A diachronic corpus-based study of hedging in L2 postgraduate theses in civil engineering

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Abstract

Hedging devices abound in academic writing. Few studies, however, have examined how hedges have evolved in academic writing in an ESL context over time. Among the existing studies, contradictory findings exist. The present study was motivated by the contradictory findings and used a corpus of 28762 words culled from postgraduate theses written by L2 Civil Engineering students between 1980 and 2023 to examine the diachronic development of hedges. We used Hyland's (1998, 2018) taxonomy of hedging devices to analyse the selected corpus. AntConc 4.2.4 Concordance software was used for the analysis of the data. To establish statistical significance, a log-likelihood test was also performed. The analysis revealed that over the past 43 years, the use of hedges has increased significantly (65.10%). Hedging modals were the most commonly used hedging type, whereas hedging nouns were the least frequently utilised. The study also discovered increases in the use of hedging verbs (63.10%), hedging adjectives (1.72%), hedging modals (66.67%), and hedging nouns (97.06%), but decreases in the use of hedging adverbs (-1.86%) and hedging quantifiers/determiners (21.89%). "See" and "show" were the most common lexical verbs, while "possible" and "potential" were the most common hedging adjectives. "Can" was the most often-used hedging modal, "probability" for hedging nouns and "usually" for hedging adverbs. The study concludes that theses in Civil Engineering are becoming more reader-oriented, and that writers' use of hedges contribute to an increase in persuasiveness in academic texts. The findings of this study have implications for teaching academic writing.

Keywords: academic writing, hedging devices, postgraduate thesis, L2 speakers of English

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1. Introduction

The strongest motivations for academic work include the pursuit of knowledge, the pursuit of truth, the progression from hypothesis to theory, and the formation of general conceptions. However, as Shoja *et al*. (2020) remark, the validity of any new finding is judged by the consensus of a highly competitive specialised community, and academics understand that findings gained from practice lead to probable certainties. Academic writers modulate the strength of their assertions in this context. According Adrian and Fajri (2023), hedging expressions are employed by writers to adjust epistemic commitment to propositions. Dong, Wang and Jiang, (2022) are os the view that hedging is an important communicative resource for academics since it both validates the individual's professional persona and is a crucial component in the rhetorical means of attaining claim acceptance. Demanou and Tabe (2022) add that hedges enable writers to anticipate assumed objections to claims by presenting comments with accuracy, caution, and diplomatic regard to colleagues' viewpoints (Demanou & Tabe, 2022).

Numerous inquiries have been undertaken globally concerning hedging in academic discourse, with notable contributions from various researchers. Varttala (2001), for instance, scrutinized the prevalence of hedging in contrasting popularised publications and research articles across economics, medicine, and technology. Aull and Lancaster (2014) took a distinct approach by comparing undergraduate research papers with research articles, aiming to elucidate shifts in stance-taking as researchers progress in their academic writing journey. Takimoto (2015) similarly examined research articles spanning the humanities, social sciences, and scientific fields, employing a cross-disciplinary approach. Haufiku and Kangira (2018) delved into the utilization of hedges within master's theses, emphasising the influence of factors such as data analysis, English language proficiency, and adherence to academic writing norms. These studies collectively contribute to our comprehension of the multifaceted nature of hedging in scholarly communication, revealing its dependence on various factors including disciplinary conventions and writers' linguistic proficiency.

While prior studies on hedging offer valuable insights, there remains a gap in corpus-driven research examining the use of hedging devices from a diachronic perspective, particularly within non-native academic environments. Such an investigation could provide a complementary addition by shedding light on the differential utilisation of hedging devices across different time periods. This is especially pertinent considering the limited exploration of diachronic trends in hedging (Yao, Wei, & Wang, 2023), and the conflicting findings in existing diachronic studies (Adrian & Fajri, 2023). For instance, Šandová (2021) scrutinised a corpus of research article abstracts published in the Journal of Pragmatics and observed a significant decrease in the occurrence of hedging devices over the past three decades. Conversely, Gillaerts and van de Velde (2010) found an increase in the use of hedging markers in linguistic research article abstracts over a similar timeframe. To address this gap in the literature, the current study investigates the use of hedging in L2 postgraduate theses authored by Ghanaian Civil Engineering writers, employing a diachronic lens to analyse temporal shifts in hedging practices. To achieve this objective, the research seeks answers to the following questions:

➢ What are the hedging devices employed in the L2 postgraduate theses written by Civil Engineering students in two different periods (1980-1993 and 2010-2023)?

➢ Do the L2 postgraduate theses written by Civil Engineering students in the two different periods (1980-1993 and 2010-2023) show differences in the frequency of hedging devices?

➢ Are there any differences in the categories of hedging devices employed in L2 postgraduate theses written by Civil Engineering students in two different periods?

In the sections that follow, we present a review of literature, the methodology, results and discussion, and conclusion and implications.

