Cendikia : Media Jurnal Ilmiah Pendidikan, 13 (4) (2023) pp. 641-649
Published by: IOCSCIENCE

Cendikia : Media Jurnal Ilmiah Pendidikan

Journal homepage: www.iocscience.org/ejournal/index.php/Cendikia

The rhetorical structure of research article abstracts in science education journal

Lia Pertiwi[1], Safnil Arsyad[2]
[1,2]Postgraduate Program of English Education, University of Bengkulu, Bengkulu, Indonesia

ARTICLE INFO

Article history:

Received March 02,2023
Revised March 16,2023
Accepted March 30,2023

Keywords:

Rhetorical Structure;
Science Education;

ABSTRACT

The significance of reading the abstracts of research publications in particular disciplines is becoming more widely acknowledged in literature. In a scientific publication, the abstract is the second mini-text the reader may encounter after the title. The term paper's value is thus determined by its abstract, which also rates it as good or confusing. Today's contrast studies look into scientific fields' abstract rhetorical structures. It follows Hyland's (2000) model for rhetorical organization, which includes an introduction, purpose, method, product, and conclusion. The objective data for analysis is a corpus of forty abstracts from the sciences (biology, chemistry, physics, and science) that were published between 2021 and 2022. The findings revealed rhetorical variances in the four disciplines' abstract constructions of science education. In parts M1, M2, M3, and M4, this abstract follows a non-hierarchical five-motion structure with four stable movements. The research results support the idea that writers' preferred rhetorical and writing patterns in academic writing are influenced by standards regarding word counts and discourse communities. The conclusion of the research is that the arrangement of the movements found in the abstract demonstrates how useless lengthy texts are to the growth of rhetorical movements. Despite the fact that the five movements are not widely used in works, the findings show that abstract rhetorical movement patterns within JIPI groups generally mirror conventions.

Corresponding Author:

Lia Pertiwi,
Postgraduate Program of English Education,
University of Bengkulu,
Jl. WR. Supratman, Kandang Limun, Kec. Muara Bangka Hulu, Sumatera, Bengkulu 38371,Indonesia
Email: liapertiwi1998@gmail.com

INTRODUCTION

In becoming an academic, it is required to produce work in the form of writing through study. At the time of writing, there were many obstacles in writing texts accepted in international journals. An Abstract is one of the most important parts of writing research articles. The research of journal article (JA) abstracts has long been of interest in academic writing (e.g., Ashofteh, 2020). Previous research has explained the importance of writing abstracts. For example, Swales (1990) appeals to academia for research on JA abstracts not to be ignored due to their significance for genre and disciplinary discourse communities.

As the knowledge of the available language choices and rhetorical structures has a great influence on one's proficiency in academic writing, many investigators have recently turned to research in the area of genre analysis, thematic organization, formulaic language, rhetorical structure, and the like, to allow learners of academic writing to make more informed decisions in their writing. (e.g., Wang & Tu, 2014; Ozmen, 2016; Kaya,Ashofteh, 2020; Aziz, 2021). Furthermore, research in rhetorical structure variations in abstracts is also considered one of the recommendations for further expansion of research by Ebadi (2019).

Although some studies have discussed the structure of rhetoric across disciplines and languages and previous studies discussed the structure of movements written in various fields of English studies. From the thoughts of this author, there is no research that discusses the structure of movements written in the field of Science Education. In this study discusses the question of how similar or different the rhetorical structure of abstracts published journals of Science Education, namely Biology, Chemistry, Physics, Science.

Hyland (2009) explains that research articles are central to academic companies, as they are shorter than books. Researchers have taken care of their interest in the rhetorical development and organization of texts as social constructs of language (Halliday, 1994), and others, focus on the analysis of the accuracy of written texts, in terms of content and structure (Hyland, 2000). Furthermore, the researcher explained the importance of research. Some previous studies explaining the use of different tenses are also seen in the abstract Wang & Tu (2014). Analyzing the rhetorical organization of the abstract is also very important (Ozmen, 2016). And also, investigating abstract rhetorical movements has the equation Amnuai (2019) and Viera (2019). Since then, many studies have examined the structure of abstract movements.

As an example, Kaya & Yaqiz (2020) was making a comparison between abstracts of research articles written by two groups in the field of English Language Teaching (ELT) by Turkish scholars and non-Turkish scholars working in Anglophone countries to find the rhetorical structures they use in their abstracts. The results showed that there were no statistically significant differences in terms of displacement between the two groups. However, three activities (goals, methods, products) often occur in the abstracts of Turkish writers while foreign authors include four movements (goals, methods, products, conclusions) more generally in their abstracts. Also, these results are in line with Amnuai (2019) showing that both similarities and differences in terms of rhetorical movements and linguistic realizations are found.

