowledged that they influenced her writing. She shared the following insight:

> I compared myself with my peers. So, in a way, they motivated me. And, like, their work motivated me. They were very specific like; they didn't just write the general facts. Which I think is needed in most of the writings. And they were straight to the point, ja. They didn't just go around. Like, you can understand what they wanted to say.

When asked if her cultural identity, which she identified as Christianity, influenced her approach to science or argumentation or in applying academic literacy practices, Sara said: "I don't think so". In this context, the cultural properties from her home, specifically as related to the spiritual sphere, did not influence her academic strategies. She preferred to draw on the agency of her peers, lecturers, and the cultural values underpinning curricula in the extended degrees programme. Sara's valuing of her peers' agency was also evidenced in her opinion of dialectical and rhetorical interactions in group work. She declared that:

> Right now, I do value group work because I tend to get different ideas from different people. And I tend to see how—like when we are together, we give each other some different perspectives. So, I do value group work.

Mary's case concerned the researcher. During this end-of-year encounter, she appeared more withdrawn from dialectical interactions with peers than during the previous two interactions. When asked if there were vital changes she had made in her scientific studies, she referred to time and writing strategies. She stated: "I'm still doing it the same […] At the beginning I used to study, like, two days or a day before a test, but now I have to prepare—like, a week before, I have to prepare for it."

Mary made minimal references to interactions with the agency of her peers and the cultures of her disciplines at the University of Pretoria. When asked if there were peers and other agents off-campus who possibly assisted her through the semester, Mary responded negatively. When queried about whether she was motivated by intrinsic or extrinsic factors which enabled her study, Mary made a vague reference to a motivational speaker she heard at the beginning of the

academic year. It was difficult to determine how this individual's influence impacted her studies. In addition, when asked who he was and how he possibly influenced her argumentation or argumentative writing, Mary responded: "I forgot. I even forgot the guy's name". When asked if she drew on her home culture to motivate her argumentative writing in any way, Mary responded that she did not. Concerning drawing on the agential and cultural powers of the extended degrees programme, Mary evidenced an aversion to drawing on the activities and powers of these real domains.

Urban, township-emergent students (Violet, Denel, Nemo and Faith)

In relation to argumentative writing in her scientific Discourse, Violet acknowledged growth. She observed:

> Yeah, I have grown a lot. LST helped me a lot. Before my high schooling career, I was really not good in English. And once I came to university, and we started doing LST, it really helped me in my assignments. I really saw a difference in my writing.

After being requested to specify ways that her argumentative writing developed, Violet responded as follows:

> My sentence construction and doing, what do you call it…? Like quotations or argumentative—in essay writing, when you have to have supporting quotations and stuff from other sources—yeah.

Violet exposed how dialectical interactions with peers and her academic literacy lecturer induced shifts in her utility of language to argue in the preceding quotation.

When asked if he had observed growth in his argumentation writing since the beginning of the academic year, Nemo responded:

> I don't know about in the argumentative section if I've improved or not improved, or if I feel like I've changed. We didn't really approach a lot of that this year. But definitely, writing over all modules has definitely improved.

In terms of possible individuals whose agency had directly influenced his approach to argumentative writing, Nemo identified his academic literacy lecturer. He recalled:

> We had an LST McGraw Hill, kind of like, assignment that we had to do, and I missed it. For some reason, I missed it, and she gave me the name of the website where I could get the same test, just not under McGraw Hill. So, I did it –it was a learning styles assessment or something like that—and I did it. And they give you like a mark out of twenty for each

> different aspect of learning, and I think I got sixteen out of twenty for hearing what I learn. So, it was […] all the LST lecturers that introduced us to that.

Nemo expressed how his LST lecturers […] exposed him to online learning structures, which, in turn, enabled the development of his scientific orientation and strengths in arguing through writing.

Faith indicated that technology had significantly shaped her current modes of writing. When asked to discuss inputs into her writing, she stated: “ YouTube videos mostly. Ninety percent it’s YouTube videos and then 10 percent it’s books”. Faith incorporated content from these textual sources to enhance her written argumentation. Like a significant proportion of her peers, Faith acknowledged the agency of her LST lecturer in her argumentative writing. She stated:

> One thing that I have realised is, for example, when I am in the exam room, there is time allocation. So, I can’t waste time on things that I don’t know anymore. So, I go for what I know first and then come back for those that I don’t know. So, my way of writing has changed ’cause I am now—I now respect time more than anything. So, I make sure I write as fast as I can, but in the same process, I need to be writing what’s right, not just writing.

