



Metadiscourse Features in Undergraduate Electrical Engineering Laboratory Reports

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Abstract. Background: A generic analysis of engineering laboratory report's (ELR) introduction, method, result, discussion and conclusion (IMRDC) sections can cover issues of various types of discursual patterns; notably the linguistic features. An essential part of linguistic features of IMRDC which are often overlooked in ELR is interactive and interactional metadiscourse usage that can assist to make the text persuasive and unfolding to a discourse community. The main principle behind applying interactive metadiscourse is the view of writing as socially engaging; specifically, it indicates the ways writers project themselves into their arguments to declare their attitudes and commitments to the readers.

Objective: This study aimed to explore what metadiscourse features are used by the undergraduate students in writing the IMRDC sections of the ELR's and how these features are realized linguistically in writing the separate sections.

Methods: Hyland's (2005) interpersonal and interactional metadiscourse model was adopted to analyze 35 ELR's written in academic context. A corpus analysis was conducted using AntConc version 19 to determine the metadiscourse features electronically.

Results: The findings show unequal distribution of metadiscourse features with interactive resources more commonly used $f = 1348$ while interactional resources were only $f = 797$ in the genre of electrical engineering laboratory reports.

Conclusion: This study has attempted to better understand the way the third and fourth-year electrical engineering undergraduate students compose their laboratory reports by using the metadiscourse features. This research can be replicated to other studies in the engineering domain. The pedagogical implication of this study is that teaching and learning of metadiscourse features should be incorporated in secondary education and foundation level of tertiary education among scientific students.

Keywords: Genre · Laboratory reports · Metadiscourse features · Corpus analysis

1 Introduction

The written communication in academic context is an interaction between the writer and the reader using text as the medium, and in this study, metadiscourse can be referred to

as how this interaction is composed and constructed using appropriate linguistic features by the writer and concurrently interpreted by the reader. Discourse based research has been extensively moving beyond the form and function and in this study, the intervention to metadiscourse features are crucial to understand the scientific laboratory report genre associated with academic context. According to Hyland [1] writers use purposeful language to socially engage with readers for instance, an explicit signal to organize text such as (first of all, in other words, in conclusion) and hedges such as (may, perhaps, probably) to state their viewpoints and to engage readers' interest and needs. These signals are widely called metadiscourse markers, which are the linguistic resources employed by the writer to assist the reader to organize, interpret and evaluate what is written. This research will shed light into communicative strategies and language devices used in the laboratory report genre and contributes to the pedagogical improvement among English for academic (EAP) practitioners and science academics as to what extent laboratory report assist students in experiencing process of reporting scientific experiment. Ranawake & Wilson [2] posits that laboratory reports are one of the major writing tasks among tertiary science subjects that serves dual purposes to teach students to communicate as scientists and as a way for academics to measure learning achievement in the laboratory. The purpose of tertiary students writing Electrical Engineering Laboratory Report (EELR) is to report their laboratory findings as part of their compulsory assessment for certain courses they enroll, where the readers are the laboratory instructors, content specialists and peers from the same field of study. Dahl [3] considers two cultures which influence writers in producing scientific texts: disciplinary culture and native language writing culture. In this study, the selected writers belong to the same major of study, which is electrical engineering, but consist of students who speak different native languages, however the medium of academic writing is still English.

2 Metadiscourse Features

Metadiscourse can be defined as a specific type of reflexivity in language which refers to the text itself as text or as language commonly used in academic discourse. Generally, metadiscourse refers to linguistic material that reveals the presence of writer and reader in the text by either commenting on the text in other ways or by referring to the organisation of the text [4]. It is a guide to a reader's or receiver's perception of a text [5] but initially it is perceived differently from its early definition as simply "discourse about discourse" to a term to describe range of devices writers use to explicitly organise their texts, signal their attitudes, and engage readers to their audience and material, provides a description on the ways writers take positions and align themselves with readers in context [6].

Metadiscourse is also a term referring to interpersonal uses of language to capture communicative engagement between writers and readers [7]. The current understanding of what a metadiscourse has now shifted from to an understanding of the use of language that offers a representation of writers and their work and on how an author negotiates social relations with readers. This interaction between writer and reader views metadiscourse as a set of interpersonal resources used to organise a discourse or the writer's stance towards content and reader [8]. The mediation of the text as a medium of interaction between the writer and reader is a written communication, while the

study of metadiscourse is defined as how such interactions are designed, conceived and constructed by the writer [9].

