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CROSS-CULTURAL ANALYSIS OF HEDGES USED IN ARTICLES ON ROBOTICS

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Abstract

The appropriate use of hedges manifests the author's professional competences and helps to develop the relationship with the reader and join the scientific community. Various languages display considerable variations in the use of hedges, which may bring about cross-cultural misinterpretation and hinder scientific communication. The corpus of 45 articles on robotics written by Russian, Chinese and American researchers was compiled. The hedges, selected from the articles, were analyzed with the help of the concordance program. The percentage of hedges used in abstracts, introductions and conclusions was computed and comparative analysis was performed. The list of hedges which are generally used in scientific papers on robotics was compiled. The results suggest that though the difference in the percentage of hedges employed is minor, American authors tend to use more hedges and give preference to certain hedges in their writings. Despite the fact that academic writing in English is developing throughout the world, we face the influence of national academic writing traditions. The researchers willing to establish cross-cultural scientific communication should be able to understand the nature and functions of hedges employed by authors from different countries and correctly use them in their own writings. The results of the present study would be helpful to academic writing teachers as well as to researchers who publish their papers in English.

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1. Introduction

It's common knowledge that research papers written in English have become a tool to access international scientific community. "Cognitive activity is accompanied by standards and prescriptions, which are developed by the scientific community in a sociocultural dimension" (Akopova & Chernyavskaya, 2014, p. 349). Despite the globalization process and English being the lingua franca of science and technology, the verbalization of scientific knowledge is marked by the presence of national, cultural, social and psychological specifics. They may be manifested in "different evaluative patterns and norms in relation to the degree of argumentativeness, categorical manner, accuracy, information density when presenting the scientific result" (Chernyavskaya, 2017, p. 220).

Dramatic changes, that we're facing today in the sphere of science and technology, occurrence of new knowledge domains result in the need for new academic and technical writing competences and in specialized language resources that researcher should obtain. "A competitive scholar today, no matter what their domain is, must be prepared to present information on their research projects in different text forms" (Almazova et al., 2018, p. 105).

"Higher education is aimed at training of highly qualified personnel in a particular field that are called upon to fulfill tasks aimed at developing the industry in which they work, developing the scientific and industrial potential of the state" (Leontieva & Ababkova, 2018, p. 875). Acquiring the skills of effective academic writing as part of the higher education program is intended to help the novice researcher join the scientific community.

Many scientists claim the importance "for engineers to receive additional competencies in the field of communication, which will allow combining scientific, industrial and communication technologies in the development and implementation of scientific and technical products" (Trostinskaia et al., 2018, p. 1198).

Publishing research results is an inseparable part of a researcher's professional life. To become part of the scientific community, both native and nonnative researchers have to be able to write research articles in English. It's vital that they are aware, among other linguistic features, of the rhetorical conventions used in their fields of research.

Conducting an intercultural dialogue involves overcoming differences in cultures and developing the ability to appropriate verbal behavior. The readers of scientific articles "are expecting a standard form, language and style when reading research papers" (Derntl, 2014, p. 105). Writers are supposed to "present their claims cautiously, accurately and modestly to meet discourse community expectations and to gain acceptance for their statements" (Hyland, 1996, p. 477).

In their search for truth and "through the attentive and painstaking organization of their thoughts, scientists acknowledge that their contribution is a mere glimmer of light in the stream of endeavors to investigate and penetrate the wondrous mystery which include man and the universe" (Tarantino, 1991, p. 33). Myers (1989) states, that researchers have to present themselves as "the humble servants of the discipline" (p. 5).

In order to tone down their statements, researchers have a variety of linguistic devices available which are generally referred to as "hedges." Hedging is now generally acknowledged to play a crucial role in both spoken and written academic discourse, and as such it has attracted considerable attention

from linguists all over the world (Crompton, 1997; Fraser, 1975; Hinkel, 1997; Hyland, 1996; 2006; Lakoff, 1972; Salager-Meyer, 1994; Skelton, 1988; Swales, 1990, etc.).

The definition of hedging has evolved over the years. As Peter Crompton (1997) states: "Unless or until a definition and a clear description can be achieved there seems little hope of studying or teaching the phenomenon consistently" (p. 271). The linguistic phenomenon of hedging was introduced by Lakoff (1972) who implied that hedges are words or phrases that make things "fuzzy". Hyland (1996) states that a hedge is "any linguistic means used to indicate either (a) a lack of complete commitment to the truth of an accompanying proposition or (b) a desire not to express that commitment categorically. Hedges are therefore the means by which a writer can present a proposition as an opinion rather than a fact" (p. 477). According to Swales (1990), hedges are rhetorical devices used for "projecting honesty, modesty and proper caution in self-reports and for diplomatically creating space in areas heavily populated by other researchers" (p. 175). Summing up the definitions of hedges, we can conclude that hedging is a technique used to reduce the level of categorical utterance, making the audience aware of the position without imposing the opinion of the writer.