4.7.4 Conclusion

Students’ pre-university experiences that shaped their primary Discourses at home, in their local communities and schools remained embedded in their personal epistemologies throughout the academic year. In this regard, the current study confirms Bangeni and Kapp’s (2005) claim that novice scholars are required to navigate multiple homes as they learn in universities. This study’s findings also affirm Boughey’s (2013) postulation that social structures, culture and agency are active entities in the ways first-year students’ attempt to incorporate new communicative modes into their Discourses of which academic literacy practices are involved. Once the participants entered the University of Pretoria, they had to modify aspects of their academic Discourses to meaningfully participate in learning interactions involving dialectical, rhetorical and written argumentation. However, as the academic year progressed, it became evident that not all participants were equally required to modify and adapt their pre-university Discourses to established modes of reasoning and writing in the new learning environment. This disparity was especially noticeable due to the unavoidable need of all students to modify their learning strategies that incorporated argumentative writing and dialectical interactions with peer agency.

Students exposed to expert secondary discourses in their homes and schools underwent the least Discourse modification related to learning and writing strategies. To re-assert, these participants reported that, with some modification, the rhetorical, dialectical and writing skills they brought to the university continued to work for them. Of significance is the observable trend that students

who could elaborate their pre-university Discourses to the end of the academic year were predominantly from the well-resourced urban cohort. In this regard and as Archer (1995: 316) reasons, “structural stability and the forces maintaining it” are key features of some students’ pre-university Discourses that enable the elaboration of aspects of their cultural identities. Richard’s structural origins enabled the elaboration of his Discourse with minor modifications to succeed academically; he was from a wealthy family. One of the reasons for the perpetuation of students' Discourses from materially well-off families relates to their professional objectives of entering similar expert industries as family members. While this was the case for many students in this cohort, it was not for all of them. Some students also identified their personal agency as sources of motivation to argue and succeed academically. In addition to their exposure to enabling agency on *and* off-campus *throughout* the academic year, students who experienced minor Discourse modifications exuded greater confidence towards their future studies and their capacity to apply writing and dialect to succeed.

Most students from rural and urban townships reported the unavoidable task of having to modify their Discourses to argue through writing and dialect. Unlike students from the well-resourced urban cohort, these scholars did not have much exposure to expert Discourses in their homes and local communities. In addition, a noticeable number of participants from South African rural and urban townships shared experiences of science pedagogy in schools that have limited access to tools that are essential for experimentation. While students from materially under-resourced communities substituted their constrained access to scientific tools and literature in their homes and schools with online and alternative resources, undeniably, due to these constraints, they had to make significant Discourse modifications that continued through T3. In the examples of these participants, Archer’s (1995: 316) argument that “structural restraints […] delay […] emergence” was confirmed. Students’ modifications included the employment of new argumentative writing strategies, minimising autonomous learning practices for increased agential interactions and utility of learning technologies. It was observed that students from all cohorts who willingly modified their written and rhetorical strategies experienced fewer difficulties and academic stress when contrasted with students who did not. In this regard, modifications to students’ dialectical and written strategies enabled morphogenesis or new forms of their scientific Discourses. In contrast, students who were unwilling, hesitant, or struggling to modify and adapt their learning methods to established dialectical and writing strategies experienced morphostasis. Morphostasis is the constrained emergence of new scientific Discourses.

Archer's (1995) morphogenic cycle exposed this reality: A significant proportion of first-year students in South Africa emerges from social and educational domains that has constrained their development in written argumentation. Entrance of the participants' pre-university Discourses into the University of Pretoria involved jumping hurdles that included cultural modifications. Modification of the participants' scholarly Discourses involved adopting new academic literacy practices and new ways of arguing with teachers and peers. This study's data highlighted how many South African first-year students, as exemplified in the participants' narratives, emerge from social and educational contexts in which they were insufficiently prepared for the discursive interactions common in universities. As a case in point, students from each of the three cohorts reported that they had to adapt their written and dialectical argumentative strategies to the multicultural atmosphere of the university environment. However, by virtue of their closer proximity to expert, secondary Discourses in their families and communities, the suburban cohort was less required to modify their Discourses, including the application of literacy practices, than students from materially under-resourced domains. In other words, the suburban cohort could elaborate their pre-university, scholarly Discourses with fewer modifications than students from urban and rural townships while arguing in writing. Access to scientific artefacts, literature and technology in the participants' homes and schools further enabled students from the suburban cohort to master on-campus interactions that involve argumentation. It was observed that participants from the township and rural communities who had to overcome phobias around and passive interactions with learning technologies faced the additional hurdle of learning to employ tools such as BlackBoard. In this context, pre-university exposure to learning technologies in students' Discourses proved to be constraining and enabling factors in their on-campus, written argumentation.

The research and knowledge gaps that this study filled rest in the following key areas: The study generated new insights into intersections between first-year science students' pre-university Discourses and how they weave with their attempts to competently participate in dialectical and rhetorical argumentation that feed into academic writing. Specifically, the study filled knowledge gaps about the relationship between the activities of social structures, culture and agency in the pre-university Discourses of extended degree, natural science students emerged in the Mamelodi campus of the University of Pretoria. This knowledge is essential for higher education development in South Africa due to the critical roles that extended and foundational programmes play in South Africa's tertiary domain. While extended degree initiatives are not capacitated to facilitate the development of all academically vulnerable first-year students in South Africa, this study's data recommend that their capacity be expanded. This is because the participants of this analysis indicated that, at present, South Africa's higher education system, including its institutional cultures and modes of arguing, was incongruently aligned to students' epistemic and

ontological worldviews. Due to the extra time that students are afforded in extended degree programmes, this study argues that they are effective pedagogic structures for inducting students into discursive modes of arguing and secondary discourses that rely on academic literacy practices.

