

Hedging Strategies in English and Chemistry Masters' Theses in the University of Cape Coast, Ghana

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ABSTRACT

The literature on academic writing maintains that, scientific texts, like any other form of communication, ought to obey certain conventions that characterize the norms of the discourse community. Following this argument, hedging, the technique of presenting claims with caution, precision, moderation, and humility has attracted much scholarly attention. However, a plethora of studies into hedging as an important rhetorical tool in academic writing have concentrated on experts writing, particularly, Research Articles (henceforth, RA) to the neglect of other forms of academic writing. Moving away from RAs, the current study explores the linguistic strategies that are employed as hedging devices in the Introduction and Discussion sections of English and Chemistry masters' theses in the University of Cape Coast, Ghana, paying attention to their semantic implications. Employing mixed research design, the study uses a total data set of 40 theses (20 each from English and Chemistry). The study, which employs Quirk et al.'s (1985) functional principle for establishing word class and Hyland's (1998) model as analytical frameworks, concludes that hedging in English and Chemistry masters' theses is both lexical and grammatical phenomenon, though the use of the former far outweighs the latter. The study serves as a basis for further research in hedging at various levels in students' writing.

Key Words: Hedging, Theses, Ghana

1.0 INTRODUCTION

Over the years, investigations into academic writing, particularly linguistically oriented studies of the rhetoric of scientific discourse, have produced abundant information on various fields of scientific inquiry. One area of research which has received considerable attention from scholars in linguistics and its allied fields is hedging, the technique that researchers employ in presenting claims with caution, precision, moderation and humility. The place of this concept as an inevitable rhetorical device in academic writing hinges on the popular belief that scientific texts are not neutral accounts of factual information derived from nature (Bazerman, 1988; Mulkay, 1979; Gilbert, 1976). Based on this premise, academic texts are currently regarded as socially constructed 'rhetorical artefacts' (Hyland, 1998, p. 16) where, instead of always putting forward information in a straightforward manner, authors often engage in the processes of negotiation and persuasion. For instance, when the accuracy or precision of the information may be subject to debate, authors may wish to formulate their statements cautiously, adhering to central virtues of humility, caution and scientific honesty, normally expected by the scientific community, thus resorting to the strategies of hedging (Varttala, 2001).

Although several studies on hedging (see Benesch, 2008; Zemach and Rumisek, 2005; and Fulmiler, 2002) have investigated into various kinds of academic genres (e.g. text books, conference paper presentations, examiners' reports), it is probably RAs that have been dealt with most extensively in the literature. Besides focusing on expert writing, most of these studies on hedging have been conducted in the Asia and Euro-American settings. Even though there is enough evidence to show that the concept of hedging has been adequately researched into within the context of academic writing, there seem to be a gap in the literature as regard how students employ this important rhetorical tool of academic writing in their research reports. The current study therefore attempts to fill the vacuum in the literature by exploring the linguistic strategies employed as hedging devices in English and Chemistry masters theses.

2.0 LITERATURE REVIEW

2.1 Hedging as a Semantic Phenomenon

According to Lakoff's semantic characterization of hedging, hedges are words that may be said to have two seemingly contradictory functions – those that make things fuzzier or less fuzzier. As regards the ability of hedges to increase fuzziness, reference may be made to Salager-Meyer's (1994, p.150) study which states that hedging is often linked to purposive vagueness and tentativeness, which is suggestive that hedges are typically associated with an increase in linguistic fuzziness. Salager-Meyer's (1994) position can be traced back to G. Lakoff's (1973) work which emphasizes that "natural language sentences are not often entirely true or false, or nonsensical, but rather somewhat true and somewhat false, and that membership in conceptual categories is not a simple yes-no question, but a matter of degree" (pp. 458-459).

In explicating G. Lakoff's work, Brown and Levinson (1987, p. 145) say that hedges may be regarded as elements that can "modify the degree of membership of a predicate or noun phrase in a set." With regard to the truth-value of referential information, hedging from the above analyses, can be said to operate on a continuum between absolute truth and falsehood. This is exemplified in Lakoff's (1973, p. 459) "birdiness hierarchy" which says that instead of making a categorical statement like *1. Penguins are birds.*, we can introduce a fuzzy expression in the statement to hedge the degree of membership of penguins in the category of birds, vaguely placing penguins at the unspecified outer limits of birdiness as *2. Penguins are **sort of** birds.* The vagueness and imprecision expressed by the hedge *sort of* renders the conceptualization of the status of penguins being more fuzzy where, in pragmatic terms, it can be said to be signaling the speaker's wish to control his or her commitment to the accuracy of what is being said.

However, G. Lakoff (1973) reports R. Lakoff's observation that some verbs and syntactic categories convey hedged performatives where hedges can be used to tone down the illocutionary force of the entire speech acts as in the following: *3. John is hungry.* *4. I **suppose** that John is hungry.* where the emboldened word in (4) can be viewed as reducing the force of the assertion. In this particular instance, however, it again seems that the hedge comments on the validity of the proposition, thereby emphasizing that what is said may not be absolutely true. It then establishes some functional similarity between the hedges in (4) and (6) below since they both can be interpreted as injecting some air of imprecision or fuzziness into the utterances. Instances of hedges in (6) somehow can also be associated with

modification of category membership where, instead of being included within the category of ‘true’ propositions, the assertion in (6) is distanced from the category of absolute truthfulness and is placed at an unspecified point on the continuum between truth and falsehood. Lakoff’s (1973) work thus shows that hedging, as an increase in fuzziness, can be a useful means of expressing less than full commitment as concerns both membership in a specific conceptual category and the accuracy of entire propositions (Varttala, 2001).