2. Literature review

2.1 The Concept of Hedging

Lakoff (1973) offered the first definition of hedging, defining hedges as words whose meaning implicitly entails fuzziness. Using Lakoff's notion as a starting point, researchers have examined hedging in language from many perspectives over the years. The first set of definitions, following Lakoff (1973) emphasises vagueness and fuzziness as fundamental aspects of hedging devices. Hedges, according to Brown and Levinson (1987, p. 145), are "elements that modify the degree of membership of a predicate or a noun phrase in a set" and are employed to achieve linguistic vagueness. In a similar line, Prince, Frader and Bosk (1982) define hedges as objects that make things fuzzier. Similarly, Channel (1994) define hedges as statements that are purposeful and imprecise or expressions whose meanings are driven by innate uncertainty.

The second category of treatments focuses on another significant component of hedging: the avoidance of the writer's responsibility for the statement. As noted by Zou and Hyland (2019), hedges communicate the writer's uncertain attitude concerning the particular statement. Hedges, according to Crismore and Vande Kopple (1988, p. 185), are components that "signal a tentative or cautious assessment of the truth of referential information," allowing authors to abdicate responsibility for the information supplied. Myers (1989) defines hedges as logical techniques used for coping with social interactions throughout the article publication process. According to Markkanen & Schroder (1997, p. 5), "hedges can offer a possibility for textual manipulation in the sense that the reader is left in the dark regarding the truth value of what is being expressed and who is responsible for it." Hyland (2021) describes hedging as a tentative language that is frequently employed to manage the level of author confidence or commitment in presenting claims, facts, or opinions while motivating readers to participate in a discussion regarding the nature of propositions.

The third group of definitions emphasises politeness as a feature of hedging. According to Brown & Levinson (1987), the boundaries of hedging are extended to negative politeness which is used for avoiding threats to the face of the participants. Politeness has also been emphasised in Hubler's (1983, 156-157) definition of hedging devices as "indications of negative politeness used to avoid apodictic statements overlooking the readers' wish to judge for themselves." Salager-Meyer's (2011:36) claims that being polyfunctional, "hedges can express politeness, indirectness, understatement, mitigation, commitment, and/or vagueness."

As the definitions above indicate, the research tradition on hedges concentrates on three critical aspects: vagueness and fuzziness, avoidance of the author's responsibility, and politeness. Hyland's (2018) pragmatically oriented definition of hedges as a multifunctional phenomenon will be adopted for this study because it appears to be more extensive than others and thus, it is persuasive. Hedging will be regarded as a phenomenon that contributes to language's interactional function, as a method of interactional metadiscourse used to limit the degree of authorial confidence or commitment to propositional content.

2.2 Taxonomy of Hedging Devices

Academics have developed a number of taxonomies of hedging devices based on formal or functional criteria (e.g., Crompton, 1997; Hyland, 1996; Salager & Meyer, 1994). Crompton (1997), for example, classified all hedges into six types based only on their form only: *1. Sentences containing copulas other than be. Sentences with epistemic modals. 3. Sentences include clauses referring to the likelihood of the subsequent statement being true. 4. Sentences including sentence adverbials that refer to the likelihood of the proposition being true. 5. Sentences containing reported propositions where the author(s) can be held responsible for any tentativeness in the verbal group or nonuse of factive reporting verbs. 6. Sentences conveying a reported claim that a hypothesised entity X*

exists, and the author(s) can be assumed to be responsible for making the hypothesis. Crompton's (1997) taxonomy has been critiqued for focusing on epistemic modality with the sole purpose of avoiding commitment (Martin, 2003).

Salager-Meyer's (1994) taxonomy categorises hedges into five categories: "shields" (e.g., seem, appear), "approximators" (e.g., usually, somewhat), "expressions of authors' personal doubt and direct involvement" (e.g., I believe, to our knowledge), "emotionally-charged intensifiers" (e.g., surprisingly, extremely difficult), and "compound hedges" (e.g., it could be suggested). This taxonomy, however, has been criticised due to apparent overlaps within the identified categories (Chen & Zhang, 2017).

This study used Hyland's (1996) categorisation, focusing especially on lexical hedges because they are the principal strategies for hedging used by Anglophone writers (Hyland, 1994) and are likely to be acknowledged as hedges in the academic discourse community (Chen & Zhang, 2017). Kim and Lim (2015) add that Hyland's (1996) framework helps to establish a justification for writers' use of hedges in academic writing. Hyland (1994) identified seven (7) different categories of hedges, namely: modal auxiliary verbs (may, may, and can), adjectival, adverbial, and nominal modal expressions (possibility, perhaps, probability), modal lexical verbs (believe, presume), the usage of the if clause, the passive form, impersonal phrases, and temporal reference. Hyland (1996) modified hedges as lexical verbs (e.g. indicate, suggest, appear); adverbs (e.g. evidently, probably); adjectives (e.g. likely, possible); modal verbs (e.g. would, may, could); and nouns (e.g. possibility).