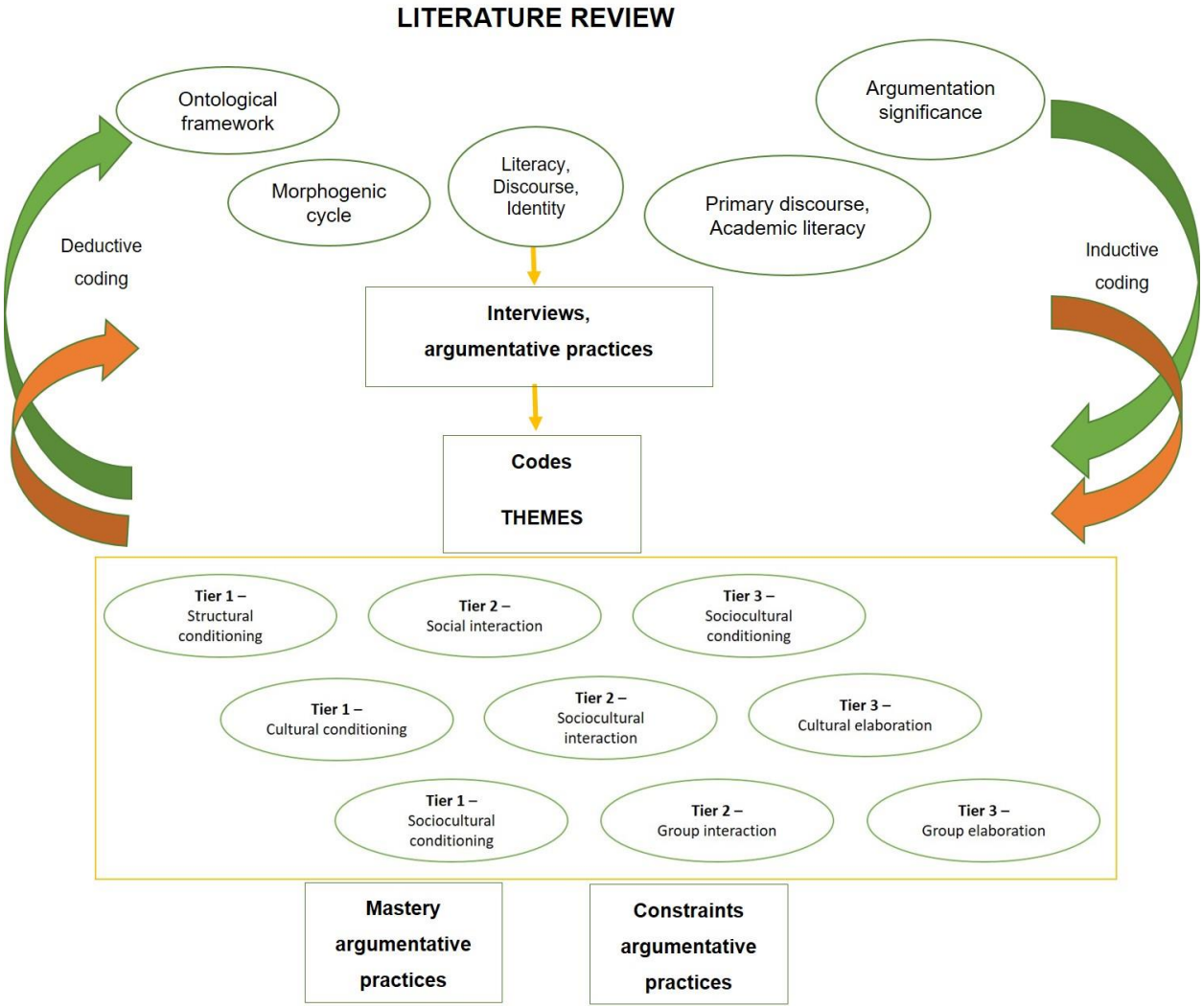

Figure 4.1: Archer's morphogenetic tiers (1995) applied to data analysis

CHAPTER 5: CONCLUSION

5.1 Introduction

This study's objective was to explore how first-year natural science students' cultural identities intersect with the methods they employ to demonstrate competency in argumentation practices. The analysis was particularly interested in how students' on, and off-campus dialectical and rhetorical interactions (see Section 2.6.3) shaped their argumentative writing. To highlight intersections between the participants' written, dialectical and rhetorical experiences, the study advanced three questions that shape the presentation of its conclusive statements.

5.2 Application and implications of findings

5.2.1 Cultural identities and argumentation

What is the nature of the relationship between students' cultural identities and how they put forth and sustain an argument while constructing academic texts in a natural sciences faculty?