In the second part of Lakoff’s (1973) description of the phenomenon, hedges may be thought of as rendering things less fuzzy. Commenting on this, Burns (1991, p.8) emphasizes that “we are sometimes faced with a range of cases where a predicate [or some other element] clearly applies at the one end and certainly fails to apply at the other, but it is not at all clear what ought to be said about the cases in-between”. Burn’s view is confirmed by Varttala (2001), particularly, in the contexts where the information-oriented nature of language use demands conceptual precision. As Brown (1995, p.10) claims, the language of science is threatened by the imperfection of natural language. This limited nature of conceptual language may be seen as one manifestation of these imperfections that may possibly be corrected to some extent by employing linguistic items like hedges which indicate the peripheral nature of a given phenomenon with regard to the conceptual category of natural language. We may dwell on G. Lakoff’s (1973) analogy of “vegetableness hierarchy” as an example where he says one could say that 5. *Pickles are vegetables*.

However, if one considers, for example, *carrots*, it is obvious that they are more readily associated with the core group of the conceptual category of vegetables and are therefore higher in Lakoff’s hierarchy than pickles. In some cases, it may be sufficient to describe pickles simply as vegetables, but if we should be more precise about their vegetableness, we can hedge our conceptualization that 6. *Pickles can be viewed as vegetables*. Thus, apart from items increasing fuzziness by virtue of placing the phenomena at the vague periphery of conceptual categories, hedges may be looked at as devices that decrease fuzziness. Hedges could then be interpreted to be signals that the phenomenon under scrutiny does not conform to - the limited conceptual category of natural language - and by way of distancing the phenomenon from the core of a given conceptual category, hedges actually render the relationship between the phenomenon of the universe and the relevant conceptual categories more accurate (Varttala, 2001). Hedging may thus be employed to portray either the relationship between a phenomenon and a conceptual category or truthfulness of a proposition as accurately as possible. In the case of this interpretation, too, the sender may be seen as exercising caution when constructing utterances in attempt to state what would be too categorical.

To summarize the discussion on Lakoff’s work on hedges, we can think of two different motivations for hedging in view of the conceptualization of the universe. First, in increasing the fuzziness of an utterance, interactants can be thought to play down the degree of their commitment to the accuracy of concepts or propositions. Second, hedges can be said to decrease fuzziness when the interactants deem the relevant conceptual categories inadequate for the purposes of describing a given phenomenon or when the accuracy of a proposition needs to be specified as not entirely certain. The latter may often be the case in factual discourse where hedges may be employed to give “the right representation of the state of knowledge under discussion, that is, to achieve greater precision” (Rounds, 1981, summarized by Salager-Meyer, 1994, p.151). This interpretation can also be linked to

Hyland's (1998) concept of *content-oriented hedges* which refer to items which "mitigate the relationship between propositional content and non-linguistic mental representation of reality; they hedge the correspondence between what the writer says about the world and what the world is thought of to be like" (p. 162). There is also the subtype of *accuracy-oriented hedges* which is concerned with achieving precision by either marking a departure from an ideal or indicating that a proposition is based on a plausible reason or logical deduction in the absence of full knowledge.

2.2 Linguistic Realizations of Hedging

The earliest studies on hedging such as G. Lakoff (1973) were limited in scope to linguistic expressions that could be recognized as hedges. However, recent studies have identified numerous linguistic phenomena to be associated with hedging, emphasizing no absolute uniformity between studies as to which linguistic phenomena should be regarded as falling within the category. Literature relating to hedging seems to suggest that hedges are linguistic choices that include an inherent component of fuzziness, providing the opportunity to comment on group membership, truth-value, and illocutionary force. However, there is variation between studies as to the actual items treated as hedges. In some studies (e.g. Prince et al., 1982), the phenomena treated as hedges are not described very thoroughly. In other studies too, (e.g. Hyland, 1998), the focus is on a specific linguistic feature but not the broad range of alternatives available for hedging. Lachowicz (1981), for instance, has examined the use of the agentless passives and has pointed out that they are a useful strategy for hedging. He maintains that agentless passives are less dogmatic in tone and express a "tendency toward generalizing cases in point, allowing the author to be more open to other possibilities of interpretation" (p.113). Hedging has also been associated with numerical data including items like *about*, *approximately*, *close to* and *in that round*. The idea of numerical imprecision as hedging is also dealt with by Channel (1994).

While certain studies deal with a specific linguistic phenomenon, others have covered a wider range. Studying hedging in news writing, for example, Zuck and Zuck (1985) draw attention to an array of devices. They first discuss how vagueness in presenting the sources of news items may amount to hedging and then proceed to present a list of other items typically used as hedges. Most of the items on the list are verbal or adverbial expressions that express different degrees of probability. The main categories consist of auxiliaries (e.g. *may*, *might*, *can*, *could*), semi-auxiliaries (e.g. *appear*, *seem*), full verbs (e.g. *suggest*), the passive voice, various adverbs and adverbials (e.g. *probably*, *almost*, *relatively*), some adjectives (e.g. *probable*) and indefinite nouns and pronouns. Similar items are also mentioned by Markannen and Schroder (1987), according to whom, modal verbs, modal adverbs and particles, the use of some pronouns and even agentless passives, as well as other impersonal expressions, and certain vocabulary choices may be seen as central manifestations of hedging in English and German. Skelton (1988, p. 37) also points out that there are a number of ways in which one can hedge in English. These include personal phrases, the system of modal expressions, verbs like *seem*, *look* and *appear*, introductory structures like *I think*, the suffix *-ish* in connection with certain adjectives, and so on. Other lists of linguistic phenomena with hedging potentials are presented by Grabe and Kaplan (1997) and Hyland (1998; 1994).