2.3 Previous Studies

Hedging has been studied in a variety of contexts, including academic disciplines (Hyland, 1998; Youssef, 2016), cultures (Mur-Dueñas, 2011; Mu et al., 2015), post-graduate essays (Hyland, 2010; Risda, Effendi Kadarisman & Astuti, 2018), undergraduate student writings (Ho & Li 2018; Lee & Deakin 2016), and non-native writing (Loi, Lim & Wharton 2016; Yagız & Demir 2014).

Sari (2008) examined the hedges employed in the introductions of Linguistics theses written by students from the Department of English at Universitas Airlangga. She discovered that the hedges described by Hyland (1994) that typically appear in the introduction chapter of Linguistics theses include auxiliary verb, adjectival and adverbial, modal noun, and modal lexical verb.

Halabisaz, Pazhakh, and Shakibafar (2014) analysed the use of hedges in abstracts of applied linguistic theses written in both English and Persian. They discovered that native English writers employed more hedging devices in their M.A. abstracts, but non-native (Iranian) writers used fewer hedge devices. All these studies highlight the importance of hedging and attest to the fact that hedging is a crucial convention in spoken and written discourses.

Musa (2014) and Edusei (2015) focused on hedging in academic writing in the Ghanaian context. Musa (2014) examined the occurrence of hedging in Master's theses in English and Chemistry at the University of Cape Coast. For the corpus, forty (40) theses were chosen, with 20 each for English and Chemistry. The introduction and discussion sections were the focus of the investigation. The study discovered that lexical hedges were more commonly utilised than non-lexical hedges in both disciplines. In all disciplines, modal verbs were found to be the most frequently utilised, whereas nouns were the least frequently used. Edusei (2015) also assessed 24 theses and 40 research publications, totalling 700,082 word tokens. According to the findings, epistemic modals are the most frequently utilised, whereas epistemic nouns are the least frequently used.

According to the review of related literature, a diachronic examination of the usage of hedging mechanisms in academic texts, particularly in an ESL environment, appears to be lacking. In terms of language realisations of hedging devices and the pragmatic functions they play in academic writings, this present study would thus contribute to the diachronic discourse on hedging.

3. Methodology

Research design - The present research focused primarily on a quantitative analysis that examined the frequency of occurrence of hedging devices in the corpora. A table was created to summarise the frequency of occurrence of these markers in the corpora.

Data Source - Data for this study were corpora of theses written by L2 postgraduate students at Kwame Nkrumah University of Science and Technology (KNUST). The decision to focus on postgraduate theses derives from the fact that, as Akparep, Jengre, and Amoah (2017) discovered, many Ghanaian postgraduate students are unprepared for research and postgraduate studies. It has also been found that postgraduate students at KNUST struggle with mastering academic writing practices (Lamptey & Atta-Obeng, 2012). Meanwhile, as Oyewale-Johnson (2021) reveals, little attention has been paid to research on postgraduate theses in Ghana in general, and how postgraduate students effectively apply hedging skills in their theses across fields in particular. Postgraduate theses were thus chosen to contribute to the body of knowledge about the diachronic evolution of hedging in Ghana.

The theses were those submitted to the Department of Civil Engineering. The department was chosen for one main reason: Civil Engineering is a hard science, and some academics have suggested that hedges may not be used frequently in these fields (Tran & Tang, 2022). In a similar vein, the majority of pragmatic studies about hedging has been carried out within the domain of soft sciences (Adrian & Fajri, 2023). Therefore, linguistic research in the field of hedges in the hard sciences, especially in Civil Engineering, appears to be promising.

Sample - Purposive sampling was used to select theses submitted to the Department of Civil Engineering between 1980 and 2023. It was very difficult finding theses written 1980 in the selected discipline. The study period was divided into two parts: 1980 to 1993 and 2010 to 2023. Four theses were chosen for each sub-corpus. The fact that four theses were obtained from the first study period (1980-1993) influenced the selection of four in the second study period (2010-2023). The corpus of theses created to study hedging devices totalled 28,762 words: 16,462 words from 1980 to 1993 and 12,300 words from 2010 to 2023. The corpus only comprised the major content of each thesis. The data did not include any abstracts, headings, quotes, tables, figures, examples, equations, notes, or references.

Data Collection Procedure - The theses were either retrieved directly from the electronic version or manually scanned and converted to text format. Since theses written before 2008 were not available on the University online repository, we took the hard copies from the main library of the university and scanned them.

Data Analysis - This study was a corpus-based empirical one (Biber, Conrad & Reppen, 1999), which entailed quantitative analysis of texts via a text analysis software. AntConc 4.2.4 (Anthony, 2023) was used to search the corpora for hedging devices. Figure 1 is an image of the concordance results for modal "can" in the corpora.