Individuals acquire competencies in specific disciplines that allow them to communicate effectively as a member of a discourse community. In academic discourse, there seems to be a variation [10] investigated whether there is a finite construct of academic writing in one discipline. In the same vein [11] studied the universal nature of scientific writing in academic discourse. Halliday [12] asserted the existence of linguistic variation due to functional variations in different disciplines.

Metadiscourse features vary across disciplines and scientific communities. In some cases, the scientific text is written to allow readers to make their own inferences and understanding while some other texts emphasize a much clearer message to improve readers' understanding in a friendlier manner. The use of varying frequencies of metadiscourse in academic texts is what is called writer responsible versus reader responsible [13]. These variations show differences in social relationships, values and beliefs underlying writing practices in various discourse communities. Mauranen [7] claims that scientific texts are culturally independent and vary across disciplines based on the genre specificity of scientific text and rhetorical practices of its members. Metadiscourse is also considered a critical feature in scientific and language based writing among academics for publication in journals as it shows intelligibility through proper norms, values and assumptions.

Hyland [14] conducted a study to determine the distribution of metadiscourse in a corpus of 240 doctoral and masters' theses. The study shows how postgraduate students use language to claim the credibility of their research work in different disciplines. This study highlights how metadiscourse can reveal rhetorical and social distinctiveness of various disciplinary communities. The corpus consists of data from four different disciplines such as applied linguistics, business studies and public administration for soft field studies, while electrical engineering, biology and computer sciences as hard fields studies. The study indicates that metadiscourse has universal characteristics that can be applied to all studies in academic and all four fields of studies show about the same frequency of use in both textual and interpersonal resources. A number of endophoric markers were also noted in the electrical engineering thesis that emphasises the use of tables, figures, charts and so on.

Hyland [6] defines the term 'genre' as an act of grouping text together to depict how writers typically make language choices such as the use of metadiscourse features to achieve communicative purposes. Genre is a social activity of a specific discourse community realized in language [7]. He added that scientific articles have generic constraints as it reflects social rather than linguistic regulations set by the members of its discourse community. The readers are the determining factor in the linguistic choices made by authors in genre studies [6]. He points out that metadiscourse structure is defined as a device that can show how language choices can function in various ways.

Metadiscourse features and linguistic choices can be realised in numerous ways. There are large numbers of linguistic features from capitalization, punctuation, parentheses, paralinguistic clues such as in spoken messages like tone and voice stress to large clauses which are used by writers to convey themselves to readers and listeners. Therefore, a variety of metadiscourse models have been introduced. The earlier model

was introduced by Vande Kopple [15]. In his model, the two main categories of metadiscourse are “textual” and “interpersonal”. Under the textual category, there were four strategies such as; text connectives, code glosses, illocution markers and narrator constituted textual metadiscourse meanwhile another three strategies such as; validity markers, attitude markers and commentaries made up the interpersonal metadiscourse features. This taxonomy has shed light into many issues in academic writing although there were overlaps in some of its functions. The category ‘validity marker’ refers to citation, which can be used to enhance a claim by the support of credible others.

The above model was revised by Crismore et al. [16]. In this model, the two main categories ‘textual and interpersonal’ were maintained but the subcategories were separated and reorganised. The ‘textual’ metadiscourse was further divided into two categories of ‘textual’ and ‘interpretive’ markers. The reason for this revision is an attempt to separate organisational and evaluative functions. The textual features are seen to help organise the text meanwhile the interpretive markers are used to help readers to better interpret and understand text better [16].

2.1 Hyland’s Metadiscourse Model

This study applied Hyland’s model [6] to investigate metadiscourse markers used in EELR that employs corpus-based methodology. Hyland [6] defines metadiscourse as “the cover term for the self-reflective expressions used to negotiate interactional meanings in a text, assisting a writer to express a viewpoint and engage with readers as members of a particular community”. According to Hyland and Tse’s [17] notion of metadiscourse, the total meaning of a text is a result of the use of its component parts, by distinguishing the idea of its content from the material being used, and to organise content which conveys writer’s beliefs and attitudes towards it. Besides, they further described metadiscourse as a tool used by writers to understand themselves and their orientation towards their text and readers. Metadiscourse enable writers to acknowledge, construct and negotiate social relations, representing themselves, their views and their audience and in academic context, writers discuss ideas, claim solidarity with readers, evaluate material and acknowledge other’s views by using metadiscourse [6]. The writers’ awareness of themselves and the readers make the discourse sensitive to context and enable writers to also make predictions about reader’s knowledge and responses [17]. The term interactive and interactional can be used in characterizing interpersonal choices [18].