As for the functions that hedges perform in texts, the interpretation of such a broad phenomenon is quite varied. For example, according to Clyne's (1991), hedging performs two functions in the scientific text: "to make statements sound less categorical and to reduce the writer's responsibility for the claims that he makes" (p. 16). Rounds (1981) argues, that hedges are not used simply to cover oneself and to make things fuzzy, but they are means that promote greater preciseness in scientific claims. Hyland (2006) views the nature of hedging from the angle of its orientation toward the proposition (hedges help accurately state uncertain statements with appropriate caution), toward the writer (the writer anticipates the possible negative consequences of being proved wrong), and toward the reader (the writer gains readers' ratification of claims). Hedges display hesitation, uncertainty, indirectness, and/or politeness to reduce the imposition on the reader (Hinkel, 1997; Swales, 1990; Swales & Feak, 2004). Generalizing the functions of hedging, we can conclude that they all relate to 'protecting' oneself in one way or another. A hedge is viewed as a type of fence the writer may benefit from.

The taxonomy of hedging rendered in literature is extremely diverse and varied. Darian (1995) classifies hedges according to part of speech principle (p. 15). According to Salager-Meyer (1994), taxonomy of hedges has four main categories: 1. shields: modal verbs, semi-auxiliaries, probability adverbs, epistemic verbs; 2. approximators; 3. expressions of the authors' personal doubt and direct involvement; 4. emotionally charged intensifiers. Hinkel (2005) identifies six hedging devices: epistemic hedges (e.g., mostly), lexical hedges (e.g., kind of, maybe), and possibility hedges (e.g., perhaps); downtoners (e.g., nearly); assertive pronouns (any-); and adverbs of frequency (e.g., frequently). There are many more classifications offered by researchers (Crompton, 1997; Hinkel, 2005; Myers, 1989; Salager-Meyer, 1994; Skelton, 1988, to mention only a few). In the present paper an attempt to classify hedges occurring in texts on robotics basing on a corpus-based principle will be made.

The cultural differences in the degree of indirectness permitted in academic writing and proficiency writers from different cultures achieve in this sphere is of premier concern for this article. Different languages display considerable variations in the use of hedges, which may bring about cross-cultural misinterpretation and hinder scientific communication. Numerous studies reveal that

representatives of different cultures may use hedges differently and very often non-speakers of English are unable to use hedges in their academic prose possibly due to socio-cultural issue, limitation in classroom instruction and lack of awareness on disciplinary culture. In all the reviewed literature on the difference in hedging employment by authors from different countries it is argued that non-native speakers use much fewer hedging devices in their academic writing (Afshar & Bagherieh, 2014; Hyland, 2006; Kim & Limb, 2015; Mkhitaryan & Tumanyan, 2015; Rezanova & Kogut, 2015; Salager-Meyer, 1994; Samaie et al., 2014; Wishnoff, 2000; Xu & Nesi, 2019; Yeganeh & Ghoreyshi, 2015).

It's common knowledge, that academic writing in English requires direct and linear arguments and L2 learners may get the impression that arguments are weakened with the employment of hedging devices. Consequently, L2 learners become so direct in their English academic prose that their writings seem to be inappropriate by native speakers" (Kim & Lim, 2015, p. 601). According to Lorenz (1998), many L2 writers are "anxious to make an impression and conscious of the limitations of their linguistic repertoire ... might feel a greater need than native speakers to stress the importance of what they have to say" (p. 59).

2. Problem Statement

Publishing research is intended to make a contribution to the ongoing dialogue in some field or discipline. The most useful contributions are thought to be made in such a way where the writer or researcher will receive credit for their contribution but will also leave room for others to add to the dialogue. Achieving this balance could be a daunting task. Conducting a scientific dialogue implies overcoming differences in cultures and developing the ability to appropriate verbal behavior.

The effective use of hedging is a tool to maintain a productive and non offensive dialogue. "Today's scientists are urged to use a style of writing which projects both personal modesty and honesty. Argumental arrogance and exuberance are not well regarded by the scientific community; whereas contrast, humility, coyness, and cautiousness are" (Salager-Meyer, 1994, p. 150).

Still due to the fact that hedging is a very broad and varied phenomenon, there may be some difference in the use of hedging devices by native and non-native writers. The cross-linguistic perspective on hedging devices gives a more comprehensive view of hedging as it can reveal similarities and differences between languages and cultures.