When we look at the linguistic items that researchers have associated with hedging, it becomes obvious that the scope of hedging has broadened considerably since G. Lakoff's (1973) work. The limited set of items dealt with by G. Lakoff has expanded to cover a wide

range of phenomena from proposal and kinesic hedges (Brown and Levinson, 1978) to the passive voice, certain lexical items, ways of citing one's sources (Zuck and Zuck, 1985), impersonality, numerical imprecision (Dubois, 1987), questions (Webber, 1994), tense (Hyland, 1994) and so on. This has been a result of the widening of the notion of hedging. When G. Lakoff's study dealt mainly with the semantics of hedges, as visible in G. Lakoff (1973), the pragmatics of hedging began to attract increasing attention. With the widening of functional scope of hedges, researchers have also become interested in a wider array of devices. Thus, it is commonly recognized that delimiting the items that can be associated with hedging is difficult. And that describing hedging exhaustively on the basis of any clearly delimited linguistic categories seems difficult. On the other hand, even though an exhaustive analysis of hedging on the basis of the traditional categories of linguistic description is problematic, it is possible to gain useful insights regarding hedges by choosing the linguistic phenomenon representing the most typical realizations as the point of departure.

2.3 The Relationship between the Present Study and the Previous Studies

From the literature, it is evident that describing hedging exhaustively on the basis of any clearly defined linguistic categories seems difficult. However, even though an exhaustive analysis of hedging on the basis of the traditional categories of linguistic description is problematic, it is possible to gain useful insights regarding hedges by choosing the linguistic phenomenon representing the most typical realizations as the point of departure. Although the different lists of hedges mentioned in the previous studies are varied and might not account for all potential cases of hedging, they are useful in illustrating some of the most central linguistic phenomena pertaining to the strategy. In essence, the linguistic forms of hedges dealt with in the literature indicate reservation, avoidance of commitment, and uncertainty regarding what is being said, the effects of hedging typically being those of modifying truth value, commenting on the accuracy of a given conceptualization, and or influencing the truthfulness and force of propositions. This perspective suggests a close affinity between the notions of hedging and modality.

2.4 Analytical Framework

The study employed Quirk, et al.'s (1985) functional principle for establishing word class as well as Hyland's (1998) model as frameworks to respectively account for the lexical and non-lexical hedging devices used in the data. According to Quirk, et al. (1985), lexical hedges, like all words in English, and particularly their word classes, may easily be identified using any criteria for establishing word classes namely, morphological, notional, and functional principles. However, in this study, we used the functional principle because of the inherent challenges the other principles seem to have. The functional principle posits that the word class of words can be determined based on the context within which they are used. Thus, *round*, as an example, can be said to belong to different word classes depending on context of its use. The word can be said to function as a noun, a verb, an adjective, and an adverb in the following sentences: 1. *The **round** is my preference.* 2. *Muslims **round** the Kabba when they go to Mecca.* 3. *I prefer the **round** pie.* 4. *Kwame went **round** the bend.*

However, as it has been hinted above, this framework can only account for hedges at the lexical level. It therefore became necessary to use another framework which can be used to analyse hedges at the syntactic level. We thus, resorted to Hyland's (1998) model. In Hyland's (1998, p.103) model, the term "grammatical" and "strategic" hedges are used to

distinguish lexical signals from regularly used grammatical patterns and other means of expressing reservation in the data analysed. This division draws attention to the preponderance of lexical mitigation in the English and Chemistry masters' theses and to conveniently categorize a diversity of expressions that might fail to be included. According to the model, the means by which grammatical hedges are expressed vary and may include questions, conditional clauses, and contrast markers as well as some formulaic phrases. These labels, Hyland (1998) says, principally function as i) reference to experimental conditions, ii) reference to a model, theory, or method, or iii) admission to a lack of knowledge. Table below 1 shows the frequency of forms of hedges in the data with respect to lexical and strategic (grammatical) categories.

3.0 METHODOLOGY

3.1 Research Design; Sampling Method; Data and Data Collection Procedure; and Method of Analysis

In order to be able to explore and understand what hedging strategies are employed in the data and present them statistically, the mixed research approach was adopted. The multi-stage sampling method (i.e. purposive and simple random) was adopted for the study. In line with Cresswell (1994), the purposive sampling method was first employed to purposefully select MPhil theses from MA and MSc. theses to best answer the research questions posed. To ensure that each and every data had an equal and independent chance of being selected (Fraenken and Wallen, 2000), the simple random sampling method was further used to select a total sample size of 40 masters' theses from both English and Chemistry. Out of this data set, 20 were English and the remaining 20, Chemistry. The data set for the study was the Introduction and Discussion sections of 40 masters' theses from Departments of English and Chemistry in University of Cape Coast, Ghana. The study focused on theses in the last decade (2002-2012) to enable me compare the findings with existing studies in the literature. Having obtained permission from the heads of the Department of English and Chemistry, I first sampled the data from the libraries of the two departments where the documents are kept. I further photocopied the Introduction and the Discussion sections of the theses for analysis. The current study employed content analysis as well as descriptive statistics as the methods of data analysis.

4.0 DISCUSSION

Table 1: Frequency of Lexico-grammatical forms of hedges in the English and Chemistry graduate theses (per 17,500 words)

	Lexical category				
	Modal verbs	Adverbs	Lexical verbs	Adjectives	Nouns
Raw score	352	315	310	48	41
Percentage	31.9	28.5	28.1	4.3	3.7
Strategic (grammatical) category					
	Limited conditions	Model, theory or method	Lack of knowledge	Others	
Raw score	1	2	2	34	
Percentage	0.1	0.2	0.2	3.0	

4.1 Lexical Hedges

It was observed that forms of hedges used in the writing of English and Chemistry masters' theses are both lexical and strategic (grammatical) in nature. To begin with lexical hedges, the table above depicts that hedging in English and Chemistry graduate students' writing is principally a lexical phenomenon. Out of the total number of 1,105 incidents of hedges employed in the data, 1,066 representing 96.5% are of the lexical category. They are modal auxiliary verbs, adverbs, lexical verbs, adjectives, and nouns. The preponderance use of lexical forms as hedges in the data corroborates the view of Holmes (1988) that lexical hedges, rather than phrasal or syntactic structures, represent the most common means of realizing epistemic modality in English.

4.1.1 Modal Auxiliary Verbs

Table 2: Frequency of modal verbs used to express hedging in the English Chemistry graduate theses (per17, 500 words)

	Modal verbs						
	may	might	can	could	would	must	should
Raw score	168	95	25	48	9	3	2
%	15.2	8.6	2.3	4.4	0.8	0.3	0.2

The data indicated that modal auxiliary verbs present the most frequent means of hedging lexically in the English and Chemistry graduate theses. Out of the total of 1,066 lexical hedges in the data, modal verbs recorded 352 instances representing 31.9%. The distribution of modals in the data as shown in Table 2 above suggests that English and Chemistry graduate students employ almost all the modals in English as hedging devices. However, *may*, *might*, *could*, and *can* seem to be the most preferred choices, whereas *would*, *should*, and *must* are less often used.

May/Might

May and *Might* are the modal verbs which were mostly used in the data. Their presence in the data is almost four times more than all the other modal verbs in the data put together. Although *may* occurs over twice as often as *might*, both modals can be used interchangeably, as they occur in the data, to indicate an assessment of possibility.

- (1) ... eating the muscles of tilapia, mudfish and crab *may* not pose any serious health problem. CH 3
- (2) The problem of paragraph disunity *may* be resolved if students are given frequent opportunities to write shorter paragraphs. EN 16
- (3) These high levels *might* be attributed to mining activities along the Pra River. CH 12
- (4) This *might* have stemmed from the general belief that much attention is given to the use of conjunctive relations in the second cycle institutions. CH 20

It can be argued that the use of the modal verbs *may* and *might* in the above extracts express the same epistemic sense of possibility where the authors show the degree of commitment they invest in the claims made. Expressing their claims as sheer possibility, the authors invariably indicate that they are not certain in the propositions made. In example 1, the data indicates that it is possible for such types of fish (i.e. tilapia, mudfish and crab) to pose health problems to consumers. Similarly, the notion of possibility is equally expressed with the use

of *might* in example 3 where it is again indicated that it is possible to attribute the high levels of something to the mining activities in the Pra River.

Can/Could

The epistemic *can* and *could* emerged as the second most preferred modal verbs, with the latter being the more frequently used. In the data, both *can* and *could* are similar to *may* and *might* in that they also express tentative possibility (e.g. Perkins, 1983). Their use in the data suggests the speculative and tentative nature of scientific writing. The following examples are typical:

- | | |
|---|-------|
| (5) The determination in 50% (v/v) methanol-water mixture can account for the low nature of values in this work. | CH 6 |
| (6) It can be inferred from the study that many different sets of textbooks ... | EN 19 |
| (7) The significance of high values could be attributed to the feeding habit and slow movement of crabs. | CH 7 |
| (8) That instance could be analyzed in relation to the concept of a superior power that initiates defence. | EN 9 |

From the extracts above, *can* and *could*, like *may* and *might*, express possibility. The tentativeness of the modal expression echoed by *can* and *could* in examples 5, 6, 7, and 8 can be made more pronounced when each of them is paraphrased as “It is possible ...” In that case, extract 6, for instance, would read as “It is possible to infer from the study that many different textbooks ...” The similarity between the epistemic uses of *could* and *may* is further illustrated by their combination in the data together with the co-occurrence of *possibility*.

- | | |
|--|-------|
| (9) Possibly , the response of the electrodes to hydrogen ions could partly account for the high slopes obtained ... | CH 19 |
| (10) Teaching the process of how mental picture is formed could possibly develop this skill. | EN 17 |

Would

The epistemic *would*, unlike *may*, *might*, *can* and *could*, is not frequently used in the data. However, in just about nine times that *would* occurs in the data, it has a common use of expressing the hypothetical variant of *will* (i.e. expressing prediction).

- | | |
|---|-------|
| (11) The average result of 24.57 (81.91%) would indicate a high degree of proficiency among the testees. | EN 5 |
| (12) ... The careful reader would understand that even if the coupon buyer is lucky and wins ... | EN 10 |

Expressing a hypothetical variant of *will*, which expresses prediction, the above extracts can better be understood when paraphrased as in the case of example 12. Thus, it would read as “It is predicted that the careful reader will understand that even if the coupon buyer is lucky and wins ...”

Should

In the data, epistemic *should* typically refers to the future and consequently has a more tentative meaning than *would*. It expresses a less confident assessment of probability based on facts known to the writer. In the data, *should* occurs far less often than *would* and only twice in the Chemistry theses.

- | | |
|--|-------|
| (13) It is expected that the value reported in ... should be higher than in 50% (v/v) methanol-water mixture. | CH 14 |
| (14) Thus a compromise should exist between rigidity and stability. | CH 6 |

Must

Must, like *should*, occurs infrequently in the Chemistry data only three times. It is a modal of inferential certainty ranging from strong to weak (Collins, 1991). The relative infrequency of *must* in academic discourse, where there is often the need to make deductions from known facts, may suggest that writers are reluctant to express even weak convictions concerning the truth of their propositions. In the few instances that it occurs in the data, *must* is almost always found with explicit hedges, underlying its essentially subjective and less categorical nature.

- (15) I *suggest* that D1 degradability *must* be casually linked to QB site occupation ... CH 16
 (16) We *think* that the coordination of the ligands *must* be able to form a rigid arrangement around the metal of interest. CH 6

Overall, the modal auxiliaries are used frequently to express epistemic modality in the writing of English and Chemistry students, and their distribution shows a preference for a more tentative forms including *might*, *may*, *could*, *can*, *would*, *should*, and *must*.

4.1.2 Epistemic Adverbs

Epistemic adverbs are the second most frequent means of hedging in the English and Chemistry graduate theses. Out of the total number of 1,066 lexical hedges used in the data, adverbs recorded 315 instances representing 28.5%. They occurred in over 30 different forms with the most frequent represented in Table 3 below:

Table 3: Frequency of most frequently occurring adverbs used to express hedging in English and Chemistry graduate theses (per 17, 500 words)

	Most frequent epistemic adverbs						
	generally	likely	normally	probably	relatively	sometimes	usually
Raw score	47	19	20	29	28	18	39
%	4.3	1.7	1.8	2.6	2.5	1.6	3.5

From both syntactic and semantic points of view, the epistemic adverbs in the data differ from the other lexical forms of hedges. Syntactically, they are not integrated as an element of the clause but can appear in a number of positions without affecting the meaning relation between the clause and adverbs. This distributional mobility of the adverbs allows the modality of the utterance to be either thematised or inserted intrasententially:

- (17) *Generally*, the actual mechanism of electrical conduction varies with the type of membrane material. CH 5
 (18) Ion selective electrodes *ideally* respond to determinand in accordance to the Nernst equation given. CH 8
 (19) *Sometimes*, a word can have a strong syllable that would normally be only a structure. EN 14

The initial position occupied by the hedges in extracts 17 and 19 helps the modality expressed in them to be thematised. This structural arrangement, which may be due to the style of the writer or for some purpose, foregrounds the uncertainty expressed. In example 18, however, the hedging device is inserted intrasententially though it is not an integral part of the clause. While the concept of theme may not be quite clear, the choice of initial position

can serve to accent the hedge and provide the reader with an alternative interpretation for the entire sentence, marking what follows as hypothetical and subjective.

Semantically, the epistemic adverbs in the data may function principally as adjuncts or disjuncts, and may intensify or tone down the proposition expressed in the verb. Quirk et al. (1972, p. 452) refer to the category of intensifying adjuncts as “downtoners” due to the lowering effect they have on the modified verb. A number of frequency adverbs in the data can be identified as downtoners.

- | | |
|---|-------|
| (20) The appearance of kinase activity correlates <i>quite</i> well with ... | CH 10 |
| (21) ... that light will <i>rarely</i> penetrate further than about ... | CH 3 |
| (22) The statement <i>partially</i> possesses the force for power indication. | EN 2 |

In extract 20, the adverb *quite* reduces the force to the claim made by the verb *correlates* thereby toning down the force of the verb. Downtoners may further be categorised into ‘approximators’ and ‘compromisers’ where in the former, the import of hedging is made manifest in a form of approximation conveyed by the said adverb. The adverb *quite* in extract 20, for instance, shows some degree of approximation in the knowledge base of the author, thus the name approximators. On the other hand, the adverbs in 21 and 22, unlike 20, convey a blurry picture. This shadow, which creates some doubts in the reader, is deliberately made to compromise the proposition made. As approximators or compromisers, downtoners suggest one thing – the impression that the author is not certain about the claim made.

Disjuncts, or what Halliday (1994) calls probability adjuncts, are another type of adverbs which are used to hedge in the data. They detach themselves from the other parts of the sentence and can be divided into two broad types which are style and content disjuncts. The former conveys the speaker’s comment on the style and form of what is being said, defining in some way the conditions under which authority is being assumed for the statement (Quirk et al., 1990). Some items in this class of adverbs therefore indicate that a generalization is being made (Quirk et al., 1972) and therefore hedge the accompanying statement:

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|---|-------|
| (23) PAHs were <i>generally</i> found as a mixture containing two or more of these compounds such as soot. | CH 5 |
| (24) The results are <i>broadly</i> similar to those obtained by ... | CH 12 |
| (25) Edu-Buandoh (1997) reveals a <i>generally</i> low level of English proficiency among Senior Secondary School students. | EN 9 |

The element of uncertainty expressed by the hedges above (i.e. disjuncts) is inherent in the writer’s attempt to generalize claims without being specific or emphatic. It tends to show an idealized situation on the ground. Content disjuncts, on the other hand, include a wide range of hedges relating to degrees of certainty. Disjuncts is concerned with certainty comment on the truth-value of what is said, firmly endorsing it, expressing doubt, or posing contingencies such as conditions or reasons (Hyland, 1998). A great deal of content disjuncts in the data simply expresses doubt without carrying implications about the truth of the statement or the sense in which it is seen to be true or false.

- | | |
|---|-------|
| (26) No carboxyl group was detected, <i>presumably</i> because it was not sought for ... | CH 16 |
| (27) The most dominant, and <i>probably</i> the most effective, forms of persuasion in contemporary culture are electronic and print advertizing. | EN 3 |

The two extracts above demonstrate that the hedging devices used express some degree of doubt about the proposition made. Meanwhile, the doubt expressed does not have any implication on the claim. Taking example 26 as an example, the writer tends to imply that the writer is only being presumptuous, perhaps because “carboxyl group” was not the target in the study. The implication is that that element might be present if it was sought for. The second group is similar to the perceptual group of evidential lexical verbs and conveys how the truth of the proposition can be mentally perceived. Most adverbs in this class communicate conviction, and items expressing doubt are rare in the data:

- | | |
|---|-------|
| (28) This can be rationalized <i>intuitively</i> with the favourable effect of ... | CH 2 |
| (29) <i>Evidentially</i> , temperature changes have effects on ISE systems. | CH 19 |
| (30) ... were observed in the data, which is <i>apparently</i> due to some intimacy that exists between the participants. | EN 9 |

It is worth noting that the mobility of adverbs can limit its scope thereby operating at either the clause level or within a group or phrase. This means that both downtoners and disjuncts may be employed in restricted roles and thus can considerably limit the scope of what is hedged:

- | | |
|--|-------|
| (31) In view of the <i>seemingly</i> wide distribution of nominal group, ... | CH 7 |
| (32) The spectra consist of few bands which are <i>approximately</i> of the same length. | CH 20 |

The instances of hedges used above depict that the effect of the hedges only affects part but not the entire structure. For instance, the hedging device (i.e. seemingly) in 31 exclusively affects the noun phrase “ wide distribution”. In example 32, however, the hedging covers only the noun phrase “some length”.

4.1.3 Epistemic Lexical Verbs

Epistemic lexical verbs emerge as the third most preferred form of lexical hedges in the data. Out of 1,066 total lexical hedges in the data, lexical verbs occur 310 times representing 28.1%. The lexical verbs in the data mostly express subjectivity and are generally used to hedge either commitment or assertiveness. They express both the mode of knowing and the source of that knowledge, thereby conveying the implications about the reliability of the knowledge itself. The epistemic lexical verbs carry some import of both judgment and evidence of the writer to suggest a non-committal means of making an assertion. As judgment verbs, they comprise the use of performative verbs which perform rather than describe the acts they label:

- | | |
|---|------|
| (33) I <i>propose</i> ... that to teach semantic predictability the instructor may begin by teaching the ways the paragraphs are developed. | EN 1 |
| (34) This <i>suggests</i> that platinum emitted in the environment can form soluble substances that are absorbed by plants. | CH 4 |

The tentativeness of the italicized verbs above clearly demonstrates the speculative nature of the performatives. The researcher’s use of the verb ‘propose’ to suggest tentativeness shows that the researcher admits some degree of uncertainty he invests in his evaluation of how a certain concept should be taught. The speculation enacted by the verb in example 33 is made clearer in that of 34 where it becomes more obvious that the researcher is making a conjecture based on some deduction from the analysis made or results obtained. The claim is thus captured as a suggestion rather than an expression of concrete fact. The speculative

category of verbs in the data also includes verbs which involve unobservable cognitive states or processes, and which do not obviously “perform” tangible acts in the way the core examples of speech act verbs as exemplified above. Unlike the performatives, these verbs appear to give a more conjectural than assertive meaning to the propositions which follow, hypothesizing a world in which something might be true.

- (36) We *hope* that by the end of one’s second cycle education, one should be able to speak
and write English effectively. EN1
- (37) I *believe* that Pt will be mobile in acidic soil water with high chloride content. CH 4

It was also observed in the data that, apart from the use of the active forms of the verbs, English and Chemistry researchers explore other grammatical means to hedge responsibility. One such means is the use of the passive voice to suppress human agency by way of distancing themselves from the claims made.

- (41) It *could be speculated* that files accumulate methyl mercury from both food sources and
water column CH 18
- (42) It *has been calculated* that the concentration of these metals in soya bean bacteroids is
14mm CH11

In addition to the use of passives, the researchers distance themselves from their propositions through the use of “abstract rhetors” (Halloran, 1984) which imply that rhetorical acts can be accomplished without human volition. They thus suggest in the excerpts below that whatever claim that is made in the various studies emanates from the data themselves.

- (43) *Fe showed* a non-linear response to these ion-selective electrodes. CH 4
- (46) *The coherence analyses of the text imply* that there are three aspects of violations. EN 15

As already indicated, the second category of lexical verbs that is present in the data is the evidential verbs. These types of lexical verbs provide evidentiary justification either based on reports of others, the evidence of the writer’s senses, or the feasibility of matching evidence to goals.

- (47) *Cooks (2001) shows that* marketing messages require an expanded discourse analysis that
scrutinizes the paralanguage accompanying the advertizing copy. EN 17
- (51) *Clouse’s study predicted that* the creation of quenching centres ... CH 5

Here, the authors make their positions clear by providing the caveat that the claims they make are based on reports of other scholars. According to Hyland (1998), scientific writers rely heavily on “hearsay” evidence from the literature, and the choice of the reporting verb can indicate their level of commitment to what is reported. For instance, the verbs used for quotative evidence in the above examples both specify and acknowledge previous findings, and also take a stance towards these findings by referring to either speculative or deductive judgment. Contrary to the previous examples of evidential verbs which are based on opinions from the literature, there is yet another group which suggests that the claim made is based on evidence from the researchers’ own observation, particularly with the help of their senses (Hyland, 1998).

- (52) From the above, C is able to speak for 30 seconds because he *seems* to be more knowledgeable in
the topic under discussion. EN14
- (53) Site S1 *appears* to be unique in terms of its heavy metal input unto the lagoon. CH 3

The data again includes a third subcategory of evidential verbs which hedge the strength by which the goals of the research or the possibility of acquiring appropriate evidence are expressed (Hyland, 1998).

- (55) We *sought to investigate* the verbal behaviour of teachers and students in casual conversation. EN 20
- (57) ... *our aim was to see* the extent to which heavy metals enter our bodies via food, drinking water and air. CH 14

From the above, the authors try to contract the goal of the study with the results achieved, thereby foregrounding the purpose of the research and downplaying the extent to which adequate supporting evidence was acquired. This strategy of hedging enables the researchers to create a context that relieves them of the responsibility regarding the degree of success achieved in meeting those objectives. It allows the authors to express modesty in undertaking the study and exercise caution in anticipating its degree of success. These metadiscourse devices thus contribute to the construction of an identity in the narrative while relating to evidence by hinting at the fallibility of knowing (Thompson and Ye, 1991).

4.2 Epistemic Adjectives

The last but one predominantly used lexical hedges in the data are the epistemic adjectives. With a total of 48 instances of only 16 items in the data, epistemic adjectives represent 4.3% of the total number of lexical hedges. Out of this limited number of adjectives, *possible* is the most frequent appearing 13 times. According to Coates (1987), *possible* has both root and epistemic meanings, roughly parallel to the modal verbs *can* and *may*.

- (58) It is *possible* that some fraction of these compounds is from the biodegradation of perylene by natural occurring population of sediment microorganisms. CH 10
- (59) It is *possible* that the basis of that expression used to humble the face is in various Ghanaian languages. EN 8

In the above, the epistemic adjectives express possibility, which involves the writers' confidence in the truth rather than an assessment of enabling conditions, even if the writers seek to hide this judgment. The epistemic meaning in both extracts suggests an interpretation that the outcomes of the studies are currently only imaginable rather than likely. In addition to taking complementation with *be*, some modal adjectives in the data are used contributively with some range of nouns.

- (60) The *possible hazardous effect* arising from pollution of environment by these heavy metals ... has not been fully documented. CH 4
- (61) However, the existence of such a *possible mechanism* in the gases was not investigated. CH 20

This use restricts the reference of the noun while still qualifying the writer's position. For example, *possible* in 61 restricts the noun *mechanism*. The use of *possible* in these contexts is epistemic as, like other uses, it does not refer to physical objects in the real world, but to what Lyons (1977) calls second or third order entities or abstract propositions which may or may not exist. Thus concepts and experiential content can be organized into impersonal constructions, the contribution of modal adjectives allowing the writer hedge the process

described. Other adjectives, which only occasionally occur in the data, include *likely*, *relative*, *potential* and *somewhat*.

- (62) The **relative** prominence of a syllable within a word or of a word within a phrase is indicated by relative stress. EN 7
- (63) There are also other **potential** sources of Cd to the lagoons from this area. CH 4
- (64) There are onset of rains and a **somewhat** increase also during the minor rains in November. CH 17

4.3 Epistemic Nouns

From the data, epistemic nouns occur as the least preferred lexical means of hedging. The data provides 41 modal nouns, representing (3.7%). The most frequently occurring noun used as hedging device in the data is *tendency*. Other nouns which were used as hedges in the data include *belief*, *possibility*, and *assumption*.

- (65) The **tendency** that ligands are found in very low concentration association with organic matter is revealed in the data. CH 17
- (66) Any text that lacks a good conclusion has the **tendency** of weakening the organization of information relation in the discourse. EN 19
- (67) There is the **possibility** of protonation of these – OH groups of the ionophores in the membrane. CH 12
- (68) The **assumption** here is that to be considered as an attractive Ghanaian, a woman must be larger-weighted and happier ... EN 5

In each of the instances above, the epistemic nouns hedge the proposition of the researcher either by indicating that his/her position on the matter is just an opinion rather than a statement of fact or likelihood.

4.2 Non-Lexical Hedges

In addition to the lexical hedges, the data provides three discourse-based strategies for hedging labeled as non-lexical hedges (Hyland, 1998). They are: i) reference to limiting experimental conditions, ii) reference to a model, theory or methodology, and iii) admission to a lack of knowledge. This category of hedges records only 3.5% of the total number of hedges in the English and Chemistry theses.

4.2.1 Admission to Limited Knowledge

Admission to lack of knowledge is a non-lexical or grammatical strategy of hedging which comments on the existing knowledge of the author. The essence of this strategy stems from the view people hold that when it comes to judging claims, readers often would want to know how much confidence the writer invests in the propositions made (Hyland, 1998). And one of the clearest means of distinguishing between conditionally true statements and speculative possibilities is making known the depth of your knowledge with respect to the claim. It is important to note that this use of hedging is different from Swales' (1990) discussion on establishing a research niche, which is an important means by which writers are able to fix their work in an evidential context of uncertainty.

- (69) Pd and its effects on humans is **not fully yet known**. CH 3
- (70) **The exact number of indigenous languages spoken in the country cannot be determined because ...** EN 5

If we consider examples (69) and (70), which are the only instances of non-lexical hedges in the data that refer to limited knowledge of the researchers, we can say that the extracts suggest some non-commitment on the part of the authors. The examples indicate that the researchers demonstrate boldly that they are not knowledgeable on the realities on the ground. They therefore admit their lack of full knowledge, which is an indication of humility, an important feature of academic writing (Irvin, 2001).

4.2.2 Reference to a model, theory or method

Another non-lexical means of hedging in the data is reference to a model, theory, or method. According Hyland (1998), writers, through this means, hedge their full commitment by referring to deficiencies in the research model, theory or method which may comprise the accuracy of their results. This allows the researcher to present results, having anticipated criticisms of the premises or methods by which they were achieved.

(71) ***If this belief is true then*** a list of ... structured information may ... EN 1

(72) ***If that is the case, then*** this researcher does not see why everybody should be referred by a plural pronoun to determiner. EN 7

The notion of uncertainty in the claims above is expressed with use of conditional clauses, making one circumstance dependent on another and thereby hedging the certainty of the outcome.

4.2.3 Reference to Experimental Limitation

Reference to experimental limitations is yet another strategy that the researchers in the data adopt to make propositions non-lexically. While this form of hedging reduces the writer's conviction, it suggests greater confidence than admitting to insufficient knowledge, because questioning the effectiveness of an experiment can also indicate the conditions under which results might be regarded as valid. The author, under this circumstance, comments on the uncertainties of experimental conditions to suggest different levels of confidence.

(72) ***We were not successful*** in obtaining the complete proportions ... CH 19

The realization of this strategy involves negative determiners and items which have negative connotations such as difficult problem and failure. This means of hedging depends on its content rather than its form.

4.2.4 Other Non-lexical Hedges

The data is suggestive that English and Chemistry student researchers have other much preferred grammatical forms for expressing commitment to propositions non-lexically rather than resorting to the three ways suggested by Hyland (1998) discussed above. The difference is enormous such that whereas the three non-lexical strategies constitute only 0.5% of the total hedges of 1105 employed in the data, the other non-lexical forms, which I have labeled as "others", record 3.0%. They include reference to authority with the use of diverse syntactic structures such as adverb phrases, prepositional phrases, and clauses. In this hedging strategy, the researcher usually makes his claim upon the assumption of a personality whom he

considers to be an expert in the area of study. This non-lexical form usually begins with the phrase “according to”:

- (73) *According to Raskin and Weiser (1987: 201)*, “Cohesion is a textual quality and is attained through ...”. EN 1
- (74) *According to Schwartz (1973)*, it is better to get a message out of an audience than to try to put one with them. EN 6

Like the three previously discussed non-lexical hedges, the scope of hedges in this strategy is not found in one lexical entity. It is realized in the entire structure that is emboldened, thus a non-lexical strategy. As evident in extracts 73 and 74, the researchers present their claims from the view point of the scholars whose names have been provided using the phrase “according to”. By this means, the researchers indicate that they are not speaking from a secure source, and that their claims are only but opinions expressed by some scholars in the area. Thus, the claims are merely what pertains in the literature and perhaps have been accepted to be true. It is important to note that this non-lexical means of hedging identified in the data is different from the use of reportive verbs (see Hyland, 1995) since, in this, the hedging element is not limited to the verb but the entire structure which is emboldened and italicized. In some instances too, the reference is not made to personality but a theory, a model or an institution where the information or the data was obtained.

- (75) *According to Crystal Field Theory*, the validity of the Irving is ... CH 6
- (76) *According to International Labour Organization (ILO)*, mining is one of the world’s most hazardous sectors. CH 9

Again, this is different from what Hyland (1988) calls “reference to limitation in theory or model” because in this instance, the researcher is certain that the theory, model, or institution being referred to is a source which is widely acclaimed in the literature and is fully creditable until it is proven otherwise. The reference to authority as a means of making a claim non categorically, other times, does not begin with the phrase “according to” as seen in the above examples. It takes some specific performative verbs:

- (77) *As explained by Fowler (1986: 17)*, world views typically produce ideologies in the sense that ... EN3
- (78) *In the view of Leech (1966: 146)*, the main effect of this device is that it reinforces the qualities of a product in a mnemonic fashion. EN14

When the researcher quotes the view of a scholar as in the case of example 79 below, the import of hedging can be thought to be similar to the previous instances where the researcher tries to buttress his claim based on somebody’s opinion. The only difference seems to be that the exact words of the personality quoted seem to exert some greater force on the claim made, thereby strengthening the argument of the researcher, which somehow, eventually compels the reader to accepting the claim. Thus, examples 77 and 78 can be paraphrased using the phrase “according to”, thereby making it similar to examples 73 and 74.

Generally, the data showed that, apart from referring to authority, English and Chemistry use other non-lexical forms of hedges. They include other syntactic forms which range from the use of adverb phrases, prepositional phrases, and clauses that reflect general opinion of the world.

- (80) *In most cases*, it is the initial word or words of sentences that are elipted. EN 2
(81) *As it is generally known in Ghana*, a company is not allowed to compare its products with those of its competitors. EN 3
(82) *To a small extent*, heavy metals enter our bodies via food, drinking water and air. CH 4
(83) *In my view*, the sentence provides a more tangible ... EN 10

In examples 80 and 83, for instance, the structures that carry the semantic load of hedging are the propositional phrases *in most cases* and *in my view*, whereas in extract 81, it is the adverb phrase *as it is generally known in Ghana*. The structure in extract 82, on the other hand, is a verbless clause.

5.0 CONCLUSION

In summary, I have provided an account for the ways hedging is linguistically realized in the Introduction the Discussion sections of English and Chemistry masters theses. From the data, it was observed that the forms of hedges used in English and Chemistry are both lexical and non-lexical, with the former being the most preferred form in both sets of data. According to the data, the lexical hedges comprised of modal verbs, adverbs, lexical verbs, adjectives and nouns. It was found that, whereas the most frequently used lexical forms of hedges in both English and Chemistry were modal verbs, the least featured were nouns. Concerning the non-lexical hedges, however, it was also observed that, apart from Hyland's (1998) three discourse-based strategies (i.e. i. reference to limiting experimental conditions, ii. reference to a model, theory or methodology, and iii. admission to a lack of knowledge), there were other forms used in the data that are not accounted for by Hyland's model. They comprised of phrases and clauses which generally made reference to authority (i.e. personality, theory, or institutions).

Secondly, it has been demonstrated that the numerical significance of hedging does not only provide the meanings hedges convey but also offers an empirical basis for the pragmatic categories of hedges discussed in the next chapter. It has been shown that assigning particular semantic meanings to decontextualized forms cannot capture the interpretation of hedges in the data, but particular devices can only be interpreted as conveying hedging meanings in the utterance of actual sentences. The discussion again has underlined the importance of hedging in structuring scientific communication and emphasized the variability of the means used to express it.

The study serves as the basis for further research in hedging at various levels in students' writing. As a study which aims at exploring the linguistic forms (lexical or grammatical) that are used as hedging devices in English and Chemistry masters theses, it stimulates research interest on academic writing, particularly on hedging in graduate students' writing in the Ghanaian context. Also, the study contributes to the literature as it attempts to show whether there exist any differences in hedging forms and functions based on disciplinary variation and across rhetorical sections.

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