The interactive resources enable writers to manage information flow that explicitly establish their own interpretations. These resources organize a discourse, anticipate reader’s knowledge, assess reader’s information processing abilities, background resources and intertextual experiences to decide what needs to be made explicit to guide reader’s interpretations [17].

2.1.1 Resources Extracted from Hyland’s 2005 Model of Metadiscourse

- Transitions, such as conjunctions, that are used to mark additive, contrastive, and consequential steps in the discourse, as opposed to events in the external world.

- Frame markers are references to text boundaries or elements of schematic text structure, including items used to sequence, label stages, announce discourse goals and indicate topic shifts.
- Endophoric markers make additional material salient and available to the reader in recovering the writer's intentions by referring to other parts of the text.
- Evidentials indicate the source of textual information which originates outside the current text.
- Code glosses signal the restatement of ideational information.

The interactional resources on the other hand focus on participants' interaction, interpersonal consistency and disciplinary identity of the writer. The concept of metadiscourse here concerns the writer's control of personality in text, establishing relationship to data, arguments, audience, degree of intimacy, expression of attitude, communication of commitments, and the extent of reader involvement (Table 1).

- Hedges signal the writer's reluctance to present propositional information categorically.
- Boosters express certainty and emphasize the force of propositions.
- Attitude markers express the writer's appraisal of propositional information, conveying
- Surprise, obligation, agreement, importance, and so on.
- Engagement markers explicitly address readers, either by selectively focusing their attention or by including them as participants in the text through second person pronouns, imperatives, question forms and asides.
- Self-mentions suggest the extent of author presence in terms of first person pronouns and possession.

2.1.2 A Model of Metadiscourse in Academic Texts

2.2 Genre-Based and Corpus-Based Studies in Engineering Written Text

The two different methods of data analysis in this study, a genre-based approach that can explain rhetorical moves in ELR text organisation while a corpus-based methodology can fill the gap on particular metadiscourse choices within ELRs text. The literature review showed very little study that use both approaches to investigate engineering disciplinary genres [19, 20] & [21]. This study aims to fill the existing gap in the ELR genre in engineering discipline with the focus on writing for academic purposes as no other similar studies ever conducted on students ELR writing. Kanoksilapatham [19] & [20] used both genre and corpus based study to analyse 60 engineering articles from top biochemistry journals. The study was conducted in two steps; first a genre analysis on moves to identify rhetorical organisation of text, which is then followed by corpus based MD analysis to show how moves vary with the occurrence of linguistic features. In the same way, Flowerdew [21] studied engineering technical reports in both professional and academic contexts. She employed both genre-based approach as well as corpus-based methodology, however Flowerdew's study used a systemic-functional approach to genre analysis which differs to this study which employs Swales move analysis.

Table 1. Different categories of metadiscourse

Category	Function	Example
Interactive resources	Help guide readers through the text	
Transition	Express semantic relation between main clauses	In addition, /but/thus/and
Frame marker	Refers to discourse acts, sequences or text stages	Finally, to conclude/my purpose is to
Endophoric marker	Refer to information in other parts of the text	Noted above/see figure/in Sect. 2
Evidentials	Refer to source of information from other text	According to x/ (y, 1990)/ Z states
Code Glosses	Help readers grasp meanings of ideational material	Namely, e.g./ such as/ in other words
Interactional resources	Involve the reader in the argument	
Hedges	Withhold writer's full commitment to proposition	Might/perhaps/possible/about
Boosters	Emphasise force or writer's certainty in proposition	In fact, /definitely/it is clear that
Attitude markers	Express writer's attitude proposition	Unfortunately, I agree/ surprisingly
Engagement markers	Explicitly refer to or build relationship with reader	Consider/ note that/ you can see that
Self- mentions	Explicit reference to author	I/we/my/our

[6]

2.3 Summary

The review above shows past studies on discourse structure with focus on genre analysis and linguistic choices with the focus on metadiscourse features in engineering discipline. The review on engineering laboratory reports in academic context is limited as very few studies were conducted in this area before. This study may considerably fill the gap in the studies on engineering laboratory reports genre as a thorough analysis of all five major sections which are Introduction, Method, Result, Discussion and Conclusion (IMRDC) is being conducted concurrently This study uses corpus-based methodology to analyse metadiscourse features commonly used to express communicative purposes in this genre.