Figure 1. *An Image of the Concordance Results for Modal "Can" IN THE Corpora*
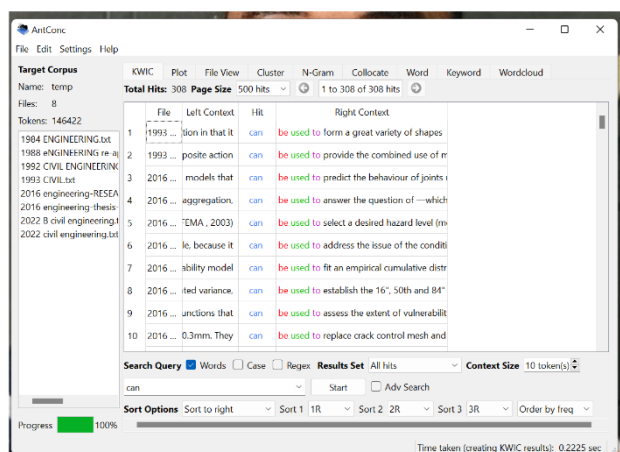
After generating frequency lists for each hedging device, we normalised them per 1,000 words (ptw). Normalisation is defined as "a method of converting raw counts into rates of occurrence, allowing scores from texts of varying lengths to be compared" (Biber & Jones, 2009, p.1299). All devices used as hedging in the corpora were normalised to 1,000 words in this study using the following formula:

$$Normed\ frequency = \frac{frequency\ (raw\ count)}{number\ of\ words}\ x1,000$$

In cases when the quantity for V1 was zero and computations were not possible, 0.00001, or a minor amount, was allocated to the "zero" amount.

Finally, to determine whether the differences were statistically significant, we used Rayson's (2016) log-likelihood calculator. The greater the log-likelihood (LL) number, the greater the difference between the two scores: $LL \geq 3.84$ is significant at $p < 0.05$; $LL \geq 6.63$ is significant at $p < 0.01$; $LL \geq 10.83$ is significant at $p < 0.001$; and an $LL \geq 15.13$ is significant at $p < 0.0001$ (Johnston, Berry & Mielke, 2006). The significance level was set at 0.05 (*), 0.01 (**) and 0.001 (***).

Hyland's (1996, 1998, 2000, 2005a, 2005b) list of most hedges was used as a framework to identify hedges. The hedges were divided into six sub-categories (Hyland 2000), modal auxiliaries (e.g., may, might, can, etc.), verbs (e.g., seem, believe, appear, etc.), Epistemic adjectives (e.g., possible, approximate, uncertain), epistemic adverbs (slightly, presumably, merely, etc.), (5) quantifiers/determiners (e.g., a few, some, many), and (6) nouns (e.g., assumption, estimate, suggestion, etc.).

4. Numerical and statistical findings

The findings are presented in the following sections, beginning with the frequency of hedges identified in the two subcorpora (Table 1). Following that, the emphasis is given to the frequency of the hedging categories in the two periods under consideration (Table 2), and the findings are analysed from a diachronic perspective. The raw and normalised frequencies of the devices are supplied in the study to shed light on their application because "it is usually considered a good practice to report both raw and normalised frequencies when writing up quantitative results from a corpus" (McEnery & Hardie, 2012, p. 51). We also discuss the statistical significance of the observed changes in usage over time.

4.1 Overall Distribution of Hedging Types (1980-2023)

This section discusses the overall distribution of hedges in the corpus. The results are presented in Table 1.

Table 1

Overall Distribution of Hedging Types over Time (Raw freq. and per 1,000 words)

Hedging Types	1980-1993		2010-2023		Total		% Change	LL/ Significance
	Raw Freq	Normed Freq.	Raw Freq	Normed Freq.	Raw Freq	Normed Freq		
Hedging Modals	364	22.11	453	36.83	817	58.94	66.56%	52.94***
Hedging Quantifiers	281	17.07	436	35.45	717	52.52	107.66%	94.12***
Hedging Verbs	278	16.89	337	27.40	615	44.29	62.24%	35.88***
Hedging Adverbs	124	7.53	91	7.40	215	14.93	-1.78%	0.02
Hedging Adjective	75	4.56	57.01	4.63	132	9.19	1.73%	0.01
Hedging Nouns	45	2.73	66	5.37	111	8.10	96.29%	12.47***
Total	1167	70.89	1440	117.07	2607	187.96		
Average	194.50	11.82	240.00	19.51	435	31.33	65.10%	

The significance level was set at 0.05 (*), 0.01 (**) and 0.001 (***)

Table 1 summarises the findings of a diachronic analysis of hedging types identified in the corpora. Overall, the use of hedging devices by L2 Civil Engineering students has increased over time. This was shown by a 65.10% increase in percentage terms. This implies that the usage of hedges in L2 postgraduate theses by Civil Engineering students has grown between 1980 and 2023. This finding is also supported by log-likelihood values. The observed

difference between the first-time span (1980-1993) and the second period (2010-2023) was statistically significant (LL= 27.48, an LL≥ 15.13 is significant at p< 0.0001). The indication is that it is 99% certain that the results are not due to chance. This finding can be justified by the fact that to promote their innovative ideas, engineers now address both L2 academics in the field and practitioners outside it, requiring them to employ more strong rhetorical strategies (Makhanya, 2023).

