Exploring Instances of Deleuzian Rhizomatic Patterns in Students' Writing and in Online Student Interactions

Tlatso Nkhobo and Chaka Chaka[*]
University of South Africa, Pretoria, South Africa
https://orcid.org/0000-0003-3851-822X
https://orcid.org/0000-0003-3558-4141

Abstract. Globally, it is a standard practice to study students' academic writing by using linear academic-writing models. This study investigated instances of Deleuzian rhizomatic patterns in students' writing and in online student interactions at an open and distance e-learning (ODeL) institution in South Africa. A convenience sample of 13 students' paragraph writing samples and of 370 first-year students was used. All the participants were enrolled in a level-one module, ENG1503, in the second semester of 2020. The study followed a mixed-method approach, and utilized *AntConc* and *AntMover* to analyse the students' writing samples, as well as Microsoft Power Business Intelligence (MS Power BI) and Gephi, in order to analyse and visualise online student interactions. When students' writing samples were analysed in terms of keywords (e.g., key themes) by using the software applications employed in this study, various rhizomatic patterns were detected in the students' text files. For example, the key-word frequencies of key themes, such as *religion* and *cult*, showed that these two key themes were used differently at the end of each concordance spectrum, thereby underscoring their varying rhizomatic patterns of usage in students' respective text files. Online student interactions on both *my*Unisa's ODF and MS Teams were visualized rhizomatically. The findings of this study underscore the importance of investigating and analysing students' writing – not only from linear models, but also from non-linear perspectives, such as a rhizomatic approach. Additionally, they underline the significance of leveraging the opportunities offered by students' writing analysis technologies, such as those employed in this study.

Keywords: students' writing; rhizomatic patterns; online student interactions; ODeL institution

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[*] Corresponding author: *Chaka Chaka, chakachaka8@gmail.com*

1. Introduction

Most English as a second language (ESL) students enrol in open-distance learning universities with different levels of competence in written English (Du Toit, 2020; Karavas & Zorbas, 2019; Manyike, 2017; Mashile et al., 2020; Niyibizi et al., 2019; Ouma, 2019; Turmudi, 2020). Conventionally, many of these universities base students' writing on linear-academic writing models (Lea & Street, 1998; Lillis, 2003). Linear-academic writing approaches treat students as if they learn how to write in the same way; and as though they develop their writing skills at the same pace, which is not the case, as argued in the current study. Most universities tend to use Euro-American-Australian (EAA) models of academic writing, as being universally applicable to all students, irrespective of their different educational and socio-cultural backgrounds. In this case, teaching and learning academic writing in an open and distance e-learning (ODeL) model is a challenge for institutions and students alike, especially for first-year ESL students (Boyle et al., 2019; Çelik, 2020; Flowerdew, 2019; Graham, 2019; Mitchell et al., 2021).

Linear-academic writing models do not recognise and affirm the literacies that students bring to higher educational institutions (HEIs). As a result, most students in HEIs are expected to master and model their academic writing on linear-academic writing approaches. However, the current study explored student writing from a rhizomatic perspective. It did so, in order to contribute to the area of academic writing in an ODeL environment. A rhizome is a concept that was introduced by Deleuze and Guatarri (1987). These two scholars used the concept of a rhizome to critique authoritarian practices and hierarchical structures in academia (Bozkurt et al., 2016; Cormier, 2008; Brailas, 2020a, 2020b; Hanley, 2019; Kairienė & Mažeikienė, 2021; Kinchin & Gravett, 2020); Mackness et al., 2016; Tillmanns & Filho, 2020; Webb, 2009). A rhizome is a botanical term referring to the roots of a plant growing from and spreading in different directions (Deleuze & Guattari, 1987; Ko & Bal, 2019; Tagata & Ribas, 2021). In this study, a rhizome was conceptualized in the same way, with reference to students' writing. Therefore, instances of Deleuzian rhizomatic patterns were explored in samples of students' academic writing (short paragraphs), and in student-engagement interactions on two online platforms, namely, *my*Unisa's online discussion forum (ODF) and Microsoft (MS) Teams.

The value of a rhizomatic approach to academic writing lies in its potential to view writing as consisting of patterns of sentences and of ideas in non-linear directions on a given topic. It is an approach that searches for thought patterns manifested by students' writing that are not necessarily linear in nature (Leander & Boldt, 2013; Kairienė & Mažeikienė, 2021; Tagata & Ribas, 2021; Turmudi, 2020; Webb, 2009). Students' academic writing, as viewed from a rhizomatic perspective conceptualizes writing as a phenomenon that grows from different focal points. In addition, it discourages the reproduction of written texts, as is the case with linear models (Amorim & Ryan, 2005; Smagorisnky et al., 2006). Furthermore, a rhizomatic perspective regards student writing as messy and destabilised at the beginning; and consequently, it rejects linear, hierarchical models of students' writing. Most importantly, a rhizomatic

approach to students' writing views students' writing as being in the process of becoming (Brailas, 2020a; Kairienė & Mažeikienė, 2021; Tagata & Ribas, 2021; Turmudi, 2020 Amorim & Ryan, 2005; Guerin, 2013).

On this basis, the overriding aim of the current study was to explore the instances of Deleuzian rhizomatic patterns in the academic writing samples of thirteen first-year ENG1503 students (at the University of South Africa), with a view to identifying the rhizomatic patterns in such writing samples displayed. Allied to this aim, was an attempt to discover the types of interaction patterns a cohort of 370 ENG1503 students exhibited when they interacted on two online platforms, *my*Unisa's ODF and MS Teams. The study had three research questions (RQs):

- RQ1 - What rhizomatic writing patterns does a cohort of first-year ENG1503 students display in their assignment paragraph responses, according to key themes (categorized by keyword frequencies, concordance, and concordance plot) and linking adverbials, as represented by the *AntConc, AntMover* and Gephi software applications?
- RQ2 - What rhizomatic structural moves does this cohort of students display in its assigned paragraph responses, as represented by the *AntMover* software application?
- RQ3 - What forms of engagement patterns do first-year ENG1503 students manifest, when they interact on MS Teams and on *my*Unisa's ODF in terms of their message posts and the frequencies of their online interactions, according to MS Power BI and Gephi visualizations?

2. The Literature Review
2.1 Traditional Student-Writing Approaches
Traditional student-writing approaches came into being from various parts of the world, particularly from Europe, North America, and Australia. They were introduced in these regions, in order to assist a growing number of international students who had enrolled for university education. These were students who were referred to as English second-language (ESL) speakers. Consequently, academic writing studies mushroomed, but with different approaches. For example, in Europe, Boyle et al. (2019), Flowerdew (2016), and Wingate and Tribble (2012) employed the academic-literacy approach; since the focus was on inducting students into the kinds of academic literacies practised in HEIs and on socializing them into academia

In North America, literacy studies developed as compositions and rhetoric writing within disciplines (Boyle et al., 2019; Ganobcsik-Williams, 2006; Graham, 2019). These studies focused on teaching students' writing that is applicable to, or practised in various communities of practice of the students concerned. In addition, students were taught English for specific purposes; because they were expected to know a discipline-based English discourse used in specific fields of studies. These approaches were, one could argue, remedial; because students could not easily emulate academic discourse practices envisaged by HEIs in their knowledge of academic literacy.

On that account, there is a gap between the way students are taught writing in their pre-university or school stages, and the academic-writing requirements set by universities. Students were seen to be struggling because they could not adapt to their new sense of being, or to their new identities expected by the universities. These developments are significant for this study; since it seeks to challenge these views by arguing, instead, that there are rhizomatic patterns in students' writing, regardless of how disjointed they may appear to be at first.

Several such studies have also been conducted in Australia, with a specific focus on genre (Elashri & Ibrahim, 2013; Iyer, 2018; Seaboyer & Barnett, 2019; Tuan, 2011). These studies were concerned with socializing students into the type of texts used in their respective fields of studies, so that they would then be able to emulate such texts in their own writing. Much of this work was based on systemic functional linguistics, which is concerned with the correct usage of language features for a particular communicative purpose and register (Gardner et al., 2019; Schlepegrell & Achugar, 2003; Schlepegrell & Go, 2007).

All these approaches view student writing as deficient, and as not meeting the required standards set by HEIs. As such, they fail to recognize and acknowledge what the students bring to academia. The approaches discussed above are still currently being used in various versions, in order to teach academic literacy in HEIs for different types of students in South Africa (Du Toit, 2020; Manyike, 2017; Van Rooyen & Coetzee-Van Rooyen, 2015). Students' academic literacy abilities are still regarded as being deficient in HEIs. For that reason, the present study adopted a different standpoint, which views and studies students' writing rhizomatically.

2.2 Rhizomatic Literacy Practices
Studies have been conducted in recent years, in which a rhizomatic perspective has been implemented to transform the binary literacy practices in teaching and learning. These studies include those of Cormier (2008), Brailas (2020a, 2020b), Cumming (2015), Honan (2009), Hanley (2019), Johnson (2014), Johnston (2018), Kairienė and Mažeikienė (2021), Ko and Bal (2019), Mackness et al. (2016), Martin and Strom (2017), Masny (2012), and Webb (2009). Webb's (2009) study, especially, paved the way on how academic writing could be taught in schools through the rhizomatic approach, as suggested by Deleuze and Guattari (1987). His study focused on introducing innovative and new ways of how to teach research and writing.

He adopted Cormier's (2008) model of a rhizome, in order to design his own models that could be used in composition classrooms, such as preparing and writing lesson plans, and writing assessment models. His study is one of the few that has explicitly provided models that teachers can use in their classrooms, in order to conduct rhizomatic teaching and learning. However, Webb (2009) cautioned that he would not dictate the way in which teachers should conduct teaching and learning; as this would be advancing the culture of linear and rigid literacy practices. He argues that literacy-instruction models are informed by historical circumstances. Moreover, he contends that for a change to happen,

composition classrooms should adopt a paradigm shift; and students should be allowed to construct their own writing-lesson plans and their own writing maps.

For his part, Johnston (2018) investigated the literacy practices of students in a seventh-grade English classroom at a New York City's middle school in Harlem. He argued that the conventional literacy practices do not allow students to be creative; and they do not consider what students bring to HEIs. He collected data by means of observations, interviews, verbal and written conversations, artifacts, and a researcher journal. He used a rhizomatic perspective to study how students deviated from the normal literacy practices. He maintains that students are, mostly, tested against predetermined norms and standards, which do not accommodate what students bring to the schooling environment.

Students who possess different literacy practices are often deemed to be incompetent and deficient. Viewing literacy practices differently, and from a rhizomatic viewpoint, would enable us to leverage the affordances brought about by rhizomatic literacies.

Furthermore, the aim of Honan's (2009) study was to investigate those patterns of academic literacy that emerged from four classrooms. He wanted to understand the kind of digital texts used in impoverished schools for teaching and learning. He, then, argued that classrooms are rhizomatic in nature, in that there are different and complex processes unfolding in each classroom. In this case, he acknowledged that conventional academic-literacy practices are hard to get rid of, even when teachers try to implement creativity into their teaching and learning practices.

In this study, Honan (2009) suggested the use of post-structural pedagogies, even in the process of teaching and learning via traditional texts. He was aware that students used various digital texts, which contributed to their learning outside school. However, such texts were not used in the classrooms to facilitate teaching and learning. He found that teachers could not comprehend the way in which students used "out-of-school" literacies, something that calls into question our teaching and learning practices, as bearers and distributors of knowledge.

3. The Research Methodology
3.1 The Study Design
This study was an exploratory research (Heigham & Croker, 2009; Riazi, 2016) because it focused mainly on exploring instances of Deleuzian rhizomatic patterns in students' writing samples and in students' engagement patterns on both of the MS Teams and on *my*Unisa's ODF. Riazi (2016, p. 115) states that exploratory research "is conducted, when the object of the study is new and has not been studied much before". This description of exploratory research resonates with this current study, in that there are very few studies that have explored rhizomatic manifestations in students' writing samples, especially at the institution under study. The study adopted a mixed-method approach (Christensen et al., 2015; Richards et al., 2012), which, in turn, comprised the

qualitative and the quantitative approaches (Richards et al., 2012; Riazi, 2016). The reason for choosing a mixed-method approach was that the data collected for the study consisted of written paragraphs, whose sentences and whose keywords, linking adverbials, and structural moves were subjected to concordance frequencies and concordance plots. Additionally, the data comprised online student-engagement patterns, which were worked out from student-message posts and from message frequencies.

3.2 Sampling
The study employed convenience sampling, in order to select thirteen students' writing samples and three hundred-and-seventy (370) first-year students (males = 165; females = 205) to participate in the *my*Unisa's ODF (n = 150) and on MS Teams (n = 220). These students were enrolled in a level-one module, ENG1503, in the second semester of 2020. All of them were invited to participate on the two online platforms through an announcement on *my*Unisa, which is UNISA's learning-management system. Prior to the study being conducted, an ethical clearance was granted by the UNISA's College of Human Sciences Research Ethics Committee, with a certificate number: 2017-CHS-026.

3.3 The-Data Collection Procedure
The study consisted of two datasets. The first dataset comprised 13 students' writing samples, and it consisted of 13 paragraph responses to the assignment question. These writing samples belonged to 13 volunteer students. The assignment question had two topics that required short-paragraph responses consisting of 100 words each. These two topics were, "Read chapter 16 of the prescribed book (from page 224) and summarize the developmental stages of religion in your own words", and "Compare and contrast a theocratic government with a democratic government".

A copy of the assignment question was emailed to the 13 volunteer students, for them to write their responses to it during their spare time. The students were given 5 days to complete the assignment and to email their written responses to one of the authors of this paper.

The second dataset comprised two sub-data sets: the student engagement patterns of 370 ENG1503 students, who interacted on both the *my*Unisa's ODF and the MS Teams during the second semester of 2020. For *my*Unisa, the student interactions were made up of messages that 150 students posted on the online discussion forum (ODF) during the first two weeks of August, 2020. The messages were related to a topic that was discussed during these two weeks. Concerning MS Teams, the student interactions consisted of messages that 220 students had posted in the chat facility during one of the virtual classes offered to them on the MS Teams in September 2020. All of this was informed by Chaka and Nkhobo's (2019) and Conde's et al. (2015) studies that investigated online student-engagement patterns.

3.4 The Data Analysis
Students' writing samples in the form of short paragraphs and online student interactions were analysed through Rhizo analysis. Rhizo analysis has been used

by scholars, such as Bangou (2019), Brailas (2020a), Kairienė and Mažeikienė (2021), Ko and Bal (2019), Sellers (2015), and Sherbine (2019). Then, the datasets were further analysed through the Corpus-software applications, *AntConc* and *AntMover*; and thereafter, they were visualized by Microsoft Power-Business Intelligence (MS Power BI) and Gephi. *AntConc* represents the text files through keyword frequencies, a concordance, and concordance plots.

For short paragraphs, the units of analysis were keywords (key themes), linking adverbials, and (rhizomatic) structural moves, while for the online student-engagement patterns, message posts and frequencies were the units of analysis.

4. The Results
4.1 *AntConc* Analysis: Assignment's Keyword Frequencies,

Concordance, and Concordance Plots
Five rhizomatic keywords were identified from the 13 responses to the assignment. These were used to trace and map the key word in context (KWIC) in relation to the assignment question's requirement. Rhizomatic keywords that were deemed to be relevant for this assignment were: *become, cult, members, religion,* and *sect.* The rhizomatic frequencies of the chosen keywords were analysed, and then ranked, as shown in Table 1.

Table 1: Assignment 1 keywords as extracted from *AntConc*

Keywords'	become	cult	members	religion	sect
Frequencies	18	23	19	25	25

In this table, both *religion* and *sect* had the highest joint hits, with *become* having the lowest hits across the 13 responses. For example, the listing of *religion* in terms of its KWIC format is displayed in Figure 1.
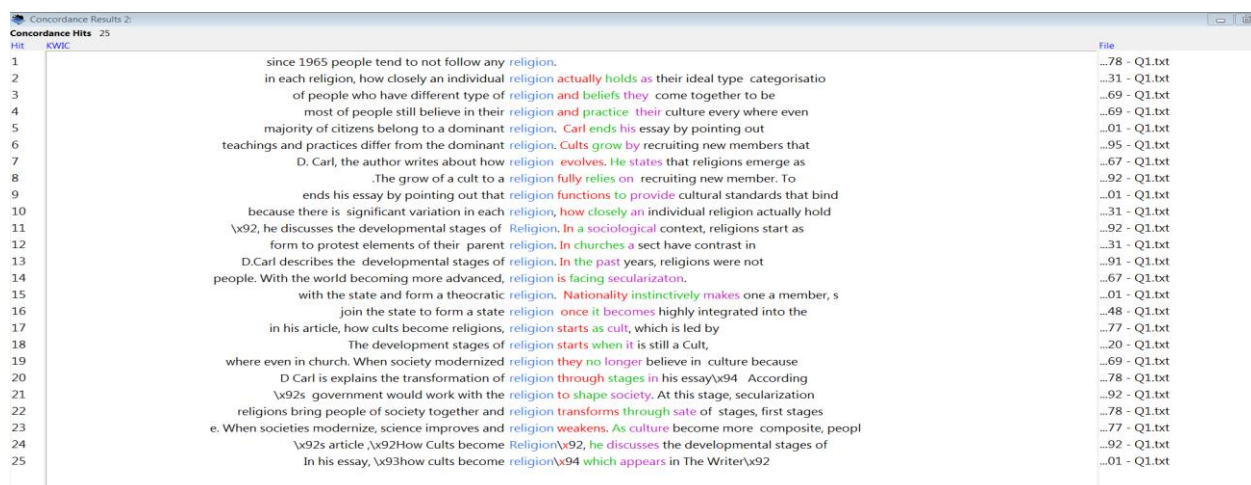

Figure 1: KWIC concordance of *religion*, as it appears in the corpus of the 13 responses to the assignment question

In this figure, *religion* as a key word, which is in the centre and which has 25 hits, it has a list of files that were used to search for it on its left-hand side. In the

centre, its KWIC concordance display is arranged, according to the words with which it occurs on either side of each concordance line. On the far-right hand side, the hits for *religion* have been ranked sequentially (with each hit appearing in its corresponding concordance line), whereas on the far right-hand side are listed the file numbers. Additionally, it co-occurred with words, such as *dominant* (n = 2) and (n = 2), and with phrases like *stages of* (n = 2) and *cults become* (n = 2). All of these immediately preceded it. Moreover, it co-occurred with phrases, such as *starts as a cult*, *starts when it is still a Cult*, *and beliefs*, and *practice*, and also with miscellaneous words (e.g., *evolves*, *functions*, and *fully*), all of which immediately followed it.
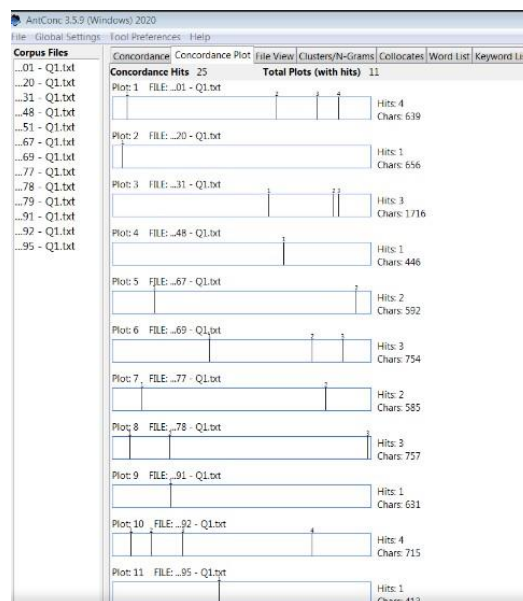

Figure 2: Concordance plot of *religion*, as it appears in the corpus of the 13 responses to the assignment question

In its rhizomatic-concordance plot, *religion* appeared in 11 assignment responses, with 4 hits in 2 assignments responses, and 1 hit each in 4 assignment responses (Figure 2). The manner in which the rhizomatic key theme, *religion*, was portrayed in context revealed the rhizomatic nature in which this key theme was used and presented itself across multiple students' files, thereby displaying rhizomatic variations in each text file. Files *01* and *92* shared a joint top ranking, followed by files *78, 69,* and *31.* In file *01, religion* was used four times in different paragraphs; in file *92,* it was used four times in multiple paragraphs. In files, *78, 69,* and *31,* it was used three times in each file.

In this context, *religion* was used to explain how cults became religion, stages/types of religion, as well as modernity; and this was evident in the interconnectivity shown across multiple text files. Figure 3 further demonstrates the dominant and the superordinate nature of *religion,* as a key theme.
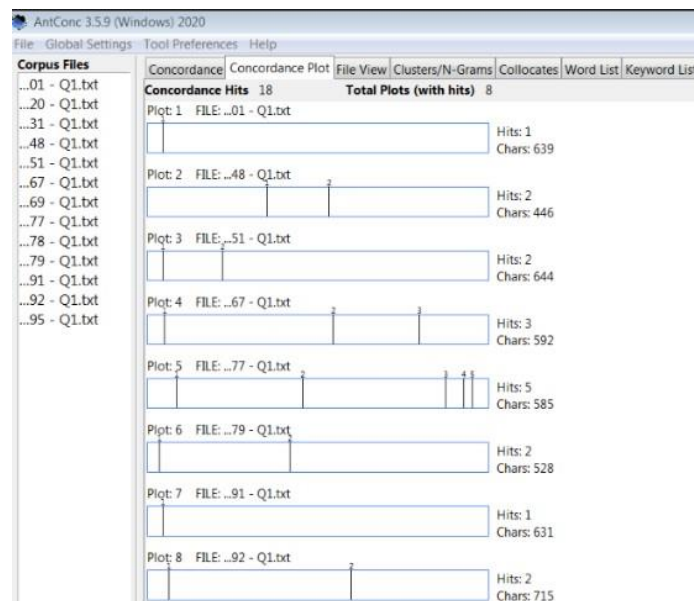
Figure 3: Visualization of key themes, *become, cult, members, religion*, and *sect*

Figure 4: KWIC concordance of *become*, as it appears in the corpus of the 13 responses to the assignment question

Another keyword, *become*, is (together with its KWIC concordance) displayed in Figure 4. In this context, it co-occurs with words, such as *to* (n = 3) and *can* (n = 2), and with phrases like *how cults* (n = 7), all of which immediately preceded it. It also co-occurred with words, such as *religion(s)* (n = 8), and with phrases like *a sect* that immediately followed it. In its rhizomatic concordance plot, *become* was used in 8 assignments, but, unlike *religion*, it was used five times in one file (77). In addition, it had 2 hits in 4 files, and one hit in each of 2 files (Figure 5).

Figure 5: Concordance plot of *become,* **as it appears in the corpus of the 13 responses to the assignment question**

4.2 *AntMover* Results for the Assignment Question: Structural Moves

The rhizomatic structural moves were analysed in the 13 assignment responses at a sentence level, when using the *AntMover* software application. The Response-text files were processed and analysed accordingly. The text files were sorted in classes (Figure 6).
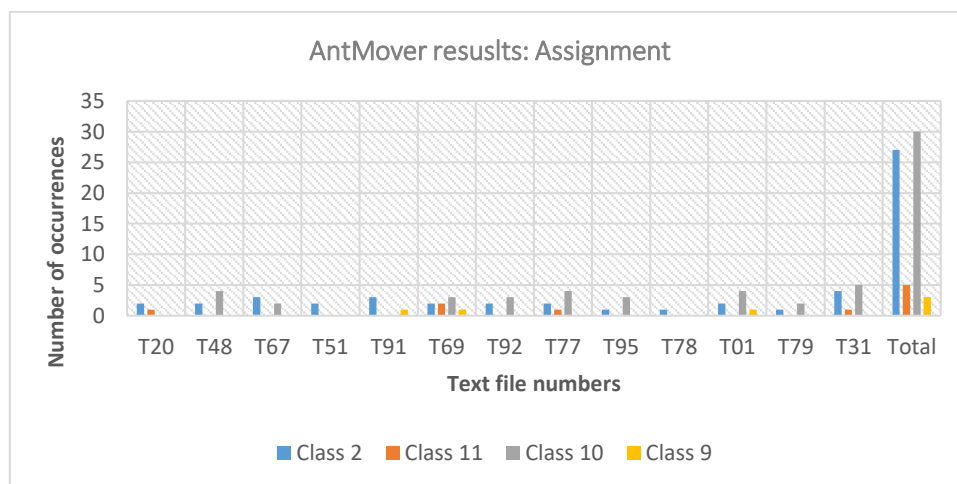

Figure 6: *AntMover* **structural moves for the Assignment Question**

For example, Class 10 (announcing the principal findings) was the highest class used (n = 30 occurrences) that was prevalent in the 13 responses. For instance, in text file 31, Class 10 was used five times. However, there was a marginal difference in its usage in text files 48, 77, and 01, all of which shared it four times, as opposed to text file 31. Text files 69, 92, and 95 followed closely, as they each used Class 10 three times. By contrast, in text files 20, 51, 91, and 78, Class 10 was not used at all; since it scored a zero occurrence.

Class 2 (making topic generalisations) was the second highest class used with the overall usage of 27 instances spread across the 13 responses. For example, text files 31, and 67 had the highest usage (4 and 3 respectively) of Class 2 in each response, while in text files 20, 48, 51, 69, 92, 77, and 01, it was used twice in each response. The lowest usage of Class 2 (n = 1 occurrence) was in text files 95, 78, and 79. On the other side, Class 9 (announcing present research) was the least-used class across the 13 responses, with an overall total of 3 occurrence instances. Text files 91, 69, and 01 had one instance of Class 9 usage in each response. Finally, the remaining text files did not use Class 9.

4.3 *AntConc* **Results for the Assignment Question: Linking Adverbials**
Celce-Murcia and Larsen-Freeman's (1998) framework was utilized to select the rhizomatic-linking adverbials (additives, adversatives, causals, and sequentials) in the 13 responses to the assignment question. The 13 responses were loaded onto *AntConc* in separate text files that were used to trace and explore the rhizomatic manifestations of linking adverbials in each response. In all of the 13 responses, two rhizomatic additive linking adverbials (*also* and *that*) were used (Figure 7).

One of the linking adverbials *also* was used twice in text file 69. On the contrary, there was no trace of the other linking adverbials in all of the other text files. The second rhizomatic additive linking adverbial, *that*, appeared twice in text files 31 and 69.

Figure 7: Some of the linking adverbials used in the 13 responses, as analysed by *AntConc*

Rhizomatic adversative linking adverbials were traced across the 13 responses; and, *actually*, was the only one that was mapped in the text file 31. No evidence of the other adversative linking adverbials was discovered in the other text files. Four causal linking adverbials, *consequently, otherwise, then*, and *therefore*, were found in some of the text files. *Consequently* appeared in the text 51 times only; and, similarly, *otherwise*, appeared in the text file 92 times only. *Then* was the most used linking adverbial across the 13 responses; and it appeared twice in text file 20, and once in text files 92, 67, 31, 48, and 78. *Therefore* was another linking adverbial that was traced once in text file 51. In all the 13 text files, two sequential linking adverbials were identified. One such example was, *first*, that

was used once in text file 78. Lastly, *then* was the second linking adverbial that was used once each in the text files 20, 92, 67, 31, 48, 78, and 20.

4.4 *my*Unisa's Online Discussion Forum (ODF) and MS Teams' Interactions

Student interactions related to student module queries on the *my*Unisa's ODF were collated and converted into text files. The text files were uploaded onto *AntConc, in order* to trace the key themes, according to the keywords. One hundred and fifty keywords were generated by *AntConc*, in the form of key themes. Thereafter, they were inputted into both Microsoft Power BI and Gephi software tools for visualization purposes. Five of the highest key themes were *assignment*, *good*, *find*, *results*, and *MCQ* (Figure 8).

Figure 8: Power BI and Gephi visualizations of students' *myUnisa's* ODF interactions

The key theme, *assignment*, was ranked fifth (n = 46 hits). It was followed by *good* at the sixth spot (n = 39 hits). *Find* (n= 16 hits), *results* (n= 12 hits), and *MCQ* (n= 10 hits), each of which, was ranked twenty-sixth, forty-first, and forty-sixth, respectively.
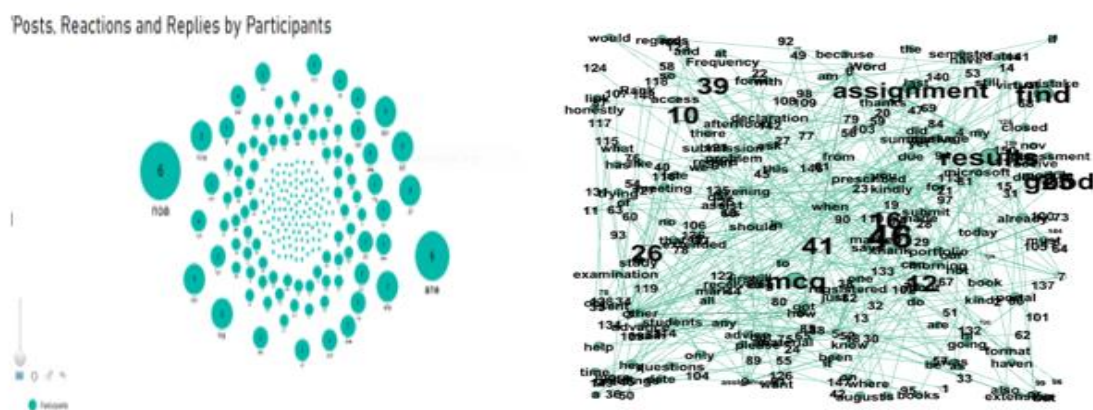
Figure 9: Power BI and Gephi visualizations of student-instructor interactions MS Teams

There were also student-instructor interactions, based on an MS Team's virtual classroom that was created in the second semester of 2020. These interactions were extracted; and, they were then processed through MS Power BI and Gephi, in order to create their visualizations (Figure 9). As shown in Figure 9, in terms of student posts, a participant with the greatest number of posts (n = 6) was Noa†; and this was followed by Ane (n = 5 posts). The other participants, such as Ela, Ezi, Kwa, Lan, Af, and Log had 3 posts each; while Gwe, Apo, Si, Nya, and Iso, had one post each. By contrast, participants like Azi, Iti, Eni, Tul, and Uli had no posts.

In terms of instructor's replies, <u>Ane</u> had the most replies (n = 14) to student queries. Second and third were Kek and Gam with 10 and 5 replies, apiece. Most participants, for example, Ngu, Uta, Ezi, Ini, and Lis posted only one reply. From a different angle, Ran made 5 reactions, with Tlh, Abe and Kol having a tie of 4 reactions, each. Most participants, namely, Sie, Low, An, and Xe, posted 2 reactions, apiece. On the other hand, participants, such as Osi, Nya, Bo, Ema, and La posted no reactions.

5. The Discussion
5.1 *AntConc*, **Keyword Frequencies, Concordance, and Concordance Plot**s
For the assignment question, students were required to "Read chapter 16 of the prescribed book (from page 224) and summarize the developmental stages of religion in your own words", and "Compare and contrast a theocratic government with a democratic government". The results demonstrated that the students used similar key themes (*become*, *cult*, *members*, *religion*, and *sect*), but in a rhizomatic manner. The rhizomatic frequencies of the identified key themes indicated that *religion* and *cult* were used differently at the end of each concordance spectrum. The highest key theme, *religion,* was used almost in the same manner in 11 of the assignment responses. However, it displayed

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† All the names assigned to participants are pseudonyms.

rhizomatic variations of use in each assignment response. For example, it was used mostly in text files 01 and 92, but in different paragraphs that portrayed rhizomatic patterns of usage in each text file. In the identified text files, *religion* was used to explain how cults became religion, stages/types of religion, as well as modernity.

This was evident in the interconnectivity displayed across multiple text files. In contrast, the key theme, *cult*, was used almost identically in different paragraphs. It was also shown that the rhizomatic frequencies of the key theme, *cult*, were largely evident in text files 20 (n= 5 hits) and 31 (n = 4 hits). By contrast, *cult* was used to explain the process of becoming religious, which is dependent on a number of followers, in order to affirm a religion's status. Although the writing samples demonstrated that students used similar key themes, nonetheless, their use of such key themes differed in each sample; and this was evident in the concordance plot, and in the rhizomatic frequencies visualized in Figure 3.

A considerable number of studies have been conducted, in which *AntConc* was used to investigate the lexical bundles and/or phraseology in the written tasks, and to compare the writing patterns of native and non-native speakers of English. Three of these studies are those of Yazıcı and Çıraklı (2019), Ulfa and Muthalib (2020), and Zhang and Pan (2020). These studies have investigated the writing patterns in student writing, even though they did not do so from a rhizomatic perspective.

For example, Yazıcı and Çıraklı (2019) examined writers' linguistic preferences and their use of repeated verbal cues in their written texts. They discovered that the play *Come and Go* had a prevalence of proper nouns and words that referred to a human body. In addition, they found that the word *silence, left* and *right* were highly repeated.

Zhang and Pan's (2020) study compared the keywords generated by *WordCloud* and *TF-IDF-LDA* investigated the sentiments of the abstracts generated by *SnowNLP* and *TextBlob*, which were verified by the use of *AntConc*. They also examined whether authorial interactions could be improved by self-mentions. They found that the keywords generated by these software programs were reliable. Furthermore, according to Zhang and Pan (2020), high-frequency words together with keywords can lead to finding the key information in a text; and these could help writers produce keywords for their papers. Even though the three studies cited here did not investigate any rhizomatic patterns in their respective areas of focus, the major similarities between them and the current study is that they are all advancing the idea that there are variations in students' academic writing.

Another study, which advances the same notion of rhizomatic learning is that of Bozkurt et al. (2016). This study contends that learning in a networked environment serves as a springboard to "rhizomatic-learning practices" (p. 20); and it also accommodates "nomadic learners" (p. 8).

5.2 *AntMover* and Structural Moves

The rhizomatic structural moves portrayed by *AntMover*, which were discovered during the analysis of the 13 assignment responses, were as follows:

- Announcing principal findings.
- Making topic generalisations.
- Announcing present research.

The results revealed that even though students used similar structural moves in their responses to the assignment question, nevertheless, the rhizomatic occurrence frequencies of such structural moves differed in each text file. Announcing the principal findings (Class 10) was the highest-used class (n = 30 occurrences) that was apparent in the responses to the assignment. However, it was used in the rhizomatic variations in each case. It enjoyed the highest rhizomatic usage (5 occurrences) in text file 31. In contrast, it displayed a variant rhizomatic usage (2 times) in text files (20, 48, 51, 69, 92, 77, and 01).

The extreme end of the results reflected the other variables' usage of Class 10 that was portrayed in text files (95, 78, and 79). Furthermore, the results showed that Class 9 (announcing the present research) was the least-used class in the responses to the assignment question. This class was used in three rhizomatic instances (files 91, 69, and 01) in all the responses. The rhizomatic patterns in student writing in relation to Class 9 demonstrated that some of the students did not support their essays with current research. Again, this showed that some students employed different approaches to writing their essays; some used their lived experiences, whilst others depended on research only.

Some of the studies conducted on rhizomatic structural moves that have used *AntMover*, have mainly focused on the writing of abstracts for research articles. Examples here are Abarghooeinezhad and Simin (2015), Bhatti et al. (2019), and Gustina (2020). In contrast, other studies have focused on either structural moves related to the findings and discussion sections (Alvi et al., 2017; Lubis, 2020), introductions in research articles (Pashapour et al., 2018; Pendar & Cotos, 2008), or conclusions in the research papers (Zamani & Ebadi, 2016). As in the previous section, most of these studies did not adopt a rhizomatic perspective in the manner in which the current study did. However, they, too, argued for variable writing patterns that were evident in the written samples.

For instance, Gustina's (2020) study investigated the rhetorical moves and linguistic features in thesis abstracts and research-article abstracts written by undergraduate students. The study found variations in the manner in which undergraduate students wrote their theses and research-article abstracts. It further observed that Move 3, referred to as the Method, was the most prevalent move used in both of the written samples. In addition, the study discovered that students who participated in it often excluded Move 5 (Conclusion) in their written samples. Further observations in Gustina's (2020) study indicate that no move was obligatory, except Move 1 (Introduction) and Move 3 (Method), which reached obligatory status. Alvi et al. (2017) studied the structural moves

of a sub-genre prevalent in the discussion section of Pakistani research oscholars' doctoral theses registered in Education, Economics, Geography, Sociology, Statistics and Psychology. They found that no structural move was obligatory. For instance, two moves (Findings – Move 3 and Recommendation – Move 9) were highly frequent or had a 66% occurrence frequency, each. Move 6 (Explanation) followed closely with 60%, Move 5 (Previous research), and Move 8 (Limitations) had a 56% occurrence frequency. The lowest move that was recorded was that of Move 4 (Unexpected outcome), which had a 30% occurrence frequency.

5.3 *AntConc* and Linking Adverbials
The results showed the rhizomatic mapping and manifestation of linking adverbials across the 13 responses to the assignment. It was demonstrated that two additive-linking adverbials (*also* and *that*) were used twice. *Also* was used twice in text file 69; and *that* appeared twice in text files 31 and 69. Four causal linking adverbials (*consequently, otherwise, then,* and therefore) were identified. *Then* produced the most rhizomatic frequencies, appearing twice in text file 20, and, once in text files 92, 67, 31, 48, and 78. However, *therefore* occurred once in text file 51, and *first* also featured once in text file 78. Overall, the findings, therefore, indicated that students used additive and causal linking adverbials more frequently than other types of linking adverbials.

A significant number of studies have been conducted, in which *AntConc* has been used to reveal the linking adverbials prevalent in the written samples. Among these studies are Bikelienė's (2017), Diamante's (2020), Dutra's et al. (2017), and Karatay's (2019) studies. In Karatay's (2019) study, it was found that students tend to use linking adverbials more often in timed essays than in untimed essays. This study also discovered that students used fewer linking adverbials under the sequential and additive linking adverbials. In addition, it found that adversative linking adverbial, *nevertheless*, appeared with the frequency of 0.08 on timed versus the frequency of 0.19 on untimed essays. Moreover, the study discovered that causal linking of the adverbial, *consequently*, scored 0.7 on timed versus 0.11 on untimed essays.

5.4 *my*Unisa's ODF and MS Teams' Interactions
As pointed out in the results section, student interactions in relation to *my*Unisa's ODF manifested five key rhizomatic themes in their posts: *assignment*, *good*, *find*, *results*, and *MCQ*. Among these, *assignment* ranked highly, followed by *results*. By contrast, in Chaka and Nkhobo's (2019) study, it was found that the instructor was more active than the students; since he was the one asking more questions, which were intended to guide the students to the correct answers. In a different, but related context, Bagarinao's (2015) study found that students portrayed different patterns in their online interactions. Similarly, the study conducted by Estacio and Raga Jr. (2017) discovered that students presented different online interactions.

In respect of MS Teams, the results showed the participants with the most, least, and zero rhizomatic posts. Onah et al. (2014) discovered that the use of online

forums encouraged students to participate in such forums and contributed towards their academic success. The same can be said in the study conducted by Buchal and Songsore (2019). This study recorded positive reactions by students when the MS Teams was used for teaching and learning purposes. It also found that the majority of students had fewer difficulties, when making use of this online platform.

6. Conclusions

When student writing samples were analysed in terms of keywords (e.g., key themes) by using the software applications employed in this study, varying rhizomatic patterns were detected in the students' text files. This was in terms of keyword frequencies, concordance, and concordance plots of the keywords used in these writing samples that were subjected to *AntMover*. For instance, the keyword frequencies of key themes, such as *religion* and *cult,* showed that these two key themes were used differently at the end of each concordance spectrum, thereby underscoring their varying rhizomatic patterns of usage in their respective text files.

With reference to structural moves, the analysis demonstrated that while students employed similar structural moves in their responses to the assignment, but the rhizomatic occurrence frequencies of these structural moves differed in each text file. Concerning linking adverbials, it emerged that additive and causal linking adverbials were used rhizomatically more than the other types of linking adverbials, such as adversatives. Furthermore, online student interactions on both *my*Unisa's ODF and MS Teams were visualized rhizomatically. Therefore, it is clear that online student-engagement patterns, of whatever type and nature, can also be represented in rhizomatic visualizations, as was the case with this study.

7. Recommendations and Limitations

The findings of this study underscore the importance of investigating and analysing students' writing not only from linear models, but also from non-linear perspectives, such as a rhizomatic approach. They also underline the significance of leveraging the affordances offered by student writing analysis technologies, such as *AntConc*, *AntMover*, and Gephi, which were employed in this study. This is more so, firstly, since the HE sector across the globe seems to be a melting pot of cultures and traditions in terms of its student populations. Secondly, this is even more evident; as the ongoing global COVID-19 pandemic is forcing HEIs to pivot more than ever than before; in order to facilitate online teaching and learning.

The first manifest limitation of this study is the fewer student-writing samples that were used. This makes the findings non-generalizable, but, rather, context-bound. The second limitation of the study is that it is module-bound: its findings relate to the module, which is being investigated. But even then, its findings only apply to the writing practices of the students, who volunteered to participate in it, even though instances abound, in which one student's writing practices are investigated. The third limitation is that the results are technology-bound: the

results are based on the datasets that were generated through *AntConc*, *AntMover*, Gephi, and MS Power BI as the specific technologies that were employed in this study. Therefore, anyone who is not able to utilize these technologies may not be able to assess the student-writing approach used in the study.

8. References

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