Students' cultural identities were conceptually approached as primary and secondary Discourses (see Section 2.5). Discourses (Gee, 2015) constitute how individuals and communities manifest their epistemologies and ontologies through various modes of communication, of which argumentative writing is one. As related to the question above, the study concludes that most first-year and natural science students at the University of Pretoria are required to make significant modifications to their pre-university Discourses as they attempt to argue through writing, dialect and rhetoric. Data that emerged from T1, the conditioning phase of students' Discourses in the morphogenetic cycle (see Section 2.3), indicated that most participants affected unavoidable modifications to their pre-university Discourses to argue effectively through writing. Argumentation, to reiterate, is the discursive process of knowledge generation (see Section 2.7.1). Less than a third of the participants shared narratives where their pre-university learning strategies, dispositions to agential interactions and argumentative writing were elaborated through the first semester with minimal adaptations to academic literacy conventions. Instead, all participants reported having to modify how they steered their Discourses through interactions with new curricula, peers and teachers to argue effectively.

Noticeably, participants from the suburban-urban cohort required the least modifications to their learning, writing and interactive strategies during T1. A case in point revolved around Larry's pre-university Discourse. Larry was exposed to the agency of a doctor in the person of his father. He attended private schools that encouraged scientific experimentation and writing. Larry's discursive conditioning (see Section 2.3.2) before he arrived at the University of Pretoria enabled his

successful interaction (see Section 2.3.3) with on-campus structures, culture and agency. Larry successfully got admitted into medicine at the end of T4. This participant's experience illustrated a pre-university Discourse conditioned to navigate the present culture of learning in Mamelodi, including its modes of arguing. Empirically, the data revealed that the majority of the participants of this study did *not* elaborate their pre-university Discourses to the end of the academic year without significant modifications. The sheer difficulty of tertiary-level study coerced participants to weave their cultural identities with agential input from peers and lecturers to succeed academically. A significant finding of this study is that all participants reported that literacy and writing skills acquired in their academic literacy modules enabled their participation in modular discourses and argumentation. By incorporating new literacy practices into their learning strategies, participants modified their academic Discourses.

Larry's experience of pre-university Discourse elaboration in the first year is not reflective of most of his peers who participated in this study. The researcher's attention is drawn to Katlego, who struggled in numerous ways to adjust to the rigour of learning, writing and arguing in Mamelodi. Katlego is a rural emergent student. He came from a working-class home where family members were constrained in their capacity to participate in the secondary discourses (see Section 2.5.1) that he employed in school. In addition, Katlego's family members were constrained in their capacity to shape his emerging Discourse once the academic year began in Mamelodi. Further compounding Katlego's agential disjuncture between Katlego's family members and his studies was his struggle to incorporate features of disciplinary discourses into his emerging scientific identity. Katlego withdrew from his peers, lecturers and other people on campus who could provide essential learning interactions that are needed to argue and learn dialectically. Evidence of morphostasis (see Section 2.3.4) in Katlego's emerging argumentation Discourse was reflected in his constant struggle to master academic literacy conventions. Had Katlego opened himself to increased dialectical interactions with peers and lecturers, he would have been exposed to their writing style and arguing. Instead, Katlego's aversion to studying with others combined with low confidence in speaking English further constrained his capacity to write argumentatively. Unlike Larry's experience of interacting with new modes of writing and arguing with minor modification to his Discourse, Katlego encountered what he often described as insurmountable requirements to change his orientation to learning. While each of the participants in this study shared unique experiences of having adapted their cultural identities to the university environment that included written argumentative practices, Larry's and Katlego's journeys are highlighted here due to their contrasting characteristics that were shaped by social structures, culture and agency.

As a result of disparate pre-university conditioning among social structures, culture and agency, this study concludes that first-year science students are prepared in disparate ways for higher education study. Examples of the interplay between social structures, culture and agency in students' pre-university Discourses included diverse interactions in the home. Of note, the majority of the participants' pre-university Discourses emerged in communities characterised by material under-resourcefulness, working-class people and social dysfunctionality. In addition, a significant number of them came from homes where their mothers were domestic workers or one of their parents was unemployed or absent. These agential experiences and distance from expert, secondary Discourses through parental or guardian agency presented additional learning hurdles students overcame before arriving at UP. The result of varying levels of proximity to expert secondary Discourses in students' homes, communities and schools, coupled with disparate access to scientific artefacts and technology, coerced the majority of them into re-learning argumentative writing, dialectical and rhetorical modes of communication that are essential for learning in higher education. T1's data generates the conclusion that universities in South Africa need to continue to apply pedagogic interventions that integrate students' application of argumentation practices that involve writing with disciplinary content. This strategy is recommended to reduce students' experiences of Discourse alienation as they attempt to demonstrate mastery of argumentative writing and course content.

5.3 Agency and argumentation

How do students exercise their personal agency and incorporate the agency of significant others to put forward and sustain an argument in their construction of academic texts in a natural sciences faculty?