As some researchers put it: "the need arose to implement productive foreign language learning that provide system integration of professional and communicative skills of students" (Rubtsova & Almazova, 2018, p. 320). The study of hedging types and its effective use should be integrated in the course of academic writing. Novice researchers should be taught to recognize hedges in scientific texts and be able to use them in their works. It's vital for researchers to be objective in transmitting their ideas, to reduce the categorical and overconfident manner of the conclusions made in English in order to be in compliance with the norms and traditions of the scientific community. The corpus-based analysis of hedging promotes the further study of the means of hedging, raise the professional culture of scientists from different countries and domains of science.

3. Research Questions

Undertaking the research we hypothesized to find the answers to the following questions:

- 1. What is the percentage of hedges being used in scientific articles on robotics?
- 2. What kind of hedge do authors give preference to?
- 3. Do authors belonging to different nationalities and cultural communities use hedges differently?

4. Purpose of the Study

The purpose of the study is to identify and analyze hedges used in scientific articles on robotics. Furthermore we aimed at determining the national specifics of using hedges by authors from Russia, China and the USA.

5. Research Methods

To conduct the research we made up a corpus of 45 articles on robotics (15 written by Russian researchers, 15 by Chinese and 15 by scientists from the USA). All the articles were selected from the site www.sciencedirect.com which is rightly considered to be the world's leading source for scientific and technical research. We deliberately selected the material from one and the same source to eliminate the possibility of different requirements that are specified by different publishers. All the articles subjected to analysis were published between 2015 and 2020. This fact makes the results quite relevant and up to date. As hedges tend to be used in sections where the author expresses their views and attitudes, the following sections of articles were given special attention to and thoroughly analyzed: Abstract, Introduction, Conclusions. Afterwards with the help of a concordance software program AntConc (Anthony, 2019) we performed the analysis of texts both with reference to the country and section of the article. Basing on the analysis of theoretical literature on hedging, included in the References section of the present research, the list of words that might serve as hedges was compiled. From the list of all words provided by the concordance program hedges were sorted out and the context was checked to make sure that the word being analyzed is a real hedge. For example, preposition about in the context "The mobile robot arm motion is recorded, and the information about direction and velocity of motion is given to the navigation computer" is not a hedge, but in the context "the designed set improved the calibration accuracy from with about 4% error to about 2% error" is. Then the consolidated list of hedges used in articles on robotics written by scientists from Russia, China and USA was formed and the percentage of hedges was computed. The percentages of hedges (over the total number of running words) were computed and subjected to thorough analysis.

6. Findings

The overall quantitative analysis of articles on robotics has shown that hedges make up 809 words (or 1,6%) out of 51478 running words from the texts subjected to analysis. It means that out of 100 words in texts on robotics there are 1 or 2 that are hedges. The selected hedges belong to various parts of speech

with adverbs being the most numerous (34 hedges), adjectives (8), modal verbs (7), verbs (6), nouns (5), pronouns (4), prepositions (2).

There are 66 different forms of hedges which can be presented in the following taxonomy: shields, which relate to the probability of a proposition or a hypothesis being true, comprising 3 groups: 1) modal verbs (can, could, may, might); 2) epistemic verbs (assume, believe, seem, suggest); 3) possibility hedges (likely, possible, potentially, probably) and approximators, used when exact figures are irrelevant or unavailable or when the state of knowledge does not allow the scientists to be more precise, comprising 5 groups: 1) of time (frequently, near future, not always, often, rarely, recent, sometimes), 2) of quantity (a large amount of, many, majority, few, numerous, several, some), 3) of frequency (broadly, commonly, typically, widely), 4) of degree (almost, enough, less, more, slightly), 5) of manner (briefly, roughly). The most frequently used hedges are: can (235 word tokens), more (58), some (48), adjectives with suffix – er (41), possible (35), may (33), could (33), should (30), many (21), often (19), mainly (17), various (17), widely (16), over (13), suggest (13), few (11), relatively (10).

As for the distribution of hedges in different parts of articles the figures are the following: Abstracts - 106 hedges, Introductions - 461 hedge, Conclusions - 242 hedges. The figures can be illustrated in the following diagram (Figure 01):

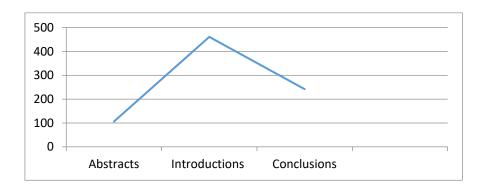


Figure 01. Distribution of hedges in different parts of articles

However, the prevalence of hedges in Introductions results only from the fact that this part of an article is longer than Abstracts and Conclusions. The analysis has shown that the percentage of hedges in Conclusions is higher making up 1,9% of all words running with 1,3% in Abstracts and 1,4% in Introductions.

