LEXICAL HEDGES IN WRITTEN ACADEMIC DISCOURSE

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Abstract: In today's highly competitive academic environment, hedges represent an essential rhetorical strategy extensively employed by research article authors who strive to have their knowledge claims accepted by fellow discourse community members. The understanding of hedges by both researchers in linguistics and academic writers ensures their appropriate identification, study and use. Therefore, this paper aims to review the linguistic realizations of hedges in written academic discourse according to the currently available literature in order to offer a comprehensive picture of the possible forms of lexical hedges, which could aid their recognition, correct usage and further research in the field.

Keywords: hedges, linguistic realizations, written academic discourse, rhetorical strategies, knowledge claims.

The current written academic environment is very dynamic and competitive as thousands of researchers strive to publish their research results in English-language international journals in order to not only create scientific knowledge but also gain individual and institutional benefits. Higher education institutions require their staff members to publish extensively, preferably in high-impact journals besides carrying out their regular teaching duties, thus often shifting the balance in favor of research activities to the detriment of student instruction. In this context, besides solid research skills and a good command of the English language, scientists must also be able to use various tools and rhetorical strategies in order to successfully present their research results.

The use of hedges allows academic writers to introduce new knowledge claims with accuracy, caution and modesty in order to diminish their chances of being refuted by specific discourse community members. Moreover, an appropriate degree of authorial presence allows research article authors to effectively present their claims and thus gain credibility and authority in their field. Hedging also stimulates writer-reader interaction in written academic discourse as target readers are assigned the active role of participating in the creation of scientific knowledge by approving or disapproving new propositions based on their knowledge in the field, experience and use of contextual understanding.

The interactive nature of academic writing, which allows scientists to negotiate their findings and readers to actively participate in the creation of scientific knowledge, was previously highlighted in the literature (Swales, 1990; Hyland, 2002, 2005; Hyland and Tse, 2004; Mauranen *et al*, 2010). At the same time, the presence of the private goals and intentions that characterize the interactive nature of the current written academic discourse were discussed by Bhatia (2004, 2008, 2012), Hyland (1996b, 1997, 1998b, 2001, 2005, 2009), Salvager-Meyer (2000), Hyland and Salager-Meyer (2008), Hyland and Tse (2004) or Gosden (1992).

Hedges were studied as a linguistic or pragmatic phenomenon in a general context by authors such as Lakoff (1972), Fraser (1975) or Brown and Levinson (1987). As far as hedging in written academic discourse is concerned, some of the contributors to the field were Prince *et al* (1982), Adams Smith (1984), Chafe (1986), Skelton (1987, 1988, 1994), Crystal (1988), Myers (1989), Crompton (1997), Hinkel (1997), Markkanen and Schröder (1997), Varttala (1999), Burrough-Boenisch (2005), Kilicoglu and Bergler (2008), Hyland and Salager-Meyer (2008), Salager-Meyer (2000), Millán (2010), Fraser (2010), Puhan *et al* (2012) and Alonso Alonso *et al* (2012).

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However, out of these numerous attempts to describe and categorize hedges, Hyland (1996a, 1996b) provided the first and most detailed classification and characterization of hedges according to their linguistic realization and pragmatic function in scientific written discourse currently available in the literature. His contribution is relevant for the research on hedges because his taxonomy is not only comprehensive and practical, but also based on the study of scientific research articles in cell and molecular biology, which thus exemplifies the use of hedges in the genre in which they occur most frequently.

Therefore, Hyland's classification of hedges according to linguistic realization shall be summarized below, accompanied by his examples from a corpus of 75.000 words taken from 26 research articles in the field of cell and molecular biology written in English and published in six international journals from the Netherlands (four), the USA (one) and France (one) between 1988 and 1993. The results of these two ample studies were also compared with general academic data provided by three large computer corpora of academic English (the JDEST science corpus created by the Jiao Dong University in Shanghai, the academic sections of the Brown University and the Lancaster/Oslo-Bergen LOB corpora) totaling over 780.000 words. Although not recent, this research, including practical examples, continues to be the most comprehensive and readily applicable in the field of hedging.