The capacity of first-year students to effectively sustain an argument through writing, rhetoric and dialectical interactions is determined by their ability to integrate their Discourses with established discursive practices in the university. Critical on-campus discursive practices that surfaced in students' narratives included arguing through written assignments, dialectical interactions with peers, lecturers and off-campus agency. The findings indicated that their personal agency and pre-university Discourses largely determined students' access agency methods to succeed academically. To clarify, in the morphogenic (see Section 2.3.4) phase of *interaction* (T2), students evidenced divergent strategies for incorporating agency into their written, dialectical and rhetorical argumentation. For example, Richard's approach to on-campus interactions with peers was characterised by distance. He believed that his personal methods of learning did not require their agential input. On the other hand, Richard had access to farmers, PhD students and researchers who worked in his hometown farming community. Richard could substitute on-campus agency with off-campus agentic inputs to enhance his argumentative writing during T1.

The findings also revealed that some participants improved their argumentative writing and dialectical skills through their willingness to draw on their agency of peers and lecturers. Examples of how students incorporated agency (see Section 2.2.6) into their argumentative writing included employing informal logic (see Section 2.6.3) acquired from lecturers, participating in verbal dialectic with peers to access their reasoning and deriving motivation from family members.

Morphogenetic and morphostatic emergence of students' argumentative discourses through agential inputs was co-determined by the interplay (see Section 2.2.2) of social structures and culture during T2. Participants who withdrew from on- and off-campus agential interactions were constrained academically. These students reported experiencing acute academic difficulties. In contrast, participants who drew motivation from off-campus agency did so in unique and enabling ways. Poverty among family agents was a resurfacing code. Many participants were motivated to succeed with their argumentative writing to pass their modules and degrees to free their families from poverty. Alternatively, participants including Aldoy relied on direct input from his mother's agency. Each night, she sat with him to help him read complex course texts and curricula arguments to cope with his dyslexia. Aldoy's mother's agency led this study to *conclude* that the emergence of first-year students' mid-year Discourses continues to draw on the dynamic agency of family members in their argumentation through deeply integrated ways. However, varying levels of exposure of family agency to secondary discourses enable and constrain students' capacity to strengthen their written and dialectical argumentation. Larry's father, a doctor, was enabled to participate in his son's modules' written and dialectical argumentation. Likewise, Richard's PhD friend and the farmers in his hometown joined him in module-emergent argumentation. In distinction, Shaka's mother and those of the other participants, who were also domestic workers, were capacitively constrained in participating in their children's discursive practices navigated in Mamelodi. In the experiences of these students, the family agency was incorporated as indirect sources of motivation but not as direct inputs into argumentative writing.

5.4 Structures and argumentation

Do students draw on social structures in the endeavour to put forward and sustain an argument in their construction of academic texts in a natural sciences faculty, and if so, how do they do so?

Archer's (1995) realist theory that includes the morphogenetic cycle construes social structures, culture and agency as operating in interplay with each other when applied in social studies (see Section 2.2.3). Through this reasoning, it is logical to ratiocinate that social structures are the domains in which human agency and culture are instantiated. Throughout the academic year, social structures proved to be in force in the emergence of students' argumentation Discourses. The powers and activities of students' families, communities, schools, degrees, and genders were

active in the ways they generated written and dialectical arguments. Therefore, this study concludes that students' capacity to demonstrate competency in effective written and dialectical argumentation is dually shaped by social structures on- and off-campus. The extent to which participants of this analysis drew on the powers of on-campus structures to argue effectively through writing is equal to their attempts to access off-campus ontologies (see Section 2.2) as sources of motivation. However, divergent characteristics of structures that shaped students' ontologies, especially their families, home communities and schools, induced either morphogenetic or morphostatic (see Section 2.3) experiences of Discourse elaboration through argumentative writing. To illustrate this conclusive point, structural entities that shaped Richard's and Larry's pre-university Discourses enabled them to interact with learning cultures in Mamelodi while simultaneously drawing on new powers from educational structures. Campus-based structures (see Section 2.2.4) that all cohorts described as dynamic in their argumentative writing, dialectical interactions, and Discourse elaboration included their academic literacy and other disciplinary modules, peer groups, assignments, and online platforms.

This study concludes that due to the diverse and contrasting structural characteristics that feature in the pre-university Discourses of participants, most first-year students in South African universities cannot avoid divorcing aspects of their epistemic and ontological selves to succeed in their studies. Informal logic and fallacy principles (see Section 2.6.3) that are familiar to senior scholars and that shape written argumentation in universities were unfamiliar to most of the participants of this study. Undoubtedly, students were exposed to expert modes of writing in their homes, schools, media and extracurricular activities. Still, *all* of them described having to modify a literacy practice or incorporate new ones into their academic Discourses to refine their argumentative writing. An indicator of most of the participants' attitude to formal argumentation is reflected in the fact that *none* of them opted to write the argumentative essay in their Grade 12 exam (see Section 2.7.4). The majority of the participants described parents who did not employ secondary discourses or scientific writing in their modes of making a living. Finally, most of the participants described constrained access to artefacts essential for scientific and argumentative writing in their homes, communities and schools.