As shown in Table 1, between 1980 and 2023, the most frequently used hedging type was hedging modals represented by 58.94 tokens per 1,000 words, followed by hedging quantifiers/determiners, 52.23 tokens per 1,000 words, then hedging verbs 44.29 tokens per 1,000 words, hedging adverbs 14.93 tokens per 1,000 words, hedging adjectives, 9.19 tokens per 1,000 words and finally, hedging nouns 8.10 token per 1,000 words. This finding is consistent with Atmaca's (2016) finding that modals are the most common hedging type in M.A. theses and PhD dissertations. The log-likelihood values also confirmed the results. The observed difference in the raw frequencies between the two periods was statistically significant in hedging quantifiers/determiners (LL= 94.12, LL ≥ 15.13 is significant at p < 0.0001), hedging modals (LL=52.94, LL ≥ 15.13 is significant at p < 0.0001), hedging verbs (LL=35.88, LL ≥ 15.13 is significant at p < 0.0001), and hedging nouns (LL=12.47, LL ≥ 10.83 is significant at p < 0.001). According to the research, epistemic modality is mostly expressed through modal auxiliaries among Civil Engineering students in a non-native context. The finding is not surprising for one major reason. According to Hyland (1999), they are 'content-motivated' hedges that prevent writers from making erroneous inferences about the propositional agreement with reality (Hyland, 1999).

4.2 Distribution of Hedging Types in the Corpus over Time

In this section, we discuss the distribution of hedging types identified in the corpus. The results are presented in Tables 2, 3, 4, 5, 6, and 7.

Table 2

Sub-Categories of the Hedging Verbs over Time (Raw and Normed Freq.)

Hedging Verbs	1980-1993		2010-2023		Total		% Change	LL/ Significance
	Raw Freq	Normed Freq.	Raw Freq	Normed Freq.	Raw Freq.	Normed Freq.		
See	45	2.73	114	9.27	159	12.00	239.05%	54.44***
Show	63	3.83	66	5.37	129	9.19	40.21%	3.67
Consider	48	2.92	14	1.14	62	4.05	-60.96%	11.12***
Observe	11	0.67	33	2.68	44	3.35	301.51%	18.85***
Expect	21	1.28	24	1.95	45	3.23	52.96%	2.03
Propose	11	0.67	25	2.03	36	2.70	204.18%	10.43**
Appear	30	1.82	5	0.41	35	2.23	-77.69%	13.27***
Indicate	15	0.91	11	0.89	26	1.81	-1.85%	0.00
Suggest	2	0.12	14	1.14	16	1.26	836.86%	13.96***
Tend to	17	1.03	1	0.08	18	1.11	-92.13%	12.95***
Help	1	0.06	12	0.98	13	1.04	1506.05%	14.45***
Reveal	7	0.43	4	0.33	11	0.75	-23.52%	0.19
Conclude	2	0.12	7	0.57	9	0.69	368.43%	4.59*
Seem	2	0.12	1	0.08	3	0.20	-33.08%	0.11
Interpret	1	0.06	1	0.08	2	0.14	33.84%	0.04
Claim	1	0.06	1	0.08	2	0.14	33.84%	0.04
Offer	1	0.06	1	0.08	2	0.14	33.84%	0.04
Argue	0	0.01	1	0.08	1	0.08	13283.74%	1.70
Understand	0	0.01	1	0.08	1	0.08	13283.74%	1.70
Believe	0	0.001	1	0.08	1	0.08	13283.74%	1.70
Average	13.90	0.84	16.85	1.37	30.75	2.21	63.10	

The significance level was set at 0.05 (*), 0.01 (**) and 0.001 (***)

Table 2 shows the subcategories of hedging verbs identified in the corpora. In broad strokes, there has been an increase of 63.10% in the use of hedging verbs in L2 postgraduate theses written by Civil Engineering students between 1980 and 2023, when the increase in overall words published is taken into account. The implication is that Civil Engineering students have increased their use of hedging verbs over the years. This means that Civil

Engineering students considered lexical verbs as a potent verbal repertoire for expressing epistemic modality through reporting or adhering to the propositions of their studies.

As revealed in Table 2, there were twenty-one (21) lexical verbs found in the corpora. The "see" (12.00), followed by "show" (9.19), "consider" (4.05), "observe" (3.35), "expect" (3.23), "propose" (2.70), and "appear" (2.23). Other verbs used included "indicate" (1.81), "suggest" (1.26), "tend to" (1.11), and "help" (1.04). Finally, the verbs "reveal" (0.75), "conclude" (0.69), "seem" (0.20), "interpret," "claim" and "offer" (0.14 each), "argue" (0.08), and finally, "understand" (0.08) and "believe" (0.08) were used. We saw statistically significant increases in the use of "see" (239.05%, significant at $p < 0.0001$), "observe" (301.51%, significant at $p < 0.0001$), "expect" (52.97%), "propose" (204.18%, significant at $p < 0.0001$), "suggest" (836.86%, significant at $p < 0.0001$), "help" (1506%, significant at $p < 0.0001$), and "conclude" (368.43%, significant at $p < 0.0001$) from 1980 to 2023.