3 Research Methodology

Metadiscourse is chosen as the subject of analysis in this study as it can be used to organize ELR writer's interaction with both the content and reader. The choice is also based on feedback received from informants who are the content and language experts who teach academic writing to engineering undergraduate students in a private higher learning institution in Malaysia. According to these internal informants, the ability to use metadiscourse features in written ELR will improve the readability of ELR among academics. The term metadiscourse itself refers to the linguistic devices used by writers to shape their argument that considers the engagement of targeted readers' needs and expectations. Most of the undergraduate students learn and use English as a second language and based on the discussions with English language lecturers in the institution, the transition markers, hedges, boosters etc. are generally taught in English language classrooms. The main reason for including these features in formal academic classrooms is to improve the interaction among students' written work with the examiners who read and evaluate students' reports, assignments, projects etc.

In this study, a corpus of 35 ELR's from the electrical engineering field have been compiled. These ELR's were written by students in third and fourth year of study while conducting laboratory experiments. The best laboratory reports were selected based on the student's score of at least 4 marks obtained out of 5 marks. The design of the analysis adapted Hyland's [6] framework for identifying metadiscourse features in academic written texts. Average length of ELR's total number of words analyzed was 1,283 per report. Firstly, a taxonomy of metadiscourse was developed by following interactive and interactional elements of metadiscourse categories proposed by [6]. Some of the PDF files of the laboratory reports were converted to text documents to enable the further analysis. Metadiscourse features were searched electronically in the whole English corpus using AntConc version 19. Once obtained, each feature was carefully analyzed in context to ensure it functioned as a metadiscourse marker. The search for metadiscourse categories were generated electronically and checked manually.

3.1 AntConc

AntConc is a freeware corpus analysis toolkit for concordancing and text analysis is used to do comparisons between textual objects for a large data corpora [22]. In the current study [23], the effectiveness of corpus linguistics software in analyzing grammatical structure has been evaluated. The result shows corpus linguistic software can reliably extract passives and active clauses from the texts. Mustafa [24] has used it to find out a number of keywords of the selected texts. The application of AntConc also is a convenient tool for linguistic research [25]. This tool has integrated useful programs in order to look at the uses of the words in texts or corpora. According to Muchnik-Rozanov and Tsybulsky [26], the linguistic analysis has been enhanced by various computational linguistic technologies available through the AntConc software. The variations in the language behavior, such as degree of descriptive elaboration, expression through the use of sense, motion, and exclusion words of the samples have been analyzed. The researchers managed to find the language behaviour from patterns of grammatical use, frequently recurring phrases in the selected corpus. In this study, the quantitative analysis

Table 2. Distribution of different categories of metadiscourse

Metadiscourse	Category	Frequency
Interactive resources	Transitions	1011
	Frame markers	171
	Endophoric markers	83
	Evidentials	25
	Code Glosses	58
Interactional resources	Hedges	146
	Boosters	203
	Attitude markers	71
	Engagement markers	23
	Self-mentions	354

is by AntConc tool. There are 35 ELR have been analyzed. Firstly, the AntConc provides a list of all the words or word-clusters in a text of alphabetical or frequency order. Secondly is the tool which is a concordancer that lets researchers view any word or phrase in context which represents a sort of company that the word keeps. Thirdly, the researchers find the keywords or term in a text based on metadiscourse, category and frequency.

4 Research Findings and Discussion

The main objectives of this study is to explore what are the metadiscourse features used by the undergraduate students in writing the IMRDC sections of the ELR's and how these features are realized linguistically in writing the separate sections. In order to meet these aims of the study, 35 ELR's written in academic context with 44924 words have been analysed via AntConc version 19. The analysis was done based on the textual metadiscourse framework compiled from Hyland [6], Dahl [3], Hempel & Degand [27] and Dafouz-Milne [28]. Table 2 shows the distribution of different categories of metadiscourses.