Students' morphing, modifying and adapting their academic Discourses to the university environment by incorporating argumentative writing and other discursive practices acquired on-campus were necessary for their academic development. If the participants' Discourses remained unchanged after successfully completing their first year of study, it would be empirically and theoretically futile to apply Archer's morphogenetic cycle (see Section 2.3). The morphogenetic cycle enabled this analysis to longitudinally identify phases in which students' Discourses underwent significant modifications. Participants including Violet, Ink and Faith welcomed

academic challenges that campus structures and cultures posed to their pre-university modes of arguing, writing and being. Not without difficulties, they described the morphing of their emergent academic Discourses as liberatory experiences. Ink's experience involved necessary changes to her writing methods and interacting with peers as prompted by a structural shift resulting from a change of degrees. Changing her career path from forensic science to medicine induced modifications to how she approached argumentative writing, assessments and peer interactions. To get the marks she needed to be accepted into medicine, Ink applied conventions acquired from campus agency and academic literacy practices. Towards the end of the academic year, Ink reduced agential engagements with peers. Whereas in T1 she willingly adopted a mentoring role that benefitted her argumentation, in T3, pressures that arose from exam preparation coerced her to focus on her individual development. Alternatively, participants such as Violet, Sara, Richard and Denel increased on-campus agential interactions towards the end of the academic year. Due to the same reasons that motivated Ink to withdraw from group work, these four scholars recognised benefits in comparing argumentative writing and dialectical strategies with each other. They discovered academic advantages gained by accepting criticism from each other's input into written argumentation. Many of the interactions occurred outside of the lecture hall and on online platforms, including WhatsApp, further evidencing the efficacy of online social structures in the emergence of students' argumentative Discourses.

5.5 Recommendations

5.5.1 Tier 1

Early in the academic year, spaces should be created in disciplinary and academic literacy curricula for first-year science students to incorporate their pre-university Discourses into learning and assessment experiences.

Sufficient studies have demonstrated that as students initiate interactions with social structures, culture and agency in universities - the experience is like moving to a new home (Bangeni & Kapp, 2005; Boughey, 2013). As new homes, universities require students to employ new, written practices while simultaneously engaging in dialectical and rhetorical interactions with lecturers, peers, off-campus agency and the curriculum. These discursive practices, which are familiar to senior scholars, are new to most first-year scientists that enter South African universities. Therefore, this study recommends that curriculum mechanisms, specifically secondary discourses employed in the sciences, are incorporated into the curriculum. This strategy aims to facilitate students' transitions from the application of primary discourses to expert modes of communicating (see Section 2.5). Examples of academic literacy practices recommended for embedding students' pre-university Discourses into the curriculum during their initial interactions

(T1) with campus structures, culture and agency include, but are not limited to, reflective, narrative and expository genres.

5.5.2 Tier 2

As the first term progresses, it is recommended that disciplinary and academic literacy curricula facilitate students' introduction to informal logic and fallacy principles that shape argumentative writing among senior scholars.

Students' narratives revealed that participants from all cohorts were required to practice informal logic and fallacy principles that were new to them or were manifested in alternative rituals during their pre-university experiences. Since academic departments employ peculiar, disciplinary discourses (see Section 2.5.1) that are distinct from how most students communicated, argued and manifested their personal ontologies during secondary school, it is recommended that they are inducted first-year scholars into their application. Van Eemeren (2019: 153) reasons that: "The way in which arguers go about defending their standpoints to others often leads to remarks from bystanders as well as analysts concerning the 'style' in which the argumentative discourse is conducted". As novice scholars navigating the first term, first-year students are in the beginning phase of developing their argumentative style. Therefore, this study recommends that informal logic and fallacy principles (see Section 2.6.3) that shape argumentative writing, including originality, empirically-based reasoning and avoidance of plagiarism, are explicitly embedded in students' assessment criteria. In this manner, the curriculum lends towards facilitating course content and argumentative writing according to established conventions.

5.5.3 Tier 3

It is recommended that disciplinary and academic literacy modules that feature at the end of the academic year increase literacy practices affiliated with professional Discourses.

Students across the three cohorts reported diverging experiences of how their career and education goals, including the selection of degrees, shaped their academic Discourses as the first year wrapped up. The following trends were observed: Participants maintained their original degree choice as designated in T1; participants switched primary degree paths as the academic year progressed or the academic year was utilised to explore future degree options. Since participants' career and educational goals surfaced in their narratives throughout the academic year and especially towards the end of it, this study recommends the inclusion of professional discourses in the curriculum. Professional discourses are affiliated with Gee's (2012) construct of secondary discourses (see Section 2.5.1). Written and dialectical argumentation that features in professional Discourses are as cognitively challenging to students as is critical scientific

deliberation. Academic literacy and mainstream curriculum developers are pivotally positioned to introduce students to communicative practices that are active in the professional sphere.