The finding implies that the use of these lexical verbs has significantly increased among L2 postgraduate students in Civil Engineering. This finding has two implications for English for Academic Purposes. The first is that Civil Engineering students have tended to prefer the use of certain tentative judgmental verbs, particularly "suggest" and "show", whereas they have reduced the use of others such as "indicate" and "tend to". Consider the use of "suggest" in the example below.

Extract 1:

> *It goes to <u>suggest</u> therefore that, low permeability in concrete equates to the durability of the concrete all other things being equal. [Civil Engineering, 2016]*

In the extract above, the writer employed the word "suggest" to indicate a certain degree of speculation and a cautious attitude towards the truth value of a notion. This usage serves the rhetorical purpose of establishing a claim's credibility. Hyland (2002) suggests that the writer's responsibility towards this certainty can be mitigated. In the words of Hyland (2002), "suggest" here lessens the writer's responsibility toward this certainty. Arthur and Fenyi (2022) add the hedge "suggest" softens the writer's proposition and restricts imposing the proposition on the audience (Jujugenia, Kyei & Nanglakong, 2021).

Table 3

Sub-Categories of the Hedging Adjectives over Time (Raw and Normed Freq.)

Hedging Adjectives	1980-1993		2010-2023		Total		% Change	LL/ Significance
	Raw Freq	Normed Freq.	Raw Freq	Normed Freq.	Raw Freq	Normed Freq		
Conjunction with	0	0.01	1	0.08	1	0.08	13283.74%	1.70
Potential	5	0.30	22	1.79	27	2.09	488.88%	17.08***
Slight	3	0.18	13	1.06	16	1.24	479.96%	9.99**
In line with	1	0.06	2	0.16	3	0.22	167.67%	0.69
Likely	8	0.49	4	0.33	12	0.81	-33.08%	0.45
Partial	6	0.36	3	0.24	9	0.61	-33.08%	0.34
Possible	39	2.37	12	0.98	51	3.34	-58.82%	8.26**
Reasonable	10	0.61	0	0.00	10	0.61	-99.87%	0.42
Probable	3	0.18	0	0.00	3	0.18	-100%	0.13
Total	75.01	4.56	57.01	4.63	132	9.19		
Average	8.33	0.51	6.33	0.51	14.67	1.02	1.72	

The significance level was set at 0.05 (*), 0.01 (**) and 0.001 (***)

Table 3 illustrates statistically significant increases in the use of hedging adjectives such as "potential" ($LL \geq$ 15.13 is significant at $p < 0.0001$), and "slight" ($LL \geq 6.63$ is significant at $p < 0.01$). Civil Engineering postgraduate students over the years have significantly reduced their use of "possible" ($LL \geq 6.63$ is significant at $p < 0.01$). Consider the use of the hedge "slight" in the excerpt below:

Extract 2:

> *This showed only a slight loss of strength at 20°C after 2 months. [Civil Engineering, 2016]*

The adjective "slight" was used in Extract 2 to indicate the writer's perspective regarding the accuracy of the information. The writer purposefully toned down his or her claim to express uncertainty or to present opinions rather than facts, and to open up additional possibilities and voices for dialogic expansion.

Table 4

Sub-Categories of the Hedging Modals over Time (Raw and Normed Freq.)

Hedging Modals	1980-1993		2010-2023		Total		% Change	LL/ Significance
	Raw Freq	Normed Freq.	Raw Freq	Normed Freq.	Raw Freq	Normed Freq		
Can	86	5.22	222	18.05	308	10.71	245.79%	108.33***
May	52	3.16	140	11.38	192	6.68	260.13%	71.59***
Should	92	5.59	23	1.87	115	4	-66.55%	26.65***
Could	69	4.19	40	3.25	109	3.79	-22.43%	1.66
Would	54	3.28	10	0.81	64	2.23	-75.30%	21.78***
Might	7	0.43	11	0.89	18	0.63	106.98%	2.44
Need to	4	0.24	6	0.49	10	0.35	104.17%	1.20
Had better	0	0.01	1	0.08	1	0.03	700.00%	1.70
Average	45.5	2.76	56.63	4.6	102.13	3.55	66.67%	

The significance level was set at 0.05 (*), 0.01 (**) and 0.001 (***)