The textual metadiscourse resources analysed include interactive, interactional and illocutionary resources. Interactive resources have the highest occurrence $f = 1349$. Among the categories in interactive resources, transitions have the highest occurrences $f = 1011$, followed by frame markers $f = 171$ occurrences, endophoric markers $f = 83$ occurrences, code glosses $f = 58$ occurrences and evidentials $f = 25$ occurrences. Besides interactive resources, interactional resources $f = 797$ occurrences. Self-mentions have the highest occurrence among the categories in interactional resources with $f = 354$ occurrences, followed by boosters $f = 203$ occurrences, hedges $f = 146$ occurrences, attitude markers $f = 71$ occurrences and engagement markers $f = 23$ occurrences. Lastly, illocutionary resources $f = 88$ occurrences.

Table 3. Distribution of categories of interactive resources

Category	Term	Frequency
Transitions	For	314
	Or	127
	Then	62
	So	58
	But	55
	Due to	49
	Because	38
	Thus	38
	Therefore	29
	While	29
Frame markers	First/ Second/ Third	71
	One	47
	Lastly	14
	Before	14
	Last	7
Endophorics	Figure ...	139
	... above	46
	... below	19
	Section	11
	Graph	7
Evidentials	According to ...	17
	By	6
	State	2
Code glosses	For example	23
	Such as	22
	In terms of	7
	Especially	2
	In particular	2

Table 3 shows the distribution of categories of interactive resources. The top 10 categories used by the students are listed in Table 3. The most used are the transitions $f = 314$ occurrences, or $f = 127$ occurrences, then $f = 62$ occurrences, so $f = 58$ occurrences and but $f = 55$ occurrences. The top 5 frame markers include first, second and third $f = 71$ occurrences, one $f = 47$ occurrences, lastly $f = 14$ occurrences, before $f = 14$ occurrence and last $f = 7$ occurrences. Meanwhile, the top 5 endophorics are

Table 4. Distribution of categories of interactional resources

Category	Term	Frequency
Hedges	About	51
	May	36
	Would	23
	Possible	20
	Could	5
Boosters	Will	141
	Show	33
	Demonstrate	16
	Clearly	4
	Always	3
	Obvious	3
Attitude markers	Should	35
	Must	32
	Have to	3
	Need to	1
Engagement markers	Consider	11
	See that	7
	Note that	5
Self-mentions	We	261
	I	75
	Our	11
	Me	5
	My	2

figure = 139 occurrences, above $f = 46$ occurrences, below $f = 19$ occurrences, section $f = 11$ occurrences and graph $f = 7$ occurrences. However, there were only 4 evidentials found in this corpus: according to $f = 17$ occurrences, by $f = 6$ occurrences, state $f = 2$ occurrences and demonstrate $f = 1$. Besides, the code glosses that were mostly used by the students included for example $f = 23$ occurrences, such as $f = 22$ occurrences, in terms of $f = 7$ occurrences, especially $f = 2$ occurrences and in particular $f = 2$ occurrences.

4.1 Interactional Resources

Students used hedges such as would, possible, could, may etc. to show decreasing or weakening claims. This may be seen as a doubt or to indicate that information is presented

as an opinion rather than fact as sometimes the writer wants to reinforce uncertainty to the laboratory experiment outcome that may not be as accurate as expected. Table 4 shows the distribution of categories of interactional resources. The widely used hedges in ELRs included about $f = 51$ occurrences, may $f = 36$ occurrences, would $f = 23$ occurrences), possible $f = 20$ occurrences and could $f = 5$ occurrences).

Boosters are widely used in academic discourse by writers to increase the force of a statement to convey meaning, the writer's attitude and confidence. The use of boosters such as obviously, clearly, always etc. allow students to express their findings confidently, to effectively mark their involvement with the readers, to stress the important experimental details and to directly engage with laboratory supervisors. These students used boosters such as will $f = 141$ occurrences, show $f = 33$ occurrences, demonstrate $f = 16$ occurrences, clearly $f = 4$ occurrences, always $f = 3$ occurrences and obvious $f = 3$ occurrences. Furthermore, the reports consist of 4 attitude markers such as should $f = 35$ occurrences), must $f = 32$ occurrences, have to $f = 3$ occurrences, need to $f = 1$ occurrence, as well as $f = 3$. In terms of engagement markers: consider $f = 11$ occurrences, see that $f = 7$ occurrences and note that $f = 5$ occurrences. The self-mentions used by the students included we $f = 261$ occurrences, I $f = 75$ occurrences, our $f = 11$ occurrences, me $f = 5$ occurrences and my $f = 2$ occurrences. Lastly, illocutionary resources were also identified in students' laboratory reports. The terms that appeared the most include compare $f = 20$ occurrences, determine $f = 20$ occurrences, conclude $f = 19$ occurrences objective of $f = 18$ occurrences and this/ it/ which means all $f = 4$ occurrences each.