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APPENDIX A: ETHICAL CLEARANCE

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Research Ethics Committee

17 August 2017

Dear Mr Eybers

Project:	**A realist approach towards students' application of agency, culture and social structures in demonstrating competency in argumentative writing**
Researcher:	**O Eybers**
Supervisor:	**Dr I Fouche**
Department:	**Unit for Academic Literacy**
Reference Number:	**04863888 (GW20170619HS)**

I am pleased to inform you that the above application was **approved** by the **Research Ethics Committee** on 14 August 2017and by the Dean of Humanities on 17 August 2017. Data collection may therefore commence.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. Should the actual research depart significantly from the proposed research, it will be necessary to apply for a new research approval and ethical clearance.

We wish you success with the project.

Sincerely

Prof Maxi Schoeman
Deputy Dean: Postgraduate Studies and Ethics
Faculty of Humanities
UNIVERSITY OF PRETORIA
e-mail: tracey.andrew@up.ac.za

cc: Prof A Carstens (HoD)
Dr I Fouche (Supervisor)

APPENDIX B: INDIVIDUAL STUDENT INTERVIEW QUESTIONS (BEGINNING SEMESTER 1)

Researcher:

The aim of these individual interviews is to allow you the opportunity to speak to the researcher in private and in a safe space about your experiences. Please remember that you may decline to answer any question and no explanation will be required of you.

The home

Question 1: If you had to describe your upbringing in two or three words, which words would you select and why?

Question 2: Is there an individual or individuals who you were closest to as a child?

Question 3: Who were the breadwinners in your home/s and what did they do for a living?

Question 4: Were you part of a small or large family? How did this affect the way you grew up? Was it positive, negative, easy, difficult?

Question 5: If any of your other family members attained qualifications from an institution of higher learning, what were these?

Question 6: Did your home and family environment influence you in any way to pursue a degree in science? Please share your views on this.

Question 7: Were there books, computers or access to any type of reading in your home? Please describe these.

Question 8: How did you resolve disputes or disagreements with other family members?

Question 9: To what extent was “culture” practiced in your home? If possible, please provide examples?

Community

Question 1: Where are you from (rural area, urban area, township or suburb)?

Question 2: How did your community shape the young adult you are today?

Question 3: Did/does your community possess the resources to produce future scientists? Please discuss your position?

Question 4: Describe your community's access to either the natural environment or computer technology. Were they accessible?

Question 4: How does your community resolve conflict or arguments?

Question 5: If you could assist aspiring scientists in your community, which three actions would you take?

Question 6: Were there any science fairs or conventions in or near to your community?

Question 7: If you had to compare your home community to campus, what would you identify as similarities and differences? Please explain?

Question 8: If you could improve your community, what would your priorities be?

Literacy

Question 1: Do you consider yourself as more of a numbers or words person? Please explain?

Question 2: What is your fondest reading memory?

Question 3: How about writing? Is there any writing you did which you really love.

Question 4: How passionate were you about any writing in secondary school?

Question 5: Did you ever have to write in order to defend or argue a position? If so, please describe this task.

Question 6: If you had to summarise your feelings about writing you have done at university to date, how would you describe them and why?

Question 7: What is your personal description of a good academic writer?

Question 8: What is your description of a good, scientific writer?

Question 9: Please describe the types of writing you did in your science related subjects at school?

Question 10: What about English or any other subject that required writing? What types of writing were expected of you?

APPENDIX C: INDIVIDUAL STUDENTS INTERVIEW QUESTIONS (END OF SEMESTERS 1 AND 2)

Question 1: In terms of your personal approach to learning, what did you have to do differently in order to succeed academically since arriving here at UP?

Question 2: What have you continued to do that is the same in order to succeed with your studies?

Question 2b: What motivates you to succeed at this point of the academic year? Are these motivational factors the same or have they changed since the beginning of the semester?

Question 3: Personality wise, do you see changes in yourself since you arrived at UP? Are you the same person or are there significant changes in your personality? If so, please describe these changes you see in yourself?

Question 3b: What aspects of your personality have assisted you in succeeding with your studies to date? Also, have you decided to change any qualities of your personality which may have stunted your academic success?

Question 4: Do you feel as if you have grown in any way as an academic or argumentative writer? Please share your thoughts about this and describe your areas of growth.

Question 5: What has helped you to improve your writing and which resources or tools have you used to develop your skills?

Question 6: Are there any people in particular who have assisted your development in writing? If so, how have they assisted you?

Question 7: During the semester, did you have to be self-motivational in terms of improving your writing and arguing, or did motivation come from elsewhere?

Question 7b: Would you agree that either your spiritual or cultural values contribute towards how you learn, write or argue? Please share your views on this.

Question 8: Are there places in the university that you went to that have helped your development as a writer? If so, please name these and describe how they assisted you?

Question 8b: Have your peers influenced your approach to writing or the sciences in any way? If so, how have they done so?