To explain this gap, the study investigated the structure of abstract rhetorical steps. The Hyland Model (2000) offers five moving rhetorical structures as a background, purpose, method, outcome, and conclusion. Several studies have addressed the structure of rhetoric and language. Previous studies have discussed movement structures written in various fields of English study. For this reason, in this study, there is no research that discusses the structure of movements written in the field of Science Education. This study discusses the question of how similar or different the rhetorical structure of abstracts published in the journal Science Education, namely Biology, Chemistry, Physics, and Science.

RESEARCH METHOD

This research method is a mixed-method. In this research, it will use a combination of qualitative and quantitative approaches, so that the research data is qualitative and quantitative as well. Exploratory sequential design used in mixed method in this research. Qualitative data is first collected and analyzed, and themes are used to encourage the development of quantitative instruments to further explore research problems so that the design of the research is mixed (Creswell & Plano,2011).

The study corpus consists of 40 journal abstracts of studies with varied Sinta scores that were published in approved national scientific publications. To suit the needs of this study sample,

a total of 40 journal article abstracts are included in the corpus. The following table provides the detailed corpus.

Table 1, the Distribution of the Corpus of the Research

No	Name of Journal	Sinta Value	Code	Average Length of Abstract	F
1	JBI (Journal Biology Indonesian)	Sinta-3	JBI	2223	10
2	JK (Journal of Chemistry)	Sinta-3	JK	2129	10
3	JFISA (Journal of Physic Sciences and Application)	Sinta-5	JFI	1928	10
4	JIPI (Journal of IPA)	Sinta-3	JIPA	2344	10
Total					40

Table 1 demonstrates that the whole corpus for this study was made up of abstracts from 40 journal articles from 4 journals, each having a different Sinta score. Total sampling is the sampling method applied in this study. Total sampling, according to Arikunto (2012), is based on a few factors. If there are more than 100 people in the population, 10-15% or 20-25% of the overall population can be collected; if there are less than 100 people, the complete sample is obtained.

For the analysis, Hyland's (2000) five-move model was used. This is because eight scientific and humanities fields are represented by Hyland's model, which details the lexico-grammatical connections between academic communities' cultures and discursive practices. As a result, the research is dependent on its objectives and communication:

Table 2, Hyland's Models (2000)

Move	Functions
1.Introduction	Establishes the context of the paper and motivates the research.
2.Purpose	Indicates the purpose and outlines the aim behind the paper.
3.Method	Provides information on design, procedures, data analysis, etc.
4.Product/Results	Indicates the results and the argument.
5.Conclusion	Points to applications or wider implications and Interpretation scope of the paper.

Table 2 shows that the main difference between the three groups of abstracts in terms of the rhetorical Move 1 (introduction) and Move 5. Below are given examples of abstracts from Move 1 to Move 5 in Abstract Science Education, can be seen below:

Move 1 Establishes the context of the paper and motivates the research of the study as in the following example:

> *Pepper cultivation techniques (Paper nigrum) in Indonesia are quite diverse in each region, depending on the type of pepper cultivated, farmer characteristics, and environmental factors, so that pepper cultivation in Indonesia can be grouped into; Conventional cultivation, non-pesticide cultivation, and organic cultivation, with monoculture or polyculture cropping patterns that have different diversity of soil microorganisms and can be beneficial for plant growth, one of which is arbuscular mycorrhizal fungi (AMF). (JBI-7)*

Move 2 Indicates the purpose and outlines the aim behind the paper of the study as in the following example:

> *The purpose of this study was to reduce the content of Pb in agricultural soils. (JK-4)*

The purpose of this study is to develop a web-based five-tier diagnostic test instrument to identify misconceptions that occur in high school students in terms of school pressure. (JFSA-2)

Move 3, Provides information on design, procedures, data analysis of the study as in following example:

The method used to determine the fractions and bioavailability of Pb and Cu was a squential extraction method, while the bioaccumulation was by the destruction method quantified using the Atomic Absorption Spectrometry (AAS). (JK-2)

This research uses descriptive quantitative method. The data used in this study include secondary data and primary data. (JIPI-10)

Move 4 Indicates the results and the argument of the study as in following example:

The results showed that 90% of teachers had not used metacognitive-based worksheets in science practicum activities about vibrations and waves even though all of them have known what metacognitive skills are, 60% of the worksheets used have not trained students to identify and analyze a problem related to experimental data related to the practicum to be carried out, and 70% had never trained their students to determine the purpose, 80% of students are not trained to design practical tables, 90% had not any reflection activities for students before and after the experiment. (JIPI-9)