Hyland's considerations regarding the use of hedges in written academic discourse, as well as his analysis and classification of hedging devices from lexical and pragmatic viewpoints were further discussed in his comprehensive book on hedging in scientific research articles (1998a), which was also based on interpreting the data retrieved from the above-mentioned corpora.

According to the results of the first major study carried out by Hyland (1996a), hedges were more prevalent in the scientific than in the general academic corpus, thus strengthening the idea that hedging is a crucial characteristic of written scientific discourse in need of further research. As mentioned in Hyland (1998a), hedging was mainly realized lexically through lexical verbs, adjectives, adverbs, nouns and modals, which accounted for 85% of all hedging devices found in the scientific corpus, as well as through three non-lexical strategic devices (reference to limited knowledge, reference to limitations of model, theory or method and reference to experimental limitations), which constituted the remaining 15% of hedging strategies encountered in the same corpus. Out of these two types, the present paper only focuses on lexical hedges, which shall be presented below.

As already mentioned, hedging is a predominantly lexical phenomenon mainly expressed with the help of modal verbs (*would*, *may*, *could*, *might*, *should*, *will*), epistemic lexical verbs (*indicate*, *suggest*, *appear*, *propose*, etc), epistemic adjectives, epistemic adverbs and nouns. According to Hyland (1996a, 1998a), the most frequent linguistic realization of hedging in the scientific corpus investigated was represented by the use of lexical verbs (27.4%), followed by adverbs (24.7%), adjectives (22.1%), modals verbs (19.4%) and nouns (6.4%).

However, the linguistic realization of hedging devices was found to vary according to the field of activity in which they occur. Thus, a comparison between the frequencies of the above-mentioned lexical hedges in the scientific corpus vs. the general academic corpus revealed that, although lexical verbs were the most frequently occurring devices in the scientific corpus, their use in the general academic corpus was even higher (33.3%). The same situation applies to modal verbs, which were significantly more prevalent in the general academic corpus (40.2%) compared with the scientific corpus (19.4%) consisting of cell and molecular biology research articles. This indicates a sparse use of modal verbs by biologists, as well as the need to not restrict the study of hedging devices to modal verbs only.

On the other hand, epistemic adverbs and adjectives occurred far more frequently in the journal corpus compared with the general academic corpus (24.7% vs. 18.1% and 22.1% vs. 4.0%, respectively), possibly due to the high lexical density characteristic of scientific discourse. Although nouns prevailed in the scientific corpus compared with the total percentage calculated for the

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general academic corpus (6.4% vs. 4.5%), their highest incidence was recorded in the written general academic corpus (7.7%). The next part of this paper will include a detailed presentation of lexical hedges in order of their frequency of occurrence in Hyland's scientific corpus and of their respective relevance for written scientific discourse.

Epistemic lexical verbs proved to be the most common linguistic realization of hedging in Hyland's scientific corpus as they accounted for 27.4% of all the hedges recorded in the cell and molecular biology research articles studied. The two most frequently occurring lexical verbs in the scientific corpus were *indicate* (10.8%) and *suggest* (9.1%), followed by *appear*, *propose*, *seem*, *report*, *predict* and *assume*, whose frequencies ranged from 4% to 1.1%, in this order (Hyland, 1996a). Therefore, this list of epistemic lexical verbs also includes the semi-auxiliaries *appear* and *seem*, which were regarded by previous authors such as Salager-Meyer (1994) as semi-auxiliaries under the category of shields alongside modal verbs, probability adverbs, adjectives and epistemic verbs. Hedges commonly occurring in conversations, such as *guess*, *reckon* or *think* failed to occur in the two types of corpora investigated by Hyland, thus again emphasizing the differences between written and spoken discourse.

According to the same source, the frequencies of *indicate* and *suggest* in the scientific corpus also surpassed those registered in the general academic corpus, which were significantly lower (3.2% and 3.7%, respectively), whereas the occurrence of the other epistemic lexical verbs did not show significant differences between the two corpora. *Seem* was the only verb whose incidence was considerably higher in the LOB corpus compared with the scientific corpus (7.7% vs. 2.3%), although its frequency in the JDEST corpus was of only 4.0%.