Question 8c: Do you value group work, either inside or outside the lecture hall? Please share your opinions on this?

Question 9: What are the key changes you made in how you wrote before coming to UP and after you started as a first-year student? Why did you make these changes in writing?

Question 10: What are some of the major differences you are now aware of, between writing in the university and in secondary-school?

Question 11: Are you still motivated by the same factors to succeed, as you were in the beginning of the year, or are there new factors? If so, please share these.

Question 12: What has been the most challenging aspect of your studies, which involves writing, in this semester?

Question 12b: Where there any events outside of the class or university which had a major impact on your studies? If so, please share and describe one or two of these?

Question 13: Have you come to see your personal identity differently, whether according to your gender, race or future profession in the end of the semester? If so, how or why is this so?

Question 14: Do your professional goals and dreams still remain the same as they were in the beginning of the year or have they changed? Please share your thoughts on this?

Question 15: Lastly, which experiences made you feel really confident or unconfident about your writing? Please share some of these experiences and how they affected you.

APPENDIX D: INFORMED CONSENT

Student consent form

Date:

Dear Student

You are kindly requested to take part in a research project which focuses on how student cultural identities and backgrounds are involved in the manner by which students develop as academic writers. The research results will contribute towards a DPhil degree in Linguistics. Parts of the DPhil thesis may be converted to conference presentations or research articles.

At the beginning of the first semester, you will write an essay to determine your academic writing ability, specifically in your ability to argue through writing. Another essay will be given at the end of the academic year to determine how you have grown as an argumentative thinker and writer. Through the academic year, you will participate in individual interviews with the researcher and focus group discussions with other students.

Your participation does not involve any risks or disadvantages. At no stage will your real name or student number be recorded. You will also be allowed to use an alias to protect your anonymity and identity. No re-analysis of your essays, interviews or statements in the focus-group discussions will be done, and only the researcher will have access to the data. If you wish to withdraw your input at any time during the research process, the data you provided will be destroyed.

Yours sincerely,

Oscar Eybers, Researcher and lecturer: Unit for Academic Literacy

Oscar.eybers@up.ac.za

0124203494

STATEMENT OF INFORMED CONSENT

I have read the information included in the above letter, and I agree that my responses may be used for research purposes.

_____

Signature of respondent

Date -

APPENDIX E: CHANGE OF SUPERVISOR (IN PROGRESS)

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

RECOMMENDATION REGARDING TITLES OF THESES/DISSERTATIONS/MINI-DISSERTATIONS,

APPOINTMENT OF SUPERVISORS/CO-SUPERVISORS

THIS FORM MUST PLEASE BE TYPED AND SUBMITTED TO THE RESEARCH ETHICS / POSTGRADUATE COMMITTEE.

Student number: u04863888 Title: Mr

Surname: Eybers Initials: OO

Course e.g. PhD – Applied Language Studies

Department: Afrikaans

Please ensure that the title is grammatically correct.
Please do not type the full title in capital letters.

For notification of the faculty board, please mention:

THESIS: **A realist approach towards students' application of agency, culture and social structures in demonstrating competency in argumentative writing**

Previous Title:

a) **SUPERVISOR:**
Please state staff number
(If a person outside the University is nominated, a CV and motivation should be attached to the proposal)

04845643

b) **CO-SUPERVISOR:**
Please state staff number
(If a person outside the University is nominated, a CV and motivation should be attached to the proposal)

N/A

ROUTE

1. SUPERVISOR:

Signature...

Date... 14 March 2021

2. DEPARTMENTAL RESEARCH/POSTGRADUATE COMMITTEE:

Signature.....

Date... 14 April 2021

3. HEAD OF DEPARTMENT:

Signature.....

Date... 15/04/2021

4. FACULTY RESEARCH ETHICS/ POSTGRADUATE COMMITTEE:
Where applicable (to approve research proposal/ethics; change of title; appointment or change of internal/external supervisor/co-supervisor;

Signature.....

Date.....

5. STUDENT ADMINISTRATION:

Signature.....

Date.....

APPROVAL:

- ☐ Ethical clearance to be considered by the Ethics Committee
- ☐ Appointment of external supervisor/co-supervisor (motivation and cv attached)
- ☐ Change of supervisor/co-supervisor
- ☐ Research proposal and title to be considered by the Postgraduate Committee (where applicable)
- ☐ Editorial change of title
- ☐ Other (mention): _____

APPENDIX F: TECHNICAL EDITING LETTER

Excellentia Edit & Transcribe

Physical address:
72 Eland Street
Miederpark
Potchefstroom
2531
Contact:
Email: excellentia.edit.transcribe@gmail.com
Phone: 0834755363

15 May 2021

TO WHOM IT MAY CONCERN

I hereby declare that the thesis titled:

A realist approach towards student application of agency, culture and social structures in demonstration of competency in argumentative writing

by

O. O. Eybers

04863888

has been technically edited by myself, which includes all tables and figures as well as the layout of the document's contents.

E Oosthuizen

May 2021