Move 5 Points to applications or wider implications and Interpretation scope of the paper of the study as in following example:

From the results of the study, it can be concluded that Angkak has the potential to be used as an antibacterial agent and natural dye. (JBI-4)

From the example above, when identifying moves and figuring out their purposes. Formulaic sentences and phrases were utilized as a referent to distinguish one action from another. For example, in a recent work, the article analyzes data from... the purpose of this investigation is... the method used is... the results revealed... the data for this research... the study's findings suggest... the article concludes... in this project…. The study employed a top-down and bottom-up strategy to identify moves and establish the boundaries between them because a move may occur inside one or more phrases (Ackland, 2009). The former, bottom-up strategy seeks for language cues to classify the textual borders of the motions in each discipline, whereas the latter, top-down approach concentrates on the content of abstracts.

RESULTS AND DISCUSSIONS

The results of the rhetorical move analysis between Journal Biology Indonesian, Journal of Chemistry, Journal of Physic Sciences and Application, and Journal of IPA across disciplines are presented in this section. Discussion is had about similarities and differences. Findings from the analysis using the Hyland model are shown in Table 3 for the journal Science Education.

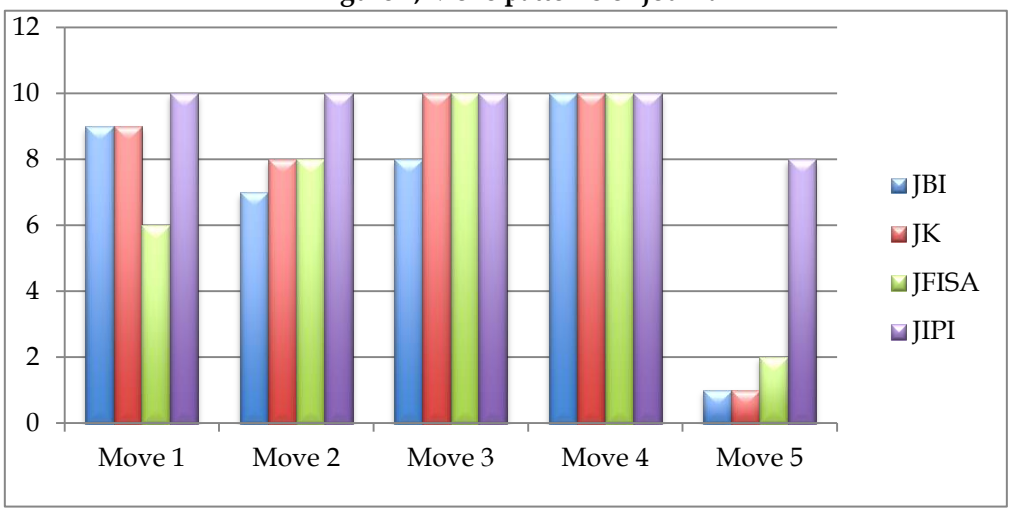
Table 3, The Distribution Moves of Research Article Abstract

Rhetorical Move	JBI n=10	JK n=10	JFISA n=10	JIPI n=10	Total n=40	Percentage	Move Category
Move-1 Introduction	9	9	6	10	34	85%	Conventional
Move-2 Purpose	7	8	8	10	33	82%	Conventional
Move-3 Method	8	10	10	10	38	95%	Conventional
Move-4 Product/Result	10	10	10	10	40	100%	Obligatory

Move-5 Conclusion	1	1	2	8	12	30%	Optional

Table 3 shows that the main differences between the four abstract groups in terms of rhetoric Move 1 (introduction), Move 2, and Move 3, the majority of abstracts in the journals JBI, JK, JFSIA and JIPI are at the conventional level. Which has 5 complete movements and the majority of abstract in Move 4 is obligatory or 100%. And among the 5 moves, only Move 5 is very low in percentage with a rate of 30% or optional.

Figure 1, Move patterns of journal



National journals are picked because they are situated in a reputable national journal called Sinta 3 to Sinta, which may be utilized as a manual or an example of a strong abstract section. Science education is the subject area covered by the national journal chosen for this study. Table 3 shows the move levels of the 4 science education journals. In move-1, it is categorized as mandatory because the average journal uses it. Then, on move-2 it is also in the medium category, because almost all journals use it as in JIPI journals, it uses all move-2. Furthermore, on move- 3 and 4 in the mandatory category, every journal uses it. Move- and move-4 are the most important parts of writing an abstract. And, in move-5 in the low or not mandatory category in it use to write abstracts in the 4 journals. In 4 science education journals, it shows that, in move-1 to move-3 in the conventional category, while in move-4 in the obligation category, and in move-5 it has an optional category. Below is an example of Moves 1–5 taken from the research data.