Hyland (1996a) identified two main functions of epistemic lexical verbs. The first one is to act as writer-based hedges by indicating the authors' lack of commitment to the truth of propositions. This distances writers from claims and protects them, at the same time encouraging readers to assess the truthfulness of the knowledge claims they introduce. The second function aims to reduce the strength of propositions and the power of claims. As a result, lexical hedges used in this way act as reader-motivated hedges. However, in both cases, epistemic lexical verbs protect the author against possible rejection.

Hyland's analysis and description of epistemic lexical verbs (1996a, 1996b, 1998a) was based on Palmer (1986), according to whom non-factual propositions can be expressed in four main ways: speculative, deductive, quotative and sensory. The first two categories suggest the writers' position regarding their claims and are therefore connected with the first function of epistemic lexical verbs. They indicate that writers seek to distance themselves from claims by adding a touch of subjectivity, uncertainty or tentativeness to their propositions, which can be paraphrased as "I believe that" and "I conclude that" (Hyland, 1998a: 120). On the other hand, the last two categories concern the nature of the evidence supporting the claims, whose power they are meant to thus lessen. They assign the source of the information to somebody else, or they indicate that a conclusion was reached without palpable evidence, and can consequently be paraphrased as "X said that" or "It seems that" (Ibid.). Based on this categorization, epistemic lexical verbs were divided by Hyland into judgmental and evidential.

Epistemic judgmental verbs are connected with the speculative and deductive ways of expressing the non-factual status of propositions in scientific writing with the purpose of hedging personal commitment. Therefore, they consist of two sub-categories: speculative verbs such as *suggest* or *propose*, and deductive verbs, such as *calculate* or *infer*, which indicate that a conclusion was reached following the writer's calculation or inferential reasoning, instead of speculation.

Because they are used to hedge personal responsibility, epistemic judgmental verbs act as writer-based hedges. Their use, combined with lack of agency serves to move responsibility away from the writer and towards a process or implicit interpretation, as in: "Third, *the present work indicates* that the aromatic ring to which the..." or in "*The model implies* that the function of grana is to shield varying amounts" (Hyland, 1996a: 264). Human agency can also be reduced through the

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use of the passive voice, which confers objectivity and distances writers from their claims: "*It has been calculated* that..." or "[...] could be speculated to..." as well as through abstract rhetors used with epistemic judgmental verbs: "Taxonomic evidence suggests...; The model implies that...; The present work indicates that..." (Hyland, 1998a: 122).

The source of the evidence introduced in scientific writing as well as the writer's relationship with such information determines one of the three types of epistemic evidential verbs identified by Hyland (1996a, 1998a). The first type regards the writer's commitment to previous findings by other authors. The *Introduction* and *Discussion* sections of scientific research articles usually include information and data already presented in other studies. Therefore, when writers mention this information again, they also use a reporting verb, such as *suggest*, *speculate*, *show*, *deduce*, *predict* or *propose* in order to indicate their level of commitment towards it. By using a certain epistemic evidential verb, writers indicate whether they consider such findings to be speculations, i.e. weaker propositions based on a writer's personal opinion or deductions, or slightly stronger claims following logical reasoning or data interpretation: "*Henninger et al speculated* that...; *Trifonov has suggested* that..." (Hyland, 1996a: 264).

The second type of epistemic evidential verbs indicates that the information about to be reported is based on the writer's sensory evidence and must therefore be regarded as unproven or possible instead of categorical or definitive. Propositions containing this information are introduced by verbs such as *appear, seem* or *observe*: "These changes *appeared* to involve... because...; This hypothesis *seems* plausible because...; ...all other features of this gene and its product *seem to indicate*..." (Hyland, 1998a: 125).

Finally, the third type of epistemic evidential verbs hedge how the evidence presented was acquired. By using verbs such as "We *sought to investigate*...; ...we *attempt to gain insight*...; we were *prompted to attempt*...", writers display modesty and caution by contrasting the purpose of their study with the results obtained, at the same time suggesting that scientific constraints, rather than personal choices, influenced the investigation and led to the reported results (Hyland, 1996a: 265). Such hedges decrease the responsibility of the author, whose identity characterized by modesty, caution and politeness is more likely to be accepted by the target discourse community.