Attitude markers emerged as the third highest occurrence among the interactional resources with $f = 71$ occurrences. The writers used attitude markers to address their affective perceptions and attitudes towards the content of the report. The use of words such as should, must, have to and need to show that the experimental process and procedures need to be followed by a step by step guideline to achieve desired outcome and as to avoid any discrepancy or errors while experimenting. By emphasising these words, these writers are expressing their degree of obligation and adherences to the experiment conducted.

Engagement markers such as consider that, see that and note that are used by the writers to engage the readers and it is one of the least used features identified among the engineering students with only $f = 23$ occurrences. This shows that the engineering students are trained to write the reports objectively and less emphasis is given to discursiveness of the text and engagement towards the readers. Here the writers did not try to grasp the attention or to include the laboratory instructors as their participants in the text. Imperative statements are omitted and questions are only seen written objectively.

An interesting finding indicates that engineering undergraduates have used self-mentions the most with $f = 354$ occurrences as compared to all the other interactional resources to refer to themselves as the author. This indicates that the writers are taking ownership of the written reports and marking self-representation when and where it is necessary to refer to oneself with these expressions. It is noted that the first-person pronoun we was extensively used, $f = 261$, to refer to the co-ownership of the other peers who had participated and collaborated in conducting the experiment.

4.2 Interactive Resources

Interactive resources are used in ELR writing to provide clear structure of writing, to manage the flow of information to guide the reader. The use of coordinating conjunctions can be seen in the transitions such as for, or, so, but, because. This indicates that the writers are using these transitions to keep the flow of information in a cohesive manner and to link the ideas in a unitary form. These transitions help the writers to express the relationship between the main and subordinating clauses. These markers also link the clauses by showing the two units have a cause and consequence relationship.

The use of frame markers provide sequential order of the entire report in a cohesive manner to ease the reader's understanding. The use of markers such as firstly, secondly, thirdly, before and lastly is referring to the ability of writers to create boundaries in sentence and paragraph levels of the reports, their clarity to itemise the information in sequence, and highlight the shifts in sections for instance, this section summarises.

Endophoric markers such as the word figure above/below $f = 139$ is prominent in this ELR genre as it helps to refer the readers to other parts of the reports such as the diagrams, figures, charts and tables. It is a common feature of a scientific genre such as ELR to use these markers to help laboratory instructors to locate information and it also alleviates repetitive reading during assessment or grading.

Evidential such as according to, states, by is an important aspect of scientific academic writing where writers cite a previous literature or a theory that serves as a point of reference or framework. However, this feature is scarcely used in ELRs $f = 25$. This indicates that very little emphasis is given to citation and referencing. The absence of this feature may be due to the nature of ELR that will never get published and is only used for internal assessment by academics teaching the subjects.

Code glosses like such as, for example, in terms of, especially, in particular were used in ELRs moderately $f = 56$. This feature helps the supervisors or content specialist to grasp the meaning of the reports as it provides additional information through elaboration of the text and discourse that is clear to readers. However, the use of code glosses in ELRs is still lacking in variation as only the examples mentioned above were used in the entire corpus.

5 Conclusion

This study has attempted to better understand the way the third and fourth-year electrical engineering undergraduate students compose their laboratory reports by using the metadiscourse features. The frequency of different metadiscourse categories such as interactional and interactive resources were obtained. This research can be replicated to other studies in the engineering domain. The limitation of this study is seen in the single fold of the analysis which focuses only on the linguistic features of this genre. It is suggested that similar study to include genre analysis of the rhetorical moves of IMRDC sections. The pedagogical implication of this study is that teaching and learning of metadiscourse features should be incorporated in secondary education and foundation level of tertiary education among scientific students.

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