As shown in Table 4, eight (8) modal auxiliaries were found in the corpora: "can" (10.71 tokens per 1,000 words), "may" (6.68 tokens per 1,000 words), "should" (4 tokens per 1,000 words), "could" (3.79 tokens per 1,000 words), "would" (2.23 tokens per 1,000 words), "might" (0.63 tokens per 1,000 words), "need to" (0.35 tokens per 1,000 words) and "had better" (0.03 tokens per 1,000 words). This finding is consistent with the findings of Abdollahzadeh (2019), who discovered that specific epistemic modals, such as "can" were commonly employed by Civil Engineering writers. The study found a statistically significant increase in the use of some hedging modals between 1980 and 2023 such as "can" (LL ≥ 15.13 is significant at p < 0.0001), and "may" (LL ≥ 15.13 is significant at p < 0.0001). Meanwhile, there was a significant decrease in the use of "should" (LL ≥ 15.13 is significant at p < 0.0001), and "would" (LL ≥ 15.13 is significant at p < 0.0001). In the corpora, it was found that these auxiliaries were generally used to convey "degree of certainty" and "degree of obligation" as in:

Extract 3:

> *Hence, one <u>can</u> analytically estimate the fragility of the structural system without necessarily requiring certain site-specific information. [Civil Engineering, 2016]*

Table 5

Sub-Categories of the Hedging Nouns over Time (Raw and Normed Freq.)

Hedging Nouns	1980-1993		2010-2023		Total		% Change	LL/ Significance
	Raw Freq	Normed Freq.	Raw Freq	Normed Freq.	Raw Freq	Normed Freq		
Chance	1	0.06	2	0.16	3	0.1	166.67%	0.69
Indication	1	0.01	5	0.41	5	0.17	4000.00%	4.20**
Tendency	4	0.24	1	0.08	5	0.17	-66.67%	1.16
Possibility	3	0.18	3	0.24	6	0.21	33.33%	0.13
Estimate	2	0.12	6	0.49	8	0.28	308.33%	3.43
Majority	2	0.12	10	0.81	12	0.42	575.00%	8.41***
Prediction	1	0.06	11	0.89	12	0.42	1383.33%	12.92***
Probability	32	1.94	28	2.28	60	2.09	17.53%	0.37
Total	45	2.73	66	5.37	111	3.86	96.70%	12.47***
Average	5.63	0.34	8.25	0.67	13.88	0.48	97.06%	

The significance level was set at 0.05 (*), 0.01 (**) and 0.001 (***)

Table 5 displays the sub-categories of hedging nouns found in the corpora. The study found that there were statistically significant increases in the use of hedging nouns such as "indication" ($LL \geq 3.84$ is significant at $p < 0.05$), "prediction" ($LL \geq 10.83$ is significant at $p < 0.001$), "majority" ($LL \geq 6.63$ is significant at $p < 0.01$), and "total" ($LL \geq 10.83$ is significant at $p < 0.001$). In terms of modal nouns, the authors shared a component of tentativeness, implying that what was said was not expected to be taken categorically and was based on subjective opinion or restricted information (indication, observation), as in:

Extract 4:

The positive response rate is an <u>indication</u> of the interest and importance that exporting firms have in relation to challenges that confront them in the NTE sector. [Civil Engineering, 2016]

Table 6

Sub-Categories of the Hedging Adverbs over Time (Raw and Normed Freq.)

Hedging Adverbs	1980-1993		2010-2023		Total		% change	LL/ Significance
	Raw Freq	Normed Freq.	Raw Freq	Normed Freq.	Raw Freq	Normed Freq		
Usually	23	1.4	18	1.46	41	1.43	4.50%	0.02
Approximately	32	1.94	8	0.65	40	1.39	-66.49%	9.27**
Highly	4	0.24	11	0.89	15	0.52	272.50%	5.75*
Mainly `	6	0.36	8	0.65	14	0.49	80.56%	1.17
Mostly	2	0.12	7	0.57	9	0.31	374.17%	4.59*
Probably	7	0.43	1	0.08	8	0.28	-81.16%	3.48
Essentially	4	0.24	2	0.16	6	0.21	-32.08%	0.22
Virtually	3	0.18	1	0.08	4	0.14	-55.00%	0.55
Largely	1	0.06	1	0.08	2	0.07	35.00%	0.02
Partly	18	1.09	2	0.16	20	0.7	-85.05%	10.48***
Intuitively	0	0.01	3	0.24	3	0.1	2340.00%	5.10*
Generally	37	2.25	15	1.22	52	1.81	-45.78%	4.30*
Widely	8	0.49	11	0.89	19	0.66	82.45%	1.75
Almost	16	0.97	3	0.24	19	0.66	-74.85%	6.38*
Total	124	7.53	91	7.40	252	8.76	-1.75	
Average	8.86	0.54	6.5	0.53	18	0.626	-1.86	

The significance level was set at 0.05 (*), 0.01 (**) and 0.001 (***)