As far as the distribution of epistemic judgmental and evidential verbs in Hyland's scientific corpus was concerned, a statistical analysis revealed that judgmental verbs prevailed in scientific writing with a frequency of 29.9% per 10.000 words compared with only 10.0% evidential verbs (Hyland, 1998a: 126). The same source revealed that within the judgmental verbs category, speculative verbs such as *indicate*, *suggest*, *propose*, *predict*, *assume*, *speculate*, etc. prevailed over the deductive verbs *estimate* and *calculate*. These figures indicate that the scientific research articles included in the analysis displayed a preference for speculative over deductive judgments as well as for judgmental over evidential hedges. This suggests that, besides distinguishing between evidence and judgment, scientific writers employ epistemic lexical verbs in order to hedge the strength of claims and their degree of commitment to claims in the attempt to adopt a context-related, pragmatically strategic position that guarantees their successful approval by the target discourse community.

As previously mentioned, epistemic adverbs proved to be the second most frequent hedging device in Hyland's scientific corpus after epistemic lexical verbs. Although most also have an adjectival counterpart, epistemic adverbs prevailed in the studied scientific corpus. Out of the 36 forms recorded, *apparently* and *probably* were the most used (2.8 per 10.000 words), followed by *essentially* and *relatively* with 2.4 each and *generally* with 2.1 (Hyland, 1996a, 1998a). On the other hand, according to the same sources, adverbs containing *–ed* participle stems, such as *allegedly*, *reportedly*, *reputedly* or *supposedly* were rare in the scientific corpus investigated, probably due to the fact that they report quotative evidence with skepticism, and a touch of subjectivity, which is to be avoided in academic writing. Therefore, various reporting verbs are usually preferred instead of them in order to avoid any negative connotations.

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Mobility seems to be the main feature of epistemic adverbs, which also differentiates them from hedging adjectives and nouns. Epistemic adverbs may occur either in an initial position, where they affect the entire sentence, rendering it hypothetical and subjective, or in the middle of a proposition, in which case they only alter the strength of the data following it.

From a semantic point of view, hedging adverbs were divided by Hyland (1996a, 1998a) into two large categories: adjuncts and disjuncts. Further on, adjuncts were regarded as downtoners, whose role is to decrease the force of verbs. In their turn, downtoners can be compromisers, when they have a slight effect (examples include *quite*, *usually*, *normally*); diminishers, which have an increased effect (*partially*, *slightly*); minimisers, which have a considerable effect (*rarely*, *occasionally*) and approximators, which approximate the force of a verb (*almost*, *virtually*, *relatively*). Out of these four types of downtoners, approximators are the strongest items as they can almost deny the truth of the verb: "... the dissociating effect of NaCl could be *almost entirely* suppressed, especially with respect to the 23kDa polypeptide" (Hyland, 1998a: 136). In Hyland's scientific corpus, diminishers occurred most frequently (26%), followed by compromisers (13%) and approximators (12%) while minimisers were rather infrequent (2%).

As far as disjuncts are concerned, these comprise style disjuncts, which convey the sense in which a statement is true (*approximately*, *generally*, *broadly*) and content disjuncts, which express the writer's attitude towards the truth of a proposition. Content disjuncts, which proved to occur more frequently than style disjuncts in the scientific corpus are related to contingency and degrees of certainty. As in the case of epistemic lexical verbs, Palmer's classification can be used to distinguish between propositions based on speculative, deductive, quotative and sensory evidence or judgments. Thus, certainty content disjuncts (*likely*, *probably*, *possibly*, *presumably*) express certainty and doubt without referring to the truth of the proposition; truth content disjuncts (*apparently*, *evidently*, *intuitively*) convey mental perception, while sense content disjuncts (*essentially*, *potentially*) judge the truth-value of propositions. Statistically speaking, certainty content disjuncts prevailed in Hyland's scientific corpus (26%), followed by sense content disjuncts (12%), while truth content disjuncts and style disjuncts occurred far less (5% and 4%, respectively).

Some adverbs also hedge the extensive numerical data often included in the *Results* and *Discussion* sections of scientific research articles. Approximators and style disjuncts like *about*, *approximately*, *some* and *around*, which occurred most frequently in the scientific corpus suggest that the numerical expressions and quantities they introduce are as accurate as possible despite the lack of exact measurements: "The synthesis of the 94, 85 and 74 kDa HSPs decreases by *approximately* 60% at 44°C while that of the 64-60 kDa class is more thermostable" (Hyland, 1998a: 139).

Overall, Hyland's data indicated rather similar occurrence patterns as far as the two main classes of hedging adverbials were concerned, with adjuncts occurring slightly more frequently than disjuncts in the scientific corpus investigated (53% vs. 47%). The fact that adverbs mitigating the force of the verb occur somewhat more frequently than those expressing authors' comments matches the mainly accuracy-oriented character of hedging adverbs. At the same time, it also reinforces the nature of written academic discourse and authors' preference for introducing new knowledge claims with caution and deference in order to prevent denial and to secure acceptance by the target discourse community.

Adjectives, the third most frequent hedging device in Hyland's scientific corpus accounted for 20% of all the hedges recorded. Epistemic adjectives are used to hedge content in order to increase the accuracy of the information presented, which thus becomes more reliable in the eyes of the target audience. Statistically speaking, *(un)likely* and *possible* were the most frequently occurring hedging adjectives in the scientific corpus, (3.1/10.000 words), followed by *most* (2.3) and *consistent with* (2.0) (Hyland, 1998a: 131).

Although constantly present in the scientific corpus, Hyland's analysis excluded two adjective used to express degrees of variation from a certain norm. Thus, *similar* was regarded as an

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objective evaluation and not as the writer's epistemic assessment while *significant* was also considered to have lost its hedging sense since it usually describes detailed statistical analyses carried out according to clear and widely-accepted protocols (Hyland, 1998a).

The analysis of *possible* revealed its popularity as an epistemic adjective in the scientific corpus, where its epistemic meaning was more frequent than its root meaning. However, Hyland also pointed out the difficulty distinguishing between root and epistemic uses of *possible* in instances when it cannot be determined whether the information presented is possible because realistic circumstances permit it, or whether it is only perceived as such by the author: "Two types of conveyor belt model are *possible* in the photosynthetic apparatus" and "Further refinements of the proposed structure are *possible* in these regions" (Hyland, 1998a: 133). The scientific corpus investigated also revealed that about 40% of the epistemic occurrences of *possible* were used attributively in combination with certain nouns, as in: "However, the existence of such a *possible mechanism* of translation regulation in plant cells was not investigated" (Ibid.).

The attributive use of epistemic adjectives is also part of the noun phrase stacking often characterizing written academic discourse, especially the hard sciences. This refers to the presentation of a complicated phenomenon as one complex item using impersonal constructions that hedge the process included in the nominal group, as in the following examples: "The *proposed substrate binding site* appears just below... There are other *potential hydrogen blood donors* nearby which could also participate in heme binding. ... might well be the evolutionary precursor of a *probable permanent N-terminal transmembrane anchor of the microsomal enzymes.*" (Hyland, 1998a: 134). Scientific research articles seem to be the perfect environment for such economical yet exclusivist constructions, whose few words pack a lot of information that can only be successfully understood by an elitist audience equipped with specialized knowledge.

As far as modal verbs are concerned, Hyland (1996a, 1998a) acknowledged the polysemous and context-dependent structure of modal verbs previously described by Coates (1983), as well as her detailed classification of modal verbs according to epistemic function and primary meaning. The results of Hyland's corpus analysis (1996a, 1996b, 1998a) indicated that 65% of the modal verbs recorded in the scientific journals studied were used epistemically, out of which the most frequent were *would*, *may* and *could*, which represented almost 77% of the total, followed by *might* and *should* (6% together), while *cannot*, *will* and *must* were used very scarcely (below 1%) and *shall* and *ought to* failed to occur in the scientific corpus. The extremely low frequency of *will* in the scientific corpus (0.8%) and its high occurrence in the general academic corpora (around 20%) was postulated to be due to the cautiousness that characterizes the predictions made in the hard sciences compared with other fields.

Hyland also analyzed and described individual occurrences of epistemic modals in the scientific corpus (1996a, 1998a). He agreed with Coates (1983) on the fact that *would* represents the main modal for expressing hypothetical predictions, in the corpora of both authors, the epistemic use of *would* being the hypothetical variant of *will*, as a marker of prediction. Also, according to the studied corpus, hypothetical *would* usually indicates the existence of prior experimental premises and, when used in conditional clauses, it expresses the conditions that have to be met in order to prove a hypothesis. In such instances, w*ould* is most frequently followed by the verbs *be*, *appear* and *suggest*.