Example 1 (Move-1, Establishes the context of the paper and motivates the research):

> *One way to reduce phosphate levels in water is by adsorption. Adsorption is considered as the best wastewater treatment method because the main material, namely adsorbent, is abundant and easy to use. (JK-9)*
>
> *In learning management and laboratory techniques, only explaining using power point media and giving assignments so that students do not understand the material presented. Therefore, it is necessary to have teaching materials such as student worksheets based on science, environment, technology, society (SETS). (JIPI-2)*

Example 2 (Move-2, Indicates the purpose and outlines the aim behind):

> *The purpose of this study was to determine the Zn Doping effect in barium hexaferrite material on crystal size and magnetic properties. (JIFSA-5)*

This study aimed to determine the effectiveness of biofiltration processing techniques with an Aerobic Fixed-Bed Reactor (AFBR) with pumice stone media combined with chlorination to reduce the levels of COD, BOD, TSS, ammonia, and coliform bacteria. (JK-6)

Example 3 (Move-3, Provides information on design, procedures, and data analysis):

Research design using a completely randomized design with 6 treatment standards; 0%, 1%, 1.5%, 2%, 2.5% with 4 repeats. (JB-4)

This study employs descriptive qualitative research, the methods used include literature study, observation, experimentation, and interviews. (JIPI-5)

Example 4 (Move-4, Indicates the results and the argument):

The results of the feasibility assessment in terms of content, graphic and language aspects obtained an average of 91% with very feasible criteria. (JIPI-7)

The results of the analysis of carbohydrate, fat, protein, water, ash, coarse fibers, food fibers, amylose, and amylopectin show a decrease in nutritional levels of cake with fermentation than without fermentation. At the preference level for color of products from fermentation flour are more popular because it has a more attractive and bright color display. (JB-8)

Example 5 (Move-5, Points to applications or wider implications and Interpretation scope of the paper):

So it can be concluded that animated video media is effective in improving physics learning outcomes. (JIPI-7)

The conclusion of the research was the implementation of student facilitator and explaining learning could improve the learning outcome and responses towards the blood circulatory system material for grade XI students.(JIPI-6)

Figure 1 provides summary statistics for movement patterns that often occur in JBI, JK, JFISA, and JIPI journals. From the data, we can see that the sequence of movements is semi-linear, i.e. JBI has a lower incidence while JIPI reports a considerable incidence of movement.

These abstracts feature a pattern of five non-hierarchical movements with three stable movements, whose functions are to convey aims, describe methods, and discuss research products, according to a comparative examination of the abstracts of science education in all four disciplines. These findings support those made by Doró (2013), Amnuai (2019), Kaya, and Yaqis (2020), who found that some abstracts must follow the format M1-M2-M3-M4. The last stage is the least used and is optional. A comparison of the results with those from previous studies demonstrates how dramatically different rhetorical movements are constructed across different fields and disciplines. Table 3 demonstrates how science publications are said to have a five-movement rhetorical structure. These results imply that science abstracts are more closely aligned with standards used in writing English than other abstract types, which is to their favor even though the percentage of occurrences in M1 and M5 is substantially higher than that in the biological, chemical, and physical categories. This tendency might be explained by the fact that when building abstract rhetorical organizations, JIPI authors typically give greater room to introductions, aims, techniques, and products.

The findings revealed shifting variations in science-related abstracts. The influence of short word lengths in writing words mostly explains the rationale for such rhetorical disparities. According to reports in the scientific community, M3 and M4 motions occur most commonly (95% of the time) whereas JIPI occurs most frequently in the JIPI group. What is notable in the data is that the step is viewed as optional in JBI while being mandatory and usual in the JIPI group. These findings are consistent with Fallatah's (2016) finding that academic authors lack consistency in their rhetorical movements.

In addition to displaying the overall structural organization, the data also highlight the various rhetorical movement patterns employed by the abstract groupings JBI, JK, JFISA, and JIPI. Due to their conventional disciplinary methods, epistemologies, and lingua-cultural origins, writers are able to produce knowledge, frame discourse, and comprehend the developing

discourse communities to whom they are writing. In other words, authors create and maintain their social reality, personal identity, and professional institutions in academies (Hyland 2009b). However, writing can be produced while taking into account the text's cohesive communication functions (Hyland, 2000). