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A Corpus-Assisted Comparative Analysis of Adversative Conjunctions in Student and ChatGPT Essays: A Rhizomatic Perspective

Tlatso Nkhobo*[a] & Chaka Chaka[a]

* Corresponding author
Email: nkhobti@unisa.ac.za

a. Department of English Studies, University of South Africa, Pretoria, South Africa

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ABSTRACT

Employing a Deleuzian-Guattarian rhizomatic framing of multiplicity, this study had a dual purpose: to investigate the occurrence frequencies of four adversative conjunctions (*but*, *however*, *while*, and *yet*) in student-written discursive essays (SWDEs, n = 50) and in ChatGPT-generated discursive essays (ChatGPT-GDEs, n = 50) as analysed by AntConc; and to extrapolate the Deleuzian-Guattarian multiplicity in these two essay sets as displayed by the use of these four adversative conjunctions in the paragraphs of the said essay sets. These two essay sets were selected, in the case of the former set, and generated in the case of the latter set, through convenience sampling. Student essays were written by first year university students, who were registered in an undergraduate English language module in the first semester of 2023 at a university in South Africa. Then, the study used AntConc (version 4.3.0) to analyse the two essay sets. In the main, the study found that the usage of the first three adversative conjunctions (*but*, *however*, and *while*) was almost evenly spread across SWDEs, a feature that indicated that in this essay set, students very nearly displayed a consistent adversative variation in contrasting ideas or in expressing concession or opposition to such ideas. On the contrary, in ChatGPT-GDEs, *while* was excessively and very nearly monopolistically employed by ChatGPT in contrasting ideas or in expressing concession or opposition to such ideas in this set of essays as compared to the other three adversative conjunctions. Finally, cases of multiplicities were almost nearly evenly distributed across the first three adversative conjunctions in SWDEs, whereas they were inordinately and almost monopolistically concentrated in one adversative conjunction (*while*) in ChatGPT-GDEs.

KEYWORDS

Adversative conjunctions; AntConc; ChatGPT-generated discursive essays (ChatGPT-GDEs); concordance and concordance plot; Deleuzian-Guattarian multiplicity; student-written discursive essays (SWDEs).

INTRODUCTION

Large language models (LLMs), powered by generative artificial intelligence (GenAI), continue making their never-ending inroads into the different strata of higher education (HE), bringing with them near-apocalyptic effects in some of the areas of this educational sector. Arguments for the many and varied applications of LLMs in the HE sector, including the benefits and risks LLMs have for the broad spectrum of this sector, are now well known (Romero et al., 2024; Sullivan et al., 2023; Yusuf et al., 2024). At the same time, sceptical views about the impact LLMs might have for certain disciplines in HE have also been expressed (Gallent-Torres et al., 2023; Nyaaba et al., 2024). Alongside all of this, there has been a growing body of work that has explored the similarities and differences between human-written and artificial intelligence-generated (AI-generated) content in different academic disciplines. The cogent argument here is that these two forms of writing bear different properties, with the former displaying more varied and complex sentence structure, which is an indicator of its high perplexity. In contrast, the latter is often seen as following a predictable, formulaic sentence structure, which, overall, has a low perplexity (Bublak, 2024; Chaka, 2023a; Hascaryo, 2023). Studies that have investigated the differences between these two forms of writing across academic disciplines include those in education (Kumar & Mindzak, 2024), English language studies (Alexander et al., 2023; Chaka, 2023a, 2024a; Georgiou, 2024; Kong & Liu, 2024), library and information science (Malika, 2024), medical education (Liu et al., 2024; Pinto et al., 2024), orthopaedics (Cooperman & Brandão, 2024; Hakam et al., 2024; Lawrence et al., 2024), and physical science (Desaire et al., 2023). Most of these studies have employed AI detectors or both AI detectors and human reviewers to distinguish between human-produced writing and AI-generated content.

However, there are a few studies that have examined the differences between human-produced writing and AI-generated content by employing other online computational tools than just AI detectors. Among these studies are Georgiou (2024), Nkhobo and Chaka (2023a, 2023b), and Zindela (2023). What these studies try to do is subject these two forms of writing to some of the computational tools that have long been used to analyse human writing, especially student writing, and not simply to detection tools designed and launched in response to the advent of LLMs powered by GenAI as is currently the case with most of the studies cited in the preceding paragraph. In view of this, the current study intends to contribute to the studies that have employed long-standing online corpus analysis tools by evaluating first-year, university-level, student-written discursive essays (SWDEs) and ChatGPT-generated discursive essays (ChatGPT-GDEs). It employed AntConc (version 4.3.0) as its preferred online corpus analysis tool. This preference was informed by the fact that most of the currently-available detection tools used for distinguishing between human-produced writing and AI-generated content often tend to have inaccuracies, misclassify these two forms of writing, and yield false positives and false negatives (see Chaka, 2024a, 2024b; Dalalah & Dalalah, 2023). Importantly, the study also views student writing from a Deleuzian-Guattarian rhizomatic perspective of *multiplicity* (Deleuze & Guattari, 1987).

Based on the points mentioned above, this study had a dual purpose: firstly, to investigate the occurrence frequencies of four adversative conjunctions (*but*, *however*, *while*, and *yet*) in student-written discursive essays (SWDEs) and in ChatGPT-generated discursive essays (ChatGPT-GDEs) as analysed by AntConc; and, secondly, to extrapolate the Deleuzian-Guattarian multiplicity in these two essay sets as displayed by the use of these four adversative conjunctions in the paragraphs of these essay sets. It, thus, had the following research questions (RQs):

- What are the occurrence frequencies of the adversative conjunctions (*however*, *but*, *while*, and *yet*) in student-written and ChatGPT-generated discursive essays as represented by the AntConc's concordance and concordance plot?
- How does the use of adversative conjunctions (*but, however, while,* and yet) tend to display *multiplicities* (connected/disconnected mutations) in the two essay sets when thoughts or ideas are contrasted or expressed oppositionally as analysed by AntConc's concordance in context and concordance plot?

DELEUZIAN AND GUATTARIAN RHIZOMATIC FRAMING: MULTIPLICITY

This study draws its theoretical underpinning from Deleuze and Guattari's (1987) construct of *multiplicity*. Multiplicity is poststructural in nature, and is often used to challenge hierarchical ways of thinking. Deleuze and Guattari (1987, p. 8) assert that "[a] multiplicity has neither subject nor object, only determinations, magnitudes, and dimensions that cannot increase in number without the multiplicity changing in nature …". In this way, multiplicities are determined through their abstract lines and by virtue of their lines of flight or deterritorialization. Deterritorialization refers to idea that multiplicities are not permanently fixed in a given landscape. In other words, multiplicities mutate and tend to interlink with other related multiplicities (Deleuze & Guattari, 1987).

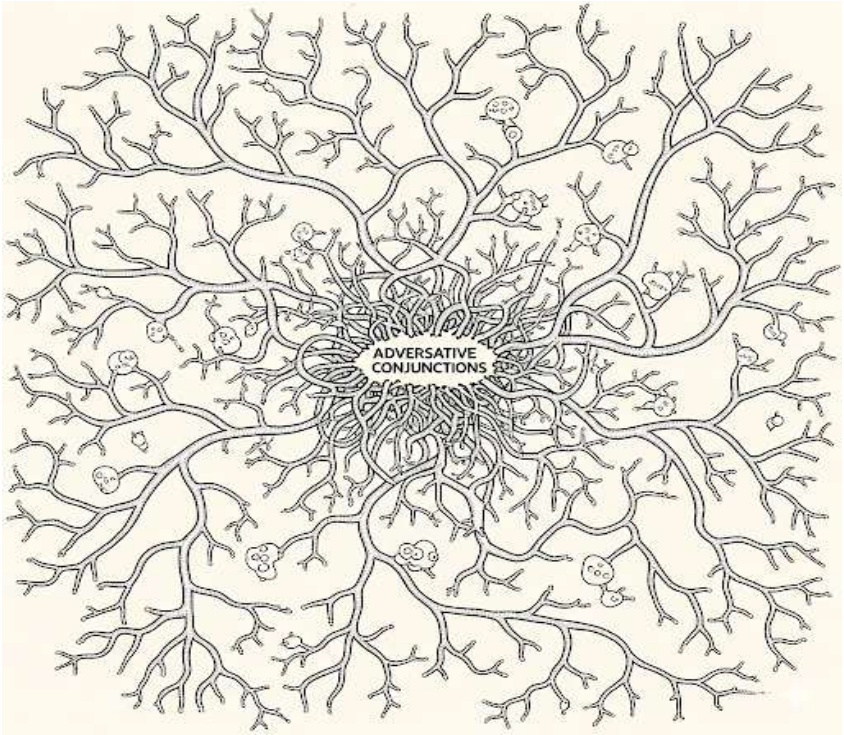
It is necessary to simplify and contextualize these thoughts about multiplicity from the notion of the rhizome as employed by Deleuze and Guattari. For them, a rhizome, a botanical concept, refers to a collection of entities or things, which on the surface, look different and independent, when actually they are connected together by a rhizome as a larger assemblage. Among other things, the rhizome is made up of multiplicity. Multiplicity entails the fact that as entities increase, they correspondingly change, expand, and give rise to new entities with the resultant change in their structures, formations, and directions. This increase in the number of entities has a multiplier effect: their multiplying triggers the same chain reaction over and over. As such, they do not have the origin (subject) and the end (object) in a way that makes them distinguishable in a straightforward manner (Olivier, 2025).

Elsewhere, multiplicity is understood as assemblages of mutations, which bring into existence other multiplicities, which can start at any point of the rhizome. As such, multiplicities can be viewed and interpreted from different non-hierarchal points (Kılıç, 2021). Closely related to the focus of the present study, multiplicities are also viewed as phenomena that happen inside and outside our minds (Luzar, 2019). Therefore, applied to this study, multiplicity entails

simultaneous representations of connected/disconnected ideas, which create lines of flight that adversative conjunctions tend to assume when ideas are contrasted or when opposing views are expressed in written texts (see Figure 1). For its part, assemblage refers to dimensional increase in multiplicity that triggers changes and amplifies connections (Deleuze & Guattari, 1987). To theorise this to adversative conjunctions, this implies that in this study adversative conjunctions are seen as an assemblage in student writing that tend to multiply and change unpredictably depending on the items they (adversative conjunctions) serve to connect at various points within student writing. So, in this study, assemblages involve representations of multiplicities that adversative conjunctions display when used in written texts.

Figure 1.

One form of a rhizome exemplifying how adversative conjunctions can multiply structurally outwardly displaying simultaneous connections and disconnections.



LITERATURE REVIEW

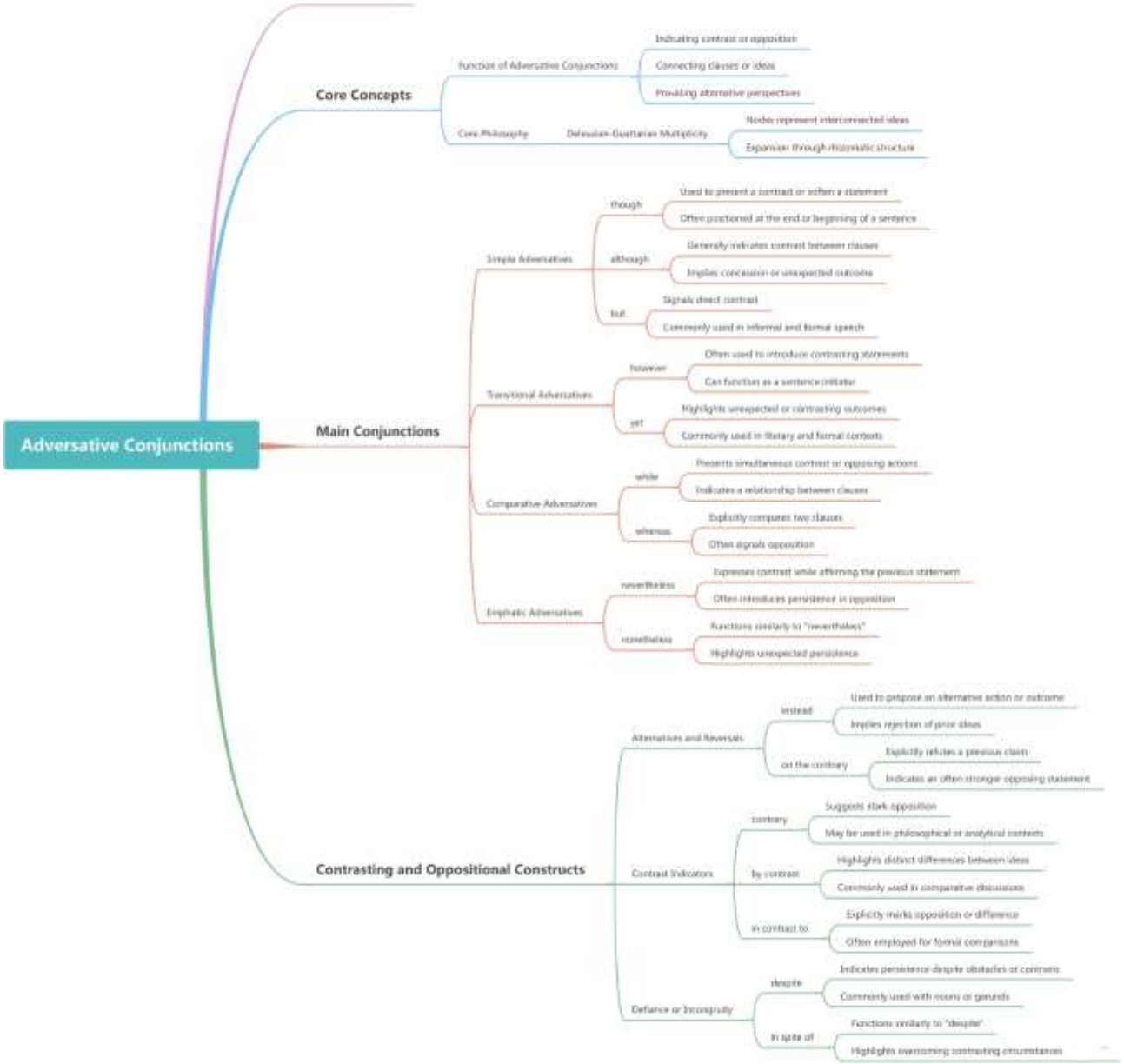
Adversative Conjunctions

The functions of adversative conjunctions, together with those of the other types of conjunctions such as additives, temporals, causals, and continuatives, have been studied largely in relation to second language writing, especially English as a second language or English as a foreign language writing (Ngadiman & Tanone, 2014; Namaziandost et al., 2019; Shah et al., 2021; Fujiwara, 2024; Wang, 2024). Some of the examples of adversative conjunctions are: *though*; *although*; *but*; *however*; *yet*; *while*; whereas; *nevertheless*; *nonetheless*; *instead*; *contrary*; *despite*; *in spite of*; *on the contrary*; *by contrast*; and *in contrast to* (Namaziandost et al., 2019; Ngadiman & Tanone, 2014; Shah et al., 2021; Wang, 2024). Most of the classifications

used for the different types of adversative conjunctions, including those of the conjunctions mentioned above, are based on Halliday and Hasan's (1976) taxonomy of cohesive devices in English, which operate at the different levels within a text. Mostly, adversative conjunctions serve the purpose of contrasting or negating information or ideas, or of signalling concession, opposition or antithesis within the text (Bogdanović et al., 2023; Namaziandost et al., 2019; Ngadiman & Tanone, 2014; Nkhobo & Chaka, 2023b; Shah et al., 2021). Adversatives also perform other functions as depicted in Figure 2, whose scope falls outside the current study.

Figure 2.

The multifarious functions served by adversative conjunctions.



AntConc and Adversative Conjunctions: Human-Written Corpora

Some of the recent studies conducted on adversative conjunctions in which AntConc was used as a corpus analysis tool or in which AntConc was one of the corpus analysis tools used are those by Namaziandost et al. (2019), Fujiwara (2024), and Wang (2024). Namaziandost et al.'s (2019)

study employed 348 applied linguistics research articles produced by 174 Iranian and 174 non-Iranian researchers. The articles were published between 2015 and 2019, and were sourced from Scopus. The two sets of articles had 1,584,076 and 1,143,652 words, each. The study utilised three corpus analysis tools, AntConc, Textanz, and Word List Expert to analyse and calculate the frequencies of adversative, additive, temporal, and causal conjunctions in the two sets of articles. With reference to the adversative conjunctions (n = 12) investigated in the study, <*but*> and <*however*> were the two most, frequently-used adversative conjunctions in the two data sets. *But* was the top most used adversative conjunction in the two sets, while *<however>* was the second most used adversative conjunction in both sets. Both of them were used more in the second set (the non-Iranian set) than in the first set (the Iranian set). *Yet* was the least used adversative conjunction compared to the other two adversative conjunctions. Overall, the study found that adversative conjunctions were the least-used conjunctions compared to additive, casual, and temporal conjunctions. It concludes that a lot of ESL learners have difficulty using conjunctions as cohesive devices (see Namaziandost et al., 2019).

Wang's (2024) study also explored two sets of corpora, 100 M.A. theses written by Chinese EFL postgraduate students from 12 distinct universities and 22 Ph.D. theses from six different universities, to investigate the usage frequencies of adversative conjunctions in them. The first corpus had 401,776 words, whereas the second one consisted of 398,174 words. The corpus analysis tool used to analyse and calculate the usage frequencies of adversative conjunctions was AntConc 4.0.4. These adversative conjunctions included *<but>, <while>, <however>*, <*yet*>*,* and <*although*>, among others. Of these five adversatives, <*but*> was the top most used adversative in both sets of corpora, with the highest frequency count in the first set (n = 5,907) as opposed to the usage frequency (n = 3,995) in the second set. It was followed by <*while*> (n = 1,836; n = 1,299) and <*however*> (n = 1,352; n = 1,186) in both sets, respectively. *Yet* (n = 588) and <a*lthough*> (n =540) were the fourth- and fifth-most used adversatives in the first set (the M.A. thesis corpus). Nonetheless, in the second set, <*although*> posted 493 usage frequencies, whereas <*yet*> generated 469 occurrence frequencies. Of the two corpora, the M.A. thesis corpus used more of these adversatives than the Ph.D. thesis corpus (see Wang, 2024).

These two studies triggered the interest of the current study. Even though these two studies focused exclusively on the adversatives used in human-written corpora, the present study sought to explore the usage frequencies of the four adversative conjunctions (*but*, *however*, *while*, and *yet*) in human- written and AI-generated essay data sets. This choice is not informed by whether these four adversatives are more important than the other English adversatives or not. Rather, it has to do with investigating the comparative occurrence frequencies of these four adversatives in each essay data set.

Coh-Metrix and AntConc: Human-Written and ChatGPT-Generated Essays

Online corpus analysis tools such as Coh-Metrix and AntConc have been used by different scholars to investigate various linguistic components in student writing well before the advent

of LLMs. Examples of scholars who have employed Coh-Metrix for this purpose are McNamara et al. (2010), Latifi and Gierl (2020), Nasseri and Thompson (2021), and Wang et al. (2021). Similarly, instances of scholars who have used AntConc include Ulfa and Muthalib (2020), Nkhobo and Chaka (2021), Papangkorn and Phoocharoensil (2021), Bogdanović et al. (2023), Özçelik (2023), Yasmin et al. (2023), and Zakiyah (2023).

Studies have been conducted and scholarly papers have been written in which the challenges, experiences, and affordances of AI tools have been explored in response to and in the aftermath of the release of LLMs such as ChatGPT, Copilot, and Claudia. Some of the examples of these papers include Chaka (2023a, 2023b), Maeng et al. (2023), Nkhobo and Chaka (2023a, 2023b), Tai et al. (2023), Georgiou (2024), Li et al. (2024), and Zhou et al. (2024). Some of these studies such as Nkhobo and Chaka (2023a) and Zindela (2023) have compared student-produced writing and ChatGPT-generated text using Coh-Metrix (version 3.0) as an online corpus analysis tool. For example, Nkhobo and Chaka's (2023a) study investigated two sets of essays, student-discursive essays and ChatGPT-generated discursive essays, both of which focused on the same essay topic. This topic was: *Write an essay in which you discuss three negative effects of using drugs for mood or behaviour syndromes*. Each set comprised seven essays in which lexical density, syntactic complexity, and referential cohesion, as three of Coh-Metrix indices, were key aspects of comparative analysis. The first set of essays was drawn from assignment scripts written by first-year, undergraduate, English language students, who were enrolled in a first-year module offered by an English department at a university in South Africa. The second set of essays consisted of the ChatGPT-generated versions of the first set of essays as informed by the same essay topic. ChatGPT-3.5 was the GPT version used for generating essays. The word length of the seven student essays ranged from 419 words to 577 words, while that of the ChatGPT-generated essays ranged from 492 words to 526 words. Student essays were written in the first semester of 2020, whereas ChatGPT-generated essays were generated in June 2023, almost seven months after the launch of ChatGPT.

In the context of the aforementioned study (Nkhobo & Chaka's 2023a study), lexical density consisted of the following clusters of lexical features: lexical diversity (content word lemmas and type-token ratio); lexical diversity (all words and type-token ratio); lexical diversity (all words and measure of textual lexical diversity (MTLD)); and lexical diversity (all words and VOCD). For its part, syntactic complexity was made up of four clusters: number of modifiers per noun phrase mean; all words and minimal edit distance; adjacent sentences, sentence syntax similarity, and mean; and all combinations, sentence syntax similarity, across paragraphs, and mean. Finally, referential cohesion also had four clusters: noun overlap, binary, adjacent sentences, and mean; binary, adjacent sentences, argument overlap, and mean; binary, all sentences, argument overlap, and mean; and all sentences, proportional, content word overlap, and mean. The study also subjected the mean scores of the Coh-Metrix results to a t test. In the main, in terms of Coh-Metrix's raw mean scores, student essays outperformed ChatGPT-generated essays in relation to lexical density and referential cohesion, whereas ChatGPT-

generated essays outperformed the former set of essays in syntactic complexity. Nevertheless, at the level of t test scores, the three Coh-Metrix linguistic indices had no statistically significant difference between the mean scores of the two essay sets (Nkhobo & Chaka, 2023a).

One of the recent studies that has employed AntConc to analyse linguistic features of both student-written essays and ChatGPT-generated essays is Fujiwara (2024). The study investigated the differences between essays written by English native speakers and ChatGPT-generated essays. It had 400 essays produced by native English speakers (NESs) sourced from the International Corpus Network of Asian Learners of English (ICNALE) and 100 ChatGPT-generated essays. There were two themes that these essays focused on: *The pros and cons of college students doing a part-time job* and *the pros and cons of smoking in restaurants*. The GPT 3.5 Turbo version of ChatGPT, which is a free version, was used to generate essays based on the same essay topics. In all, 100 essays (tokens = 35,484) were generated, 50 essays on the first theme and the other 50 essays on the second theme. The tokens for student-written essays (the ICNALE essays) totalled 90,613.

Employing AntConc (AntConc 4.2.0) as its concordancer, the study analysed and compared the differences between the two sets of essays in terms of their usage of conjunctions, prepositions, personal pronouns, and modal verbs. Some of the results of this study are worth mentioning. First, ChatGPT-generated essays displayed a fixed lexical pattern in which the same phrases like *and*, *by*, *with*, *for*, and *can* were used many times and repeatedly more than was the case with student-written essays. Generating this kind of vocabulary pattern, the study argues, has the danger of exposing students to an inflexible, unbalanced, and invariable vocabulary pattern. Second, in contrast to student-written essays, ChatGPT-generated essays had less frequently used function words. These words applied to the following categories: conjunctions (*as*, *or*, *when*, *if*, and *that*); prepositions (*before*, *about*, and *to*); personal pronouns (*it*, *they*, *I*, *my*, and *us*); and modal verbs (*will*, *would*, *could*, and *might*) (Fujiwara, 2024).

It becomes clear from the studies and papers cited above that, since the launch of ChatGPT, at least, there is some work that has investigated the differences between student-written essays and ChatGPT-generated essays using online corpus analysis tools like Coh-Metrix and AntConc. However, there are fewer studies that have done so by situating student writing within a rhizomatic framing as is the case with the present study.

RESEARCH METHODOLOGY

Research Design

This study employed an exploratory research design to answer its two research questions mentioned earlier on. It did so as the area it investigated is still under-researched (see Nkhobo & Chaka, 2023a, 2023b; Leavy, 2017; Riazi, 2016). According to Riazi (2016), one of the aims of an exploratory research design is to unravel new understandings about a given phenomenon. This view of exploratory research is relevant to the current study as it seeks to shed some new

insights into the analysis of the frequencies and multiplicities of adversative conjunctions used in SWDEs and ChatGPT-GDEs as analysed by AntConc's concordance and concordance plot.

Exploratory research design is mostly applicable to case studies, which may consist of only a certain number of participants from the larger group. This type of research design avoids generalizing research findings (Reiter, 2017). The exploratory research design employed by the present study allowed for qualitative data (essay sets) to be analysed quantitatively using AntConc (see Almalki, 2016; Christensen et al., 2015; Ivankova & Creswell, 2009; Riazi, 2016).

Sampling Procedure

The study used convenience sampling to select SWDEs and to generate ChatGPT-GDEs. Convenience sampling requires a selection of participants or datasets easily available to the researcher (Christensen et al., 2015; Etikan et al., 2016; Riazi, 2016). As a result, 50 discursive essays written by first-year students, who were enrolled in an undergraduate English language module during the first semester of 2023, were chosen. ChatGPT was regarded as a GenAI writing tool, and was prompted to produce 50 discursive essays on the same topic that was assigned to first-year students when they wrote their second assignment. Before the study was undertaken, an ethical clearance was granted by a relevant university's research ethics review committee.

Data Collection

Fifty student discursive essays, which had been submitted for Assessment 2 for an undergraduate English language module in the first semester of 2023, were downloaded from Moodle as an online assignment submission platform. The assignment required students to respond to the following discursive essay topic: *Using research, discuss TWO (2) positive and TWO (2) negative effects of how technology use in education affects students' learning. Your response should include a minimum of FIVE (5) credible sources.* Using the same essay topic as a long prompt, ChatGPT (ChatGPT-4) was instructed to generate 50 different discursive essays, one at a time, on 23 May 2024. Both essay sets had to have not more than 500 words.

Data Analysis

The data for this study consisted of two data sets derived from the two sets of discursive essays mentioned in the two preceding sub-sections. Each essay from the first data set was converted into a plain text file from its original PDF file. The same was done to ChatGPT-GDEs. Thereafter, each plain text essay was saved into a Microsoft Word (MS) file in a File Explorer folder. So, there were MS Word files for 50 SWDEs and MS Word files for 50 ChatGPT-GDEs in this File Explorer folder. All these essay files were not cleaned or tampered with in their plain text formats. This was done so as to retain the original contents of each file in the way it was written by a student or was generated by ChatGPT. Only where necessary sentences which contained no full stops had such full stops added at their endings. This was necessary to do in order to help AntCoc recognise sentence endings (see Nkhobo & Chaka, 2023b). After the conversion and filing process, the 50 SWDE files were uploaded onto AntConC (version 4.3.0) for it to analyse

them and plot the occurrence frequencies of the four adversative conjunctions (*however*, *but*, *while*, and *yet*) in each essay data set.

For the purpose of AntConc analysis, each essay data set consisted of four sub-data sets, each of which contained each of these four adversative conjunctions (see Figures 3, 4, 5, and 6).

The reliability of word usage frequencies has been investigated, mostly, concerning the word frequency effect. The latter is an exposure a user, especially a reader, has to certain words (Kuperman et al., 2024 see also Brysbaert et al., 2011; Kojima & Yamashita, 2014; Rudell, 1993). One of the main arguments made regarding word usage frequencies is that high-frequency words are better known to or better recognised by readers than low-frequency words and that they play a crucial role in memory performance. A common measure of word frequencies, which is intended to ensure reliability, is frequency per million words (fpm) (Brysbaert et al., 2011; Brysbaert et al., 2018). This measure may not be ideal or achievable for student essays written at universities as class sizes can vary from 10 students in one course to 100 or more students in another course. Besides, for university essays, word counts matter the most, and serve as a critical differentiator in written essay lengths. Another determining factor is consent: when human consent is an ethical requirement in obtaining access to participant data as is the case with most, if not all universities, getting enough student essays may be both impossible and constrictive. Under these constraining circumstances, data authenticity becomes critical: are the data (corpora) used authentically produced by students and by an AI tool? In each case, was there no priming for the use of the four adversatives under investigation as in the case of the present study? If the answer to both questions is no, then, word usage frequency becomes a reliable measure, notwithstanding the philosophical ways from which these two questions may be approached and barring some polemics they may engender. Elsewhere Kemp (2024) contends that the findings emanating from any corpus are only valuable if the corpus itself sufficiently represents the language and content of its corresponding domain.

FINDINGS

The findings section is presented in accordance with the two sets of discursive essays mentioned above. The section is divided into SWDEs and ChatGPT-GDEs. In each essay set, the findings are informed by the two research questions of the study.

Student-Written Discursive Essays (SWDEs)

Occurrence frequencies of adversative conjunctions (*however*, *but*, *while*, and *yet*)

As mentioned earlier, after uploading all SWDE plain text files onto AntConc, the four adversative conjunctions, <*but*>, <*however*>, <*while*>, and <*yet*>, were chosen and analysed. The occurrence frequencies of these adversative conjunctions are displayed in Table 1. As shown in this table, <*however*>, had the most frequencies with 45 hits. It was followed by <*but*> and <*while*> with the hit scores of 43 and 41, respectively. *Yet* had only one hit.

Table 1.

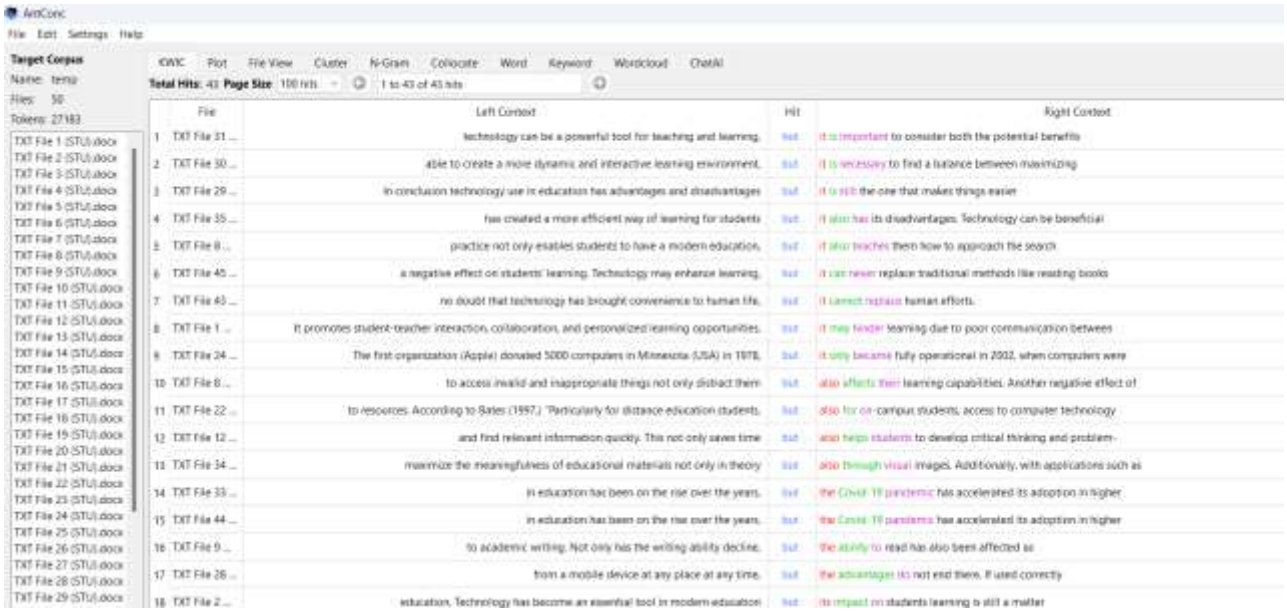
Occurrence frequencies of <but>, <however>, <while>, and <yet> in SWDEs as represented by AntConc.

Adversative Conjunctions	*but*	*however*	*while*	*yet*
Occurrence frequencies	43	45	41	1

Figure 3 portrays the concordance and concordance plot of the adversative conjunction, <*but*>. Here, this adversative conjunction had a total of 43 hits, and was the most used in text file 24, with five hits. It appeared in the beginning, middle (highest usage) and closing paragraphs. It shared four hits in text files 16 and 8. In the former text file, it occurred in the beginning (highest usage), middle, and closing paragraphs. In the latter text file, it also did so, even though its highest usage was in the middle paragraph.

Figure 3.

*The occurrence frequency of <but> in the 50 SWDEs as displayed by AntConc's concordance in context and concordance plot. * = Beginning, middle, and closing references indicate concordance plot.*



In contrast, text files 28 (beginning and closing paragraphs), 29 (beginning and closing paragraphs), 33 (beginning paragraph), 35 (middle and closing paragraphs), 44 (beginning paragraph), 22 (middle paragraph), and 48 (closing paragraph) recorded the same number of hits with two instances of usage in each text file. On the other end of the spectrum, <*but*> recorded the lowest number of usage instances in text files 1 (closing paragraph), 2 (beginning paragraph), 6 (middle paragraph), 9 (middle paragraph), 12 (middle paragraph), and 13 (beginning paragraph), with one hit in each case. It did the same in text files 21 (beginning paragraph), 30 (middle paragraph), 31 (closing paragraph), 34 (middle paragraph), 37 (beginning paragraph), and 39 (closing paragraph). The same applies to its usage occurrence in text files 43

(closing paragraph), 45 (middle paragraph), and 47 (middle paragraph), and 50 (middle paragraph).

Figure 4.

*The occurrence frequency of <however> in the 50 SWDEs as illustrated by AntConc's concordance in context and concordance plot. * = Beginning, middle, and closing references indicate concordance plot.*

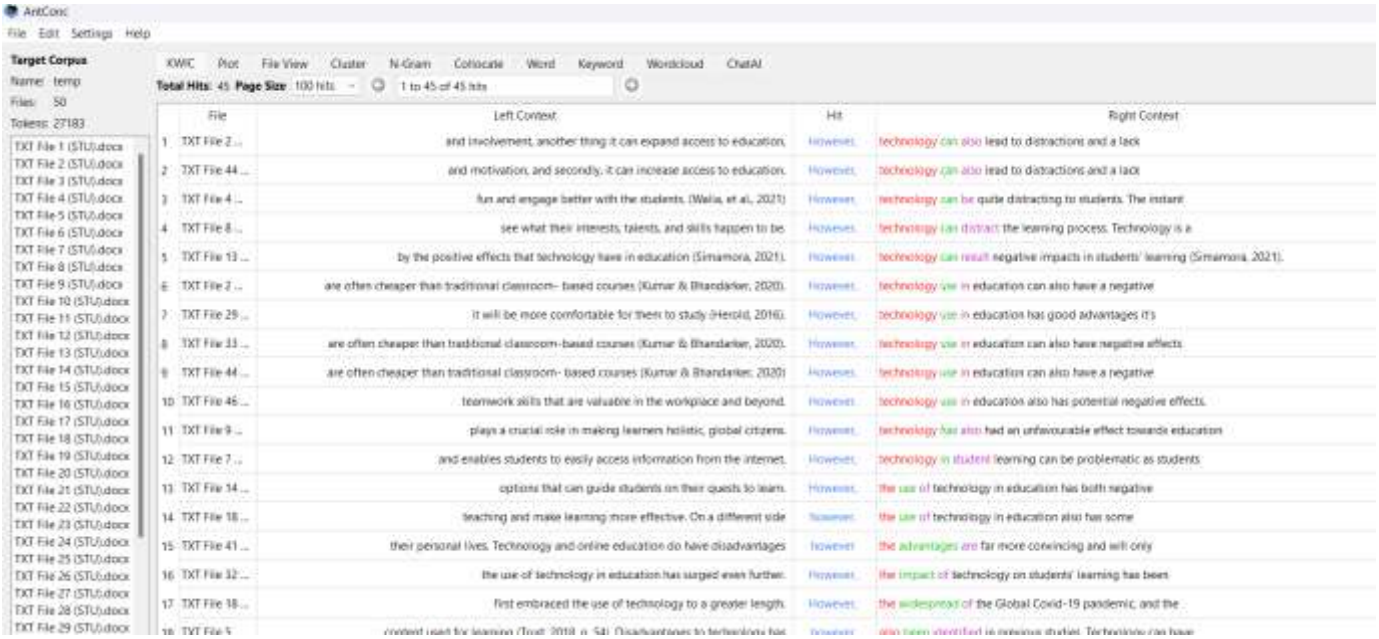


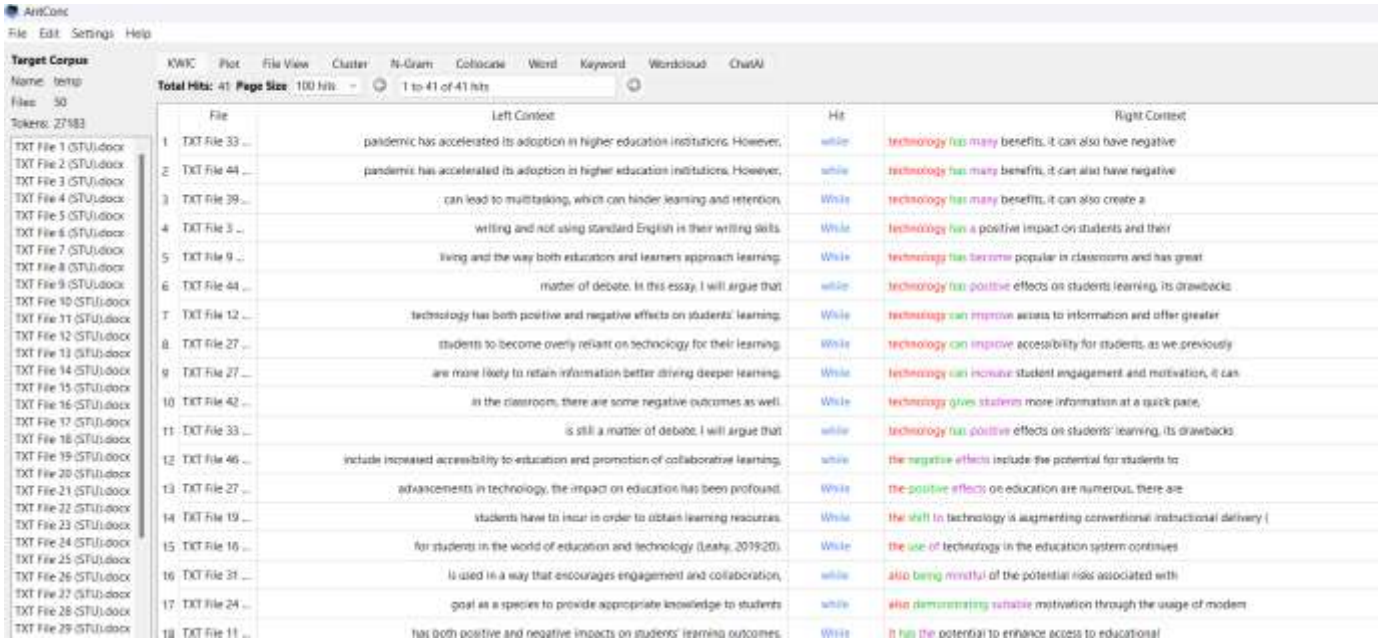
Figure 4 indicates that the concordance and concordance plot for the adversative conjunction, <*however*>, had a total of 45 hits. This adversative conjunction occurred highly in text files 20 (beginning, middle, and closing paragraphs), 34 (beginning, middle, and closing paragraphs), and 44 (beginning paragraph – highest usage - and closing paragraph) with three hits apiece. Contrary-wise, text files 2 (beginning and middle paragraphs), 7 (beginning and closing paragraphs), 14 (beginning paragraph), and 18 (beginning and middle paragraphs) recorded two hits of <*however*> each. Text files 19 (beginning and closing paragraphs), 26 (middle and closing paragraphs), 30 (beginning paragraph), 33 (beginning and middle paragraphs), and 37 (closing paragraphs) also produced the same usage pattern. The other text files such as 4 (middle paragraph), 5 (middle paragraph), 13 (beginning paragraph), 21 (middle paragraph), 27 (closing paragraph), 38 (middle paragraph), and 47 (closing paragraph) had only one usage occurrence of this adversative conjunction.

As illustrated in Figure 5, the adversative conjunction, <while>, had 41 hits, overall, and recorded the highest usage in text files 12 (beginning paragraph and closing paragraph – highest occurrence) and 27 (beginning, middle, and closing paragraphs), with three hits in each text file. However, it featured twice, each, in text files 4 (beginning and middle paragraphs), 16 (middle paragraph), 18 (beginning and closing paragraphs), and 19 (middle and closing paragraphs). It did likewise in text files 31 (beginning and closing paragraphs), 33 (beginning paragraph 44 (beginning paragraph), and 46 (beginning and closing paragraphs. On the other end, it featured once in text files such as 1 (closing paragraph), 3 (closing paragraph), 9 (beginning paragraph),

and 10 (closing paragraph). It did similarly so in text files 17 (closing paragraph), 20 (beginning paragraph), 26 (middle paragraph), 35 (beginning paragraph), 42 (middle paragraph), and 50 (middle paragraph).

Figure 5.

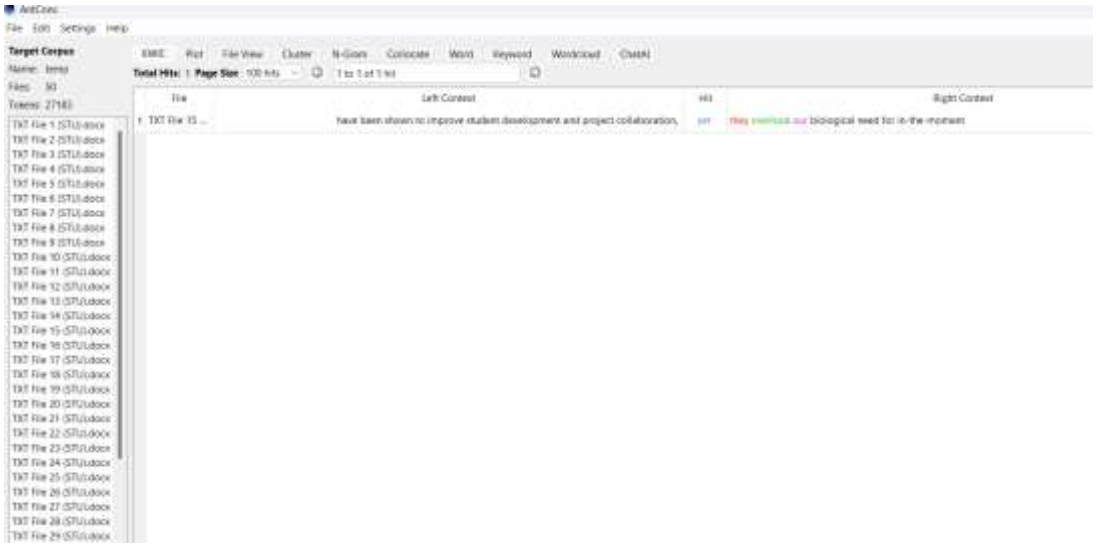
*The occurrence frequency of <while> in the 50 SWDEs as depicted by AntConc's concordance in context and concordance plot. * = Beginning, middle, and closing references indicate concordance plot.*



Pertaining to <yet>, it appeared only once in text file 15, and was not used by the other text files (see Figure 6). As such, it had only one hit, and was used in the middle paragraph of text file 15.

Figure 6.

*The occurrence frequency of <yet> in the 50 SWDEs as portrayed by AntConc's concordance in context and concordance plot. * = Beginning, middle, and closing references indicate concordance plot.*



ChatGPT-Generated Discursive Essays (ChatGPT-GDEs)

Occurrence frequencies of adversative conjunctions (*however*, *but*, *while*, and *yet*)

As was the case with SWDEs, all ChatGPT-GDEs plain text files were uploaded onto AntConc with a view to analysing the usage occurrences of the four adversative conjunctions, <*but*>, <*however*>, <*while*>, and <*yet*>, in them. The occurrence frequencies of these adversative conjunctions are as depicted in Table 2.

Table 2.

Occurrence frequencies of <but>, <however>, <while>, and <yet> in ChatGPT-GDEs as represented by AntConc.

Adversative Conjunctions	*but*	*however*	*while*	*yet*
Occurrence frequencies	2	11	111	0

As demonstrated in Table 2, <*while*> had the most hits (n = 111) as compared to the other three adversative conjunctions. The second most-used adversative conjunction was <*however*> with 11 hits. In contrast, both <*but*> and <*yet*> had two hits and a zero hit, respectively.

Figure 7. The occurrence frequency of <*but*> in the 50 ChatGPT-GDEs as portrayed by AntConc's concordance in context and concordance plot. * = Beginning, middle, and closing references indicate concordance plot.

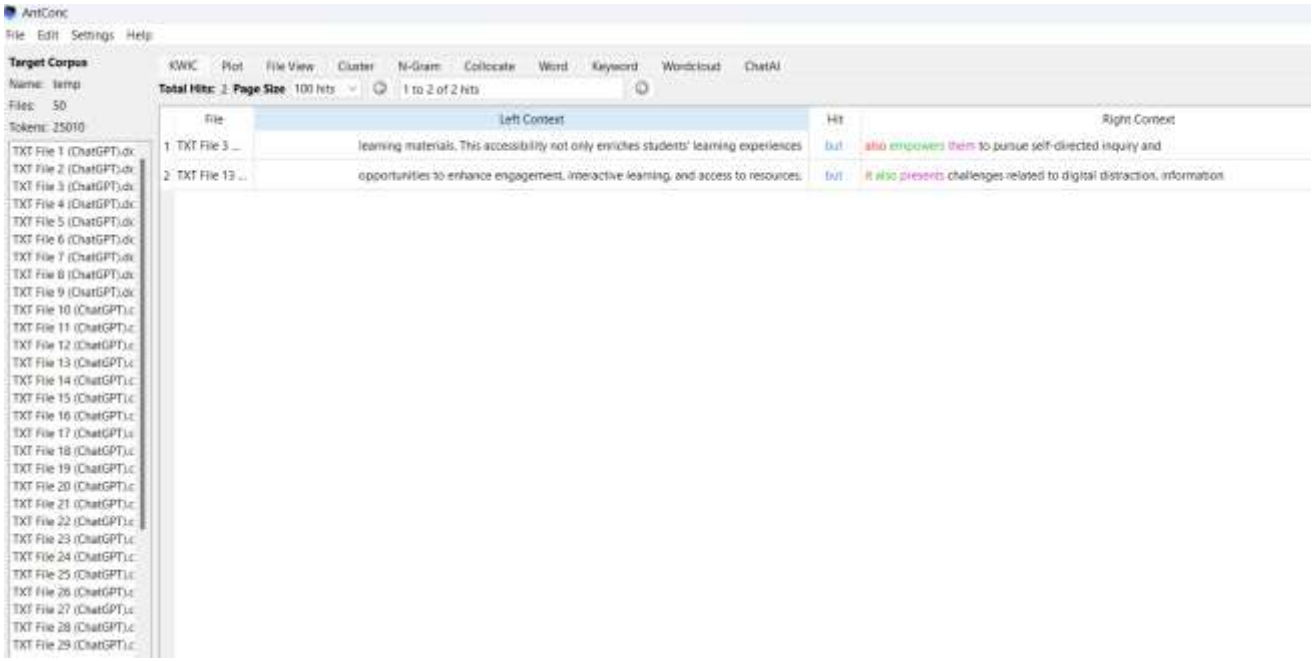
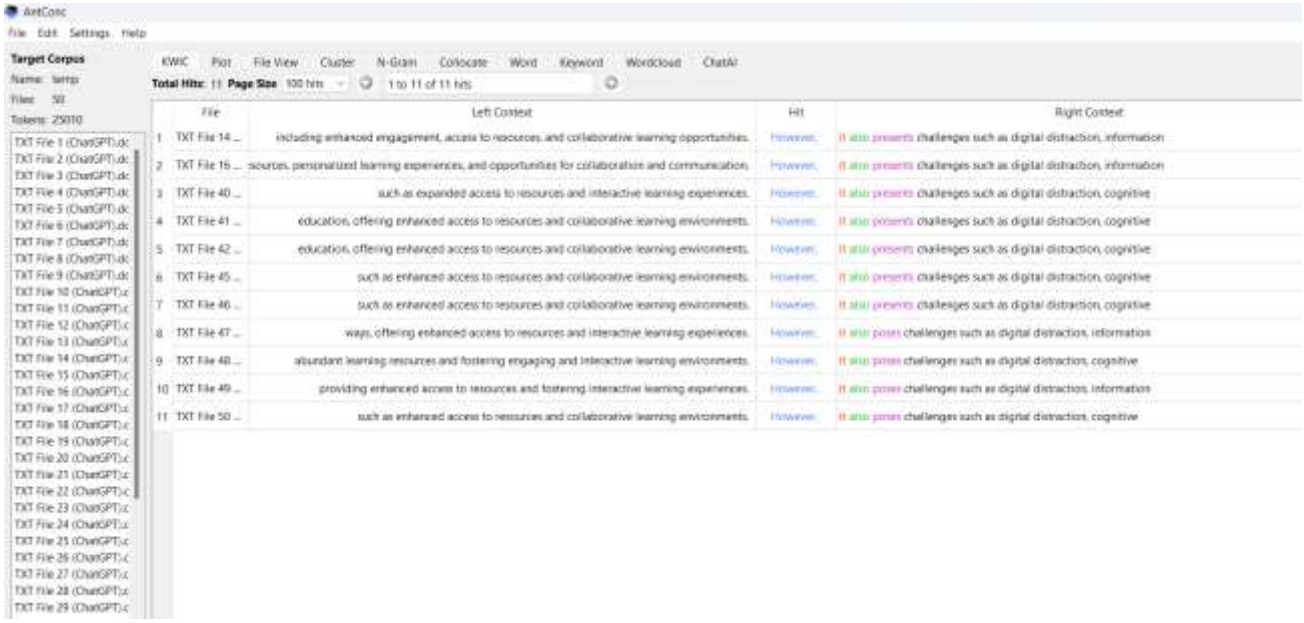


Figure 7 shows that the concordance and concordance plot for the adversative conjunction, <*but*>, in text files 3 (beginning paragraph) and 13 (closing paragraph) yielded two hits.

Figure 8.

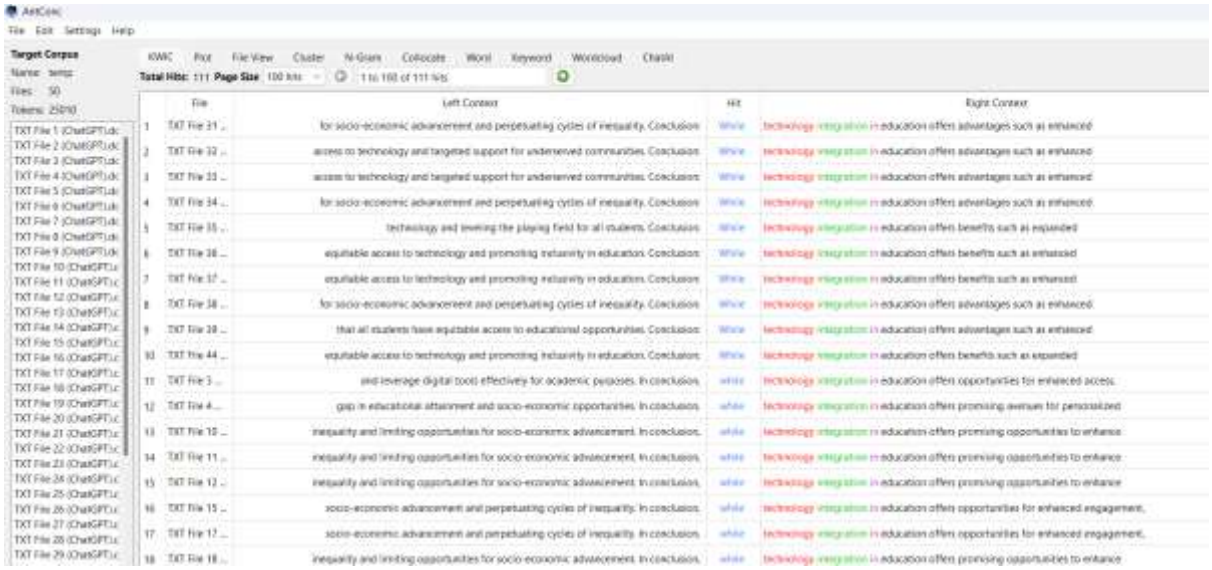
*The occurrence frequency of <however> in the 50 ChatGPT-GDEs as represented by AntConc's concordance in context and concordance plot. * = Beginning, middle, and closing references indicate concordance plot.*



As an adversative conjunction, <*however*> recorded one hit, each, in text files 14 (closing paragraph), 16 (closing paragraph), 40 (closing paragraph), 41 (closing paragraph), and 42 (closing paragraph). It did the same in text files 45 (closing paragraph), 46 (closing paragraph), 47 (closing paragraph), 48 (closing paragraph), 49 (closing paragraph), and 50 (closing paragraph) (see Figure 8).

Figure 9.

*The occurrence frequency of <while> in the 50 ChatGPT-GDEs as illustrated by AntConc's concordance in context and concordance plot. * = Beginning, middle, and closing references indicate concordance plot.*

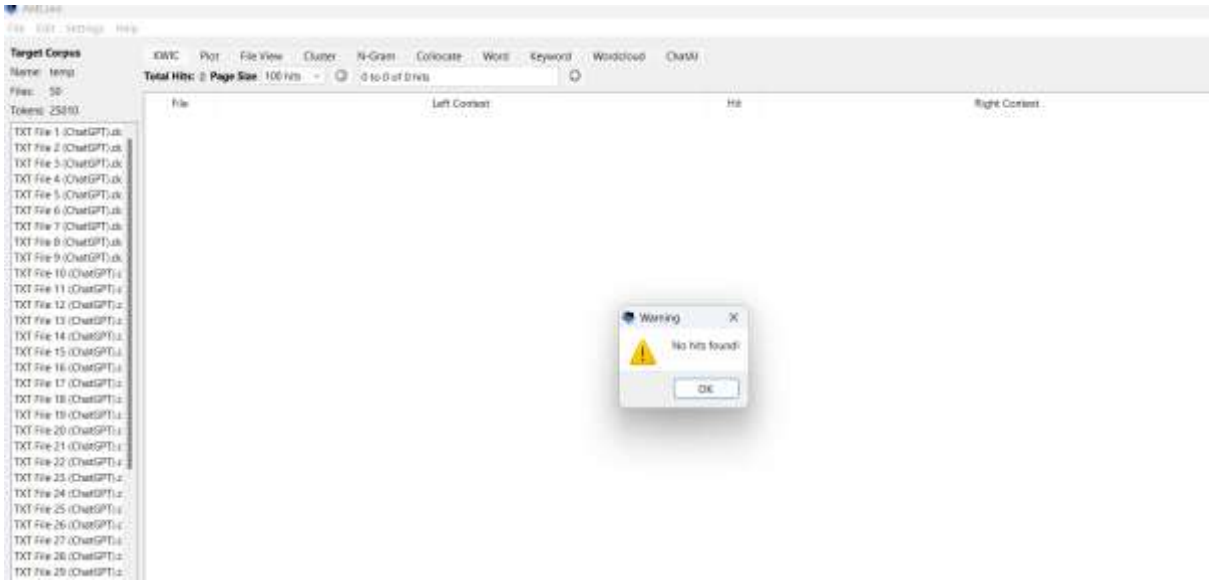


In Figure 9, <*while*> was the most used adversative conjunction in the following text files and their related paragraphs: text file 8 (beginning paragraph, middle paragraph, and closing paragraph (highest occurrence), text file 9 (beginning paragraph, middle paragraph, and closing paragraph (highest occurrence), text file 10 (beginning paragraph, middle paragraph, and closing paragraph (highest occurrence), text file 11 (beginning paragraph, middle paragraph, and closing paragraph (highest occurrence), and text file 18 (beginning paragraph, middle paragraph, and closing paragraph (highest occurrence). It had four hits in each of these text files.

It was used three times in some of the text files. Examples are text file 1 (beginning paragraph and closing paragraph (highest occurrence), text file 15 (beginning paragraph and closing paragraph (highest occurrence), text file 23 (beginning paragraph and closing paragraph (highest occurrence), text file 48 (beginning paragraph and closing paragraph (highest occurrence), and text file 50 (beginning paragraph and closing paragraph (highest occurrence). It had two hits in the other text files. Here examples are text file 2 (closing paragraph), text file 14 (beginning and middle paragraphs), text file 21 (closing paragraph), text file 26 (beginning and closing paragraphs), text file 28 (beginning and closing paragraphs), text file 31 (beginning and closing paragraphs), text file 39 (middle and closing paragraphs), and text file 45 (beginning and closing paragraphs). By contrast, it had only one hit in text files like 22 (closing paragraph), 24 (closing paragraph), 29 (closing paragraph), 35 (closing paragraph), 40 (middle paragraph), and 46 (middle paragraph).

Figure 10.

*The occurrence frequency of <yet> in the 50 ChatGPT-GDEs as depicted by AntConc's concordance in context and concordance plot. * = Beginning, middle, and closing references indicate concordance plot.*



Finally, Figure 10 demonstrates that the adversative conjunction, <*yet*>, did not appear in all the text files of the 50 ChatGPT-GDEs.

DISCUSSION

This section discusses the findings as presented in the preceding section. The discussion also takes into account the two research questions informing this study, and provides a comparative analysis of the occurrence frequencies and of the multiplicities of the four adversative conjunctions as they pertain to SWDEs and ChatGPT-GDEs.

Occurrence Frequencies of the Four Adversative Conjunctions: SWDEs vs. ChatGPT-GDEs

As highlighted in the preceding section, the adversative conjunctions, <*but*>, <*however*>, and <*while*>, were the three most used adversative conjunctions in SWDEs, whose occurrence hits were 43, 45, and 41, respectively (see Table 1). In this case, <*however*> had slightly more hits than the other two adversative conjunctions. Contrarily, two of these adversative conjunctions, <*but*> and <*however*>, had the least occurrence frequencies in ChatGPT-GDEs as they each had two and 11 hits (see Table 2). Nonetheless, <*while*> (n = 111 hits) was the most used adversative conjunction in ChatGPT-GDEs and its hits far surpassed those of either, <*but*>, <*however*>, or <*while*> in SWDEs. In fact, its hits still outstrips any paired totals of these three adversative conjunctions as used in SWDEs. *Yet* (n = 1) was the least used adversative conjunction in SWDEs, while it was not used at all in ChatGPT-GDEs. In this instance, students used <*but*>, <*however*>, and <*while*> to contrast ideas within a given sequence of occurrences of their essays more than was the case with ChatGPT, whose use of <*but*> and <*however*> was lower. In both essay sets, <*while*> was used to compare and contrast a series of events or ideas as they unfolded in separate contexts. In Namaziandost et al.'s (2019) study, though, which had only human-written corpora and no AI-generated corpus, both <*but*> and <*however*> had more frequency counts in the non-Iranian set than in the Iranian set, with <*but*> as the top most used adversative conjunction in the two sets. As is the case with the current study, <*yet*> was the least used adversative conjunction, even though it had a zero usage in the ChatGPT-GDEs of the present study.

Again, in Wang's (2024) study that consisted of two human-written corpora with no AI-generated corpus, <*but*> was the top most used adversative conjunction in both sets of corpora, and was used more in the M.A. theses than in the Ph.D. theses. At a distant second was <*while*> as the second frequently used adversative conjunction in both sets, which also occurred more in the first set than in the second one. *Yet* occurred the least in the second set, while in the first set it fared better than <*although*>. In terms of the two essay sets of which the current study consisted, the three adversative conjunctions, <*but*>, <*however*>, and <*while*>, were almost evenly used by students (in SWDEs). Nevertheless, only one adversative conjunction, <*while*>, was over-used by ChatGPT (in ChatGPT-GDEs) as compared to the other two adversative conjunctions, <*but*> and <*however*>. So, while students evenly and consistently varied their use of the first three adversative conjunctions in contrasting or negating ideas or in expressing concession, opposition or antithesis in their essays, ChatGPT repetitively and excessively employed one adversative conjunction in contrasting or negating ideas or in expressing concession, opposition or antithesis in its generated essays. In this case, SWDEs had more

adversative diversity in contrasting ideas, whereas ChatGPT-GDEs had no or lesser adversative diversity to encode the same contrasting mechanism. In a different but related context and as mentioned earlier on, Nkhobo and Chaka's (2023a) study, which used Coh-Metrix to analyse linguistic features employed between student-written and ChatGPT-generated discursive essays, found that at the level of raw mean scores, the former essay set outdid the latter set in lexical density and referential cohesion. However, the latter essay set did better than the former set in syntactic complexity.

Fujiwara's (2024) study that analysed linguistic features in student-written and ChatGPT-generated essays, discovered that ChatGPT repeatedly and severally produced the same lexical items such as conjunctions (e.g., *as*, *if*, and *or*), prepositions (e.g., *before*, *about*, and *to*), and modal verbs (e.g., *will*, *would*, *could*, and *might*) in a fixed or formulaic pattern. The study contends that this tendency exposes students to an inflexible, unbalanced, and non-variable vocabulary repertoire. All of this happens, it can be argued, without students who tend to rely on AI tools for the English language use purposes realising that this is likely to be the case since no student is able to reflect on and analyse AI-generated language on their own.

Multiplicities (Connected/Disconnected Mutations) of Four Adversative Conjunctions SWDEs vs. ChatGPT-GDEs

This section discusses how the use of adversative conjunctions (*but, however, while,* and *yet*) tended to display multiplicities (connected/disconnected mutations) in the two essay sets when thoughts or ideas were contrasted or expressed oppositionally as analysed by AntConc's concordance in context and concordance plot. The notion of multiplicities is appropriated in this section in the same way as characterised under the theoretical framing of this study.

As indicated earlier on, <*however*> (n = 45 hits) was the highly used adversative conjunction in SWDEs. This represented the highest counts of multiplicities in which the contrasting or negating of ideas occurred at the different points of the paragraphs such as in the beginning, middle, and closing paragraphs (see Figure 4). In the said paragraphs, this adversative conjunction displayed similar and dissimilar patterns of use in contrasting ideas or in expressing opposing ideas. These types of patterns served to signal connected and disconnected mutations that are analogous to Deleuze and Guattari's (1987) notion of multiplicities. This means that the use of <*however*> did not consistently and unvaryingly occur at the same slots within the given paragraphs of these essays. In a different but relevant context, Nkhobo and Chaka's (2021) study that investigated instances of Deleuzian rhizomatic patterns in first-year university students' essay samples using AntConc (version 3.5.9) and AntMover (version 1.1.0), found that keyword frequencies for key themes like *cult* and *religion* appeared differently in each concordance spectrum's end. This, contends the study, underlined the varying rhizomatic patterns used in students' essay samples.

In another separate context, Bogdanović et al.'s (2023) study, which analysed the use of transition markers in the M.A. theses produced by English as a first language and English as a second language students enrolled at universities from the United Kingdom, the United States,

Serbia, and Croatia, found that the adversative conjunction, <*however*>, was used more than the other conjunctions falling under this category in 412 instances of usage in the US and UK universities' corpora. In comparison, it was used 385 times and 162 times in the Serbian and Croatian universities' corpora, correspondingly. As highlighted in the preceding section, Nkhobo and Chaka's (2023a) study, which employed Coh-Metrix, discovered that student-written discursive essays had more raw scores for lexical density and referential cohesion across the different paragraphs than ChatGPT-generated discursive essays. Nonetheless, the reverse was true for syntactic complexity scores.

But (n = 43 hits), and <*while*> (n = 41 hits) recorded the second and third highest counts of multiplicities for contrasting ideas in the beginning, middle, and closing paragraphs in SWDEs (see Figures 3 and 5). The former (<*but*>) had five instances of contrast across these essays. Moreover, SWDEs displayed variation of ideas as represented by <*but*> in the beginning paragraphs (five times), in the middle paragraphs (7 times), and in the closing paragraphs (five times). The latter (<*while*>) had a high level of fluctuating contrasts in the beginning, middle and closing paragraphs. In other instances, <*while*> showed a consistent fluctuation of contrasting ideas in the beginning paragraphs (four times), in the middle paragraphs (four times), and in the closing paragraphs (11 times). In this way, these two adversative conjunctions exhibited similar and dissimilar patterns of contrasting ideas or of expressing opposing ideas that served to embody connected and disconnected mutations as was the case with <*however*>. This is more so as the use of these two adversative conjunctions consistently happened at varying positions within the paragraphs of SWDEs. Contrastingly, <*yet*> recorded only one hit (in the middle of one essay). In this context, this adversative conjunction failed to display multiplicity beyond its one hit. This, simultaneously, represented its lowest level of contrasting ideas. Elsewhere, Yasmin et al's. (2023) study found that the adversative conjunction, <*but*>, was highly used with 517 hits in the English newspapers, *DAWN* and *The Express Tribune*. Similarly, Özçelik (2023) study found that the adversative conjunction, <*but*>, was highly used with 127 hits in the mini-essays written by students registered for an English language course at a university in Turkey.

With reference to ChatGPT-GDEs, <*while*> had the highest counts of multiplicities for contrasting or negating ideas that occurred at the different slots of the paragraphs (e.g., beginning, middle, and closing paragraphs) in this set of essays (see Figure 9). In this case, it displayed the most instances of similar and dissimilar patterns of contrasting ideas or of expressing opposing ideas that tended to embody connected and disconnected mutations than either <*however*>, <*but*>, and <*while*> did in SWDEs. So, its multiplicities that served to signal the connected and disconnected mutations of ideas in ChatGPT-GDEs were excessively and almost exclusively exhibited by it. In contrast, both <*however*> and <*but*> displayed the lowest counts of multiplicities and, consequently, produced the lowest instances of contrasting ideas or of expressing opposing ideas. Moreover, <*yet*> had a zero contrasting of ideas and, correspondingly, a zero instance of multiplicity. As pointed out earlier on, in Nkhobo and Chaka's (2021) study, keyword frequencies for key themes like *cult* and *religion* featured differently at

the end of each concordance spectrum as analysed by AntConc and AntMover, a pattern that highlighted the varying rhizomatic instances employed in students' essay samples. In the main, in the current study, instances of multiplicities were almost evenly spread across three adversative conjunctions in human-written essays, while they were excessively concentrated in one adversative conjunction in ChatGPT-generated essays. The remaining adversative conjunction displayed minimal multiplicity in the former set of essays, and had a zero occurrence and, thus, a zero multiplicity in the latter set of essays.

CONCLUSION, LIMITATIONS, AND RECOMMENDATIONS

With two research questions that guided it, this study set out to investigate the occurrence frequencies of the adversative conjunctions (*however*, *but*, *while*, and *yet*) in student-written and ChatGPT-generated discursive essays as analysed by the AntConc's concordance and concordance plot. It also sought to extrapolate the Deleuzian-Guattarian multiplicity in these two sets of essays (SWDEs and ChatGPT-GDEs) as displayed by the use of these four adversative conjunctions in the paragraphs of these two essay sets.

Pertaining to occurrence frequencies, <*however*> emerged as a slightly highly used adversative conjunction of the four adversative conjunctions in SWDEs. But, overall, the usage of the first three adversative conjunctions (*however*, *but*, and *while*) was almost evenly spread across SWDEs, a feature that emphasises that in this essay set, students very nearly displayed a consistent adversative variation in contrasting or negating ideas or in expressing concession or opposition to such ideas. On the contrary, in ChatGPT-GDEs, <*while*> emerged as the single most used adversative conjunction among the same four adversative conjunctions in this essay set. As a result, it had a monopolistic usage of contrasting or negating ideas or of expressing concession or opposition to such ideas in this set of essays as compared to the other three adversative conjunctions. This tendency highlights the lack of adversative diversity or variation in the essays generated by ChatGPT. Based on this finding, the implication to be drawn is that any expectation that ChatGPT can teach ESL learners how to use different linguistic structures to contrast or negate ideas, needs to be treated with a lot of circumspection. In both essay sets <*yet*> had one count and a zero count in SWDEs and ChatGPT-GDEs, respectively. This occurrence frequency reflects one instance of contrasting or negating ideas and a zero instance of contrasting or negating ideas by this adversative conjunction in these two essay sets.

As regards multiplicities, <*however*>, <*but*>, and <*while*>, displayed almost equal instances of similar and dissimilar patterns of use in contrasting ideas or in expressing opposing ideas in SWDEs. This accorded them nearly the same opportunity to encode multiplicities for contrasting or negating ideas or for signalling connected and disconnected mutations within the paragraphs of this essay set. By contrast, <*while*> was the sole adversative conjunction to do so in ChatGPT-GDEs, with <*however*> and <*but*> trailing it at a distant second and at a distant third, apiece. In all, cases of multiplicities were very nearly evenly distributed across three adversative conjunctions in human-written essays, whereas they were inordinately and almost monopolistically concentrated in one adversative conjunction in ChatGPT-generated essays.

While the findings of the present study may not necessarily be generalized to other SWDEs and ChatGPT-GDEs, they, nonetheless, serve as a starting point for future studies to investigate not only the use of the four adversative conjunctions examined in this study, but also the use of other adversative conjunctions and of the other linguistic features that tend to occur in student-written essays and in the essays generated by other LLMs.

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