The comparative analysis of hedges used by authors from different countries provided us with the following results. Researches from different cultural backgrounds use quite a broad variety of hedges (Russian – 42 forms, Chinese – 39 forms and American – 38 forms). Despite the fact that articles written by American authors tend to be longer (America – 19050 words running, Russia – 17820, and China – 14608), American scientists are inclined to use more hedges in their writings (338 hedges that is 1,8% of all the words running, with Russian writers using 253 hedges that is 1,4% and Chinese – 218 hedges making up 1,5%). The obtained results can be illustrated by the following table (Table 01).

Table 01. The comparative analysis of hedges used in different parts of articles

Column Heading	Russia	China	USA
Abstracts	1,3%	1%	1,6%
Introductions	1,2%	1,4%	1,6%
Conclusions	1,9%	1,8%	2,1%

Despite the fact that the obtained results do not show dramatic difference in the percentage of hedges in texts on robotics written by authors from Russia, China and the USA, the authors tend to give preference to certain types of hedges. In the table (Table 02) below you can see the most frequently used hedges.

Table 02. The list of the most frequently used hedges

Hedge (with the number of word tokens)	Russia	China	USA
can	63	82	90
could	3	6	24
-er	7	14	20
mainly	5	10	2
may	7	4	22
more	14	11	33
possible	16	0	19
some	7	24	17
should	11	2	17
would	8	0	14

From the table above we can see that writers from different cultural backgrounds tend to give preference to certain hedges. For example, American authors are more likely to use modal verbs *could, may* and *should* than their counterparts from Russia and China. Here are some examples: *Any malfunction of the prosthesis could negatively impact the amputee's perception of the prosthetic limb... The abnormal and extremely abnormal operational modes simulated malfunctions that could occur due to a malicious cyber attack. Humanoid robots may have dozens of sensors and actuators that together realize complicated behaviors. In order to save power, the developer may want to reduce P_{TX} to the minimum value. Care should be taken with the timing of changes in current magnitudes. Road positions should be characterized by a probability density. For some reason Chinese authors didn't use hedges possible and would, that were quite frequently used by American and Russian writers.*

7. Conclusion

In this paper we have explored the realization of hedges used in articles on robotics written by Russian, Chinese and American researchers. Due to a relatively small research corpus limited to 45 articles (15 articles from each country) the present findings can be rather tentative. However, the foundation for further comparative research has been laid and the following conclusions can be drawn:

1. In general, in articles on robotics hedges account for 1,6% of all the words running. This figure suggests that 1-2 words in every one hundred words is a hedge. Though, this number is not very impressive, hedges should be given particular attention while teaching academic writing.

- 2. Basing on the selected material, we have suggested the following taxonomy of hedges: shields (modal verbs, epistemic verbs, possibility hedges) and approximators (of time, of quantity, of frequency, of degree, of manner). We assume that we might have overlooked some hedges in selected texts as the forms of hedges may be numerous and varied, but the formal selection with the help of the concordance program provided us with this material.
- 3. Though Introduction sections of articles are longer and in fact comprise more hedges that Abstracts and Conclusions, the percentage of hedges is higher in Conclusions (1,9%) with 1,3% in Abstracts and 1,4% in Introductions. This might result from the very essence of hedging and the functions of Conclusion sections. In Conclusions researchers sum up their finding and ideas and state their views. In order to protect themselves from incorrect or insufficient conclusions and not to seem overconfident they tend to use more hedges.
- 4. The comparative analysis of articles written by scientists from different countries provided us with the following results. Due to the factual character of articles on robotics, globalization and development of academic writing throughout the world, it is not possible to state that there is a big difference in the number and forms of hedges. Still American authors tend to use more hedges in their writings (1,8%), with Russian writers using 1,4% and Chinese 1,5% of hedges.
- 5. American writers tend to use *could*, *may* and *should* much more frequently than their counterparts from Russia and China. We could attribute this to the fact that for Russian and Chinese researchers English is an acquired language and they might replace modals *could* and *may* with the modal *can* as they may not feel the slight difference and give due consideration to the meaning of modals. Also it could be explained by the tradition and the peculiar character of academic discourse in each country.

The present study and the results obtained might be of help to scientists aiming to carry out further researches on academic writing and hedging in particular as well as on the comparative studies focused on materials submitted by authors from different countries. To reinforce the writers' understanding of the use and function of hedges, the study of hedges should be included in the course of academic writing. Particular forms and specific character of hedging in different countries should be given special attention to. We share the opinion of Chernyavskaya (2017) who rejects the idea "that some languages are more suitable for knowledge transfer and others are less suitable for this purpose" (p. 224) and claims that "an important area for further work will be a more detailed examination and a deeper investigation of the specific features of other cognitive styles and text strategies in structuring research articles" (p. 225). Still scientific text should be reader-oriented and cultural linguistic patterns should not hinder the perception of the text.

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