Table 6 illustrates an overview of adverbs used for hedging in the corpora, along with their respective frequencies. As shown in Table 6, the overall use of hedging adverbs in L2 postgraduate theses dropped by -1.86% between 1980 and 2023. There have been statistically significant increases in the use of some hedging adverbs such as "intuitively" ($LL \geq 3.84$ is significant at $p < 0.05$), "mostly" ($LL \geq 3.84$ is significant at $p < 0.05$), and "highly" ($LL \geq 3.84$ is significant at $p < 0.05$), while there have been statistically significant decreases in "approximately" ($LL \geq 15.13$ is significant at $p < 0.0001$), and "generally" ($LL \geq 3.84$ is significant at $p < 0.01$). It was found that the most frequently used hedging adverb was "usually", and its use over the years has increased by 4.50%. This finding is consistent with Adrian and Fajri (2023) who found that the frequency of adverbs such as "often" and "usually" in soft science research papers increased. Similarly, Boginskaya (2023) discovered that "often", "typically" and "usually" were the most commonly used adverbs in English medium research article abstracts written by L2 (Russian) writers from two fields — Engineering and Linguistics. This consistency across domains could point to the crucial function of adverbs, particularly "usually," in indicating hedging in academic writing as in the extract below.

Extract 5:

The compressive strength of concrete is usually determined by crushing 150x300mm cylinders or 150mm cubes in a compression machine. [Civil Engineering, 2016]

As demonstrated in Extract 5, the use of "usually" allowed L2 (Ghana) Civil Engineering writers to convey

reservations about the veracity of their statements. That is to say, "usually" was typically employed to tone down the assertiveness of what was being expressed. This finding corroborates the findings of Adrian and Fajri (2023) who found that epistemic adverbs were frequently used as downtowners.

Table 7

Sub-Categories of the Hedging Quantifiers over Time (Raw and Normed Freq.)

Hedging Quantifiers	1980-1993		2010-2023		Total		% change	LL/ Significance
	Raw Freq	Normed Freq.	Raw Freq	Normed Freq.	Raw Freq	Normed Freq		
Much	29	1.76	25	2.03	54	1.88	15.38%	0.27
Little	18	1.09	13	1.06	31	1.08	-3.34%	0.01
Many	37	2.25	24	1.95	61	2.12	-13.19%	0.29
Most	71	4.31	45	3.66	116	4.03	-15.17%	0.75
Several	24	1.46	13	1.06	37	1.29	-27.51%	0.90
Few, fewer	18	1.09	9	0.73	27	0.94	-33.08%	1.01
To a large extent	6	0.36	3	0.24	9	0.31	-33.08%	0.34
Some	78	4.74	32	2.60	110	3.82	-45.09%	8.76**
Total	281	17.07	164	13.33	445	15.47		
Average	35.13	2.13	20.50	1.67	55.63	1.93	-21.89%	

The significance level was set at 0.05 (*), 0.01 (**) and 0.001 (***)

The study saw an overall decrease in the use of hedging quantifiers between 1980 and 2023, represented by 21.89%. This shows that Civil Engineering students have reduced their use of hedging quantifiers between 1980 and 2023.

5. Conclusion and Implications

The study focused on the diachronic evolution of hedge usage in academic texts written between 1980 and 2023. Specifically, it discussed the overall and categorical distribution of hedges in the corpora. The corpora included L2 (Ghana) postgraduate theses written by Civil Engineering students. The results showed that, when normed for the increase in published words, the use of hedges by Civil Engineering students since 1980 has increased significantly by 65.10%. The most used hedging type was hedging modals and the least frequently used was hedging nouns. Hedging modals were the most commonly used hedging type, whereas hedging nouns were the least frequently utilised. The study discovered increases in the use of hedging verbs (63.10%), hedging adjectives (1.72%), hedging modals (66.67%), and hedging nouns (97.06%), but decreases in the use of hedging adverbs (-1.86%) and hedging quantifiers/determiners (21.89%). "See" and "show" were the most common lexical verbs, while "possible" and "potential" were the most common hedging adjectives. "Can" was the most often used hedging modal, followed by "probability" for hedging nouns and "usually" for hedging adverbs. The study concludes that theses in Civil Engineering are becoming more reader-oriented, and that writers' use of hedges contribute to an increase in persuasiveness in academic texts. There are two key pedagogical implications. First, academic research writing instruction should highlight the writing conventions of other disciplines and demonstrate their differences. Second, the significance of hedging and its use in the realm of hard science should be emphasised, as hedging is one of the valuable tools in negotiating meaning and allowing for many interpretations. Further studies involving additional disciplines are needed to validate the findings on interdisciplinary variation in linguistic patterns of hedging over time.

The findings of this study offer valuable educational implications for learners, students, and practitioners in academic writing. Educators can use the results to raise awareness among learners about the importance and usage of hedging devices, integrating corpus-based analysis tools into writing instruction to deepen students' understanding of language use patterns. Emphasizing reader-oriented writing practices can enhance students' ability to engage readers and convey uncertainty effectively, while promoting critical reading and writing skills. Additionally, practitioners can benefit from professional development initiatives informed by the study's findings, improving instructional practices and writing support services offered to students.

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