Would can also be used in order to express caution rather than hypotheses when it is not used to lessen the degree of authorial involvement but rather to soften categorical propositions thus avoiding to impose claims on the reader at the same time attempting to create writer-reader interaction through an invitation to reasoning based on common scientific grounds, as in: "This result *would* favor the hypothesis that the plant protein is targeted to the bacteroids" (Hyland, 1996a: 261).

May, the second most frequent modal verb in Hyland's scientific corpus also registered a high incidence in the written academic corpus in general. The uses of *may* were studied alongside

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those of *might*, as both modal verbs express epistemic possibility. Despite their similar epistemic function and primary meaning, *might* seems to be preferred more frequently as it denotes more tentativeness and a more remote condition of realization, especially when it reduces the writer's degree of confidence in a proposition when more than one interpretation is possible: "Such a mechanism *might* serve to balance the synthesis of the products throughout this pathway in wild type Arabidopsis (Hyland, 1998a: 117-118). *Might* was also found to occur in combination with epistemic lexical verbs such as *suggest*, *suspect* or *speculate*, or with the modal *could*.

Similarly with *may* and *might*, *could* is also used when tentative possibility needs to be expressed. According to Hyland (1996a: 260), *could* carries both a root meaning when it suggests that a certain result depends on external circumstances, as well as an epistemic meaning when it distances the writer from a proposition, as in the following examples: "It *could* also be demonstrated with both broken and intact chloroplasts. An increase in NO_3-assimilation in the roots *could* function to provide additional N to the sheath where fungal growth is more extensive". However, in both instances, writer-reader interaction is facilitated since the reader is called in to establish whether something is conceptually possible or whether the modal *could* expresses the writer's assessment of the truth of a proposition. As far as *can* is concerned, this only carries epistemic meaning in interrogative or negative form, the incidence of *cannot* being however low in the scientific corpus studied (Hyland, 1998a).

Epistemic *should* usually refers to the future. It denotes tentative assumption of probability based on inference. Its frequency in Hyland's scientific corpus proved to be lower than that of *would*, but generally higher than in other corpora. *Should* combines the subjective attitude of the writer towards the truth of a proposition with logical assumption based on already-established facts, which often characterizes scientific research articles: "Such mutants *should* also help to elucidate the UV-B signal transduction pathway" (Hyland, 1998a: 114). Besides tentative assumption, *should* was also found to have a hypothetical meaning when used to express unlikely conditions that bear negative implications, although such occurrences were rare in the research articles included in the scientific corpus.

Although the occurrence of *will* proved to be very low in Hyland's scientific corpus, it still bears a hedging function generated by its ability to reduce the strength of confident assertions and suggest a prediction about the present with future reference based on previous experience, rather than inference: "If significant energy is lost by the plasma particles in this process, the plasma *will* be cooled" (Hyland, 1996a: 262). However, probabilities in scientific writing are expressed through *would* or *could* rather than through *will*, as their more conditional and tentative character denotes a lesser degree of confidence in the truth of the proposition they accompany.

Must is another less frequently occurring modal verb in scientific writing with only six examples in Hyland's corpus of scientific research articles. Writers usually avoid it for fear of expressing strong convictions that could lead to the rejection of their knowledge claims, and consequently replace it with epistemic *could* in order to suggest tentative possibility. Nevertheless, *must* was still found to occur in combination with explicit hedges and the verb *to be*, in which case it denoted writer subjectivity and tentative assertiveness: "I *suggest* therefore that D1 degradability *must* be causally linked to QB site occupation which in turn determines PEST region accessibility to protease through allosteric effects"(Hyland, 1998a: 109).

In conclusion, the review of the available literature revealed that the most comprehensive classification of hedges in scientific research articles was the one provided by Hyland (1996a, 1996b, 1998a), according to whom the most common linguistic realizations of hedges are epistemic lexical verbs, adverbs, adjectives, modal verbs, nouns and non-lexical hedges, while the main pragmatic functions are content-based (accuracy-oriented and writer-oriented) and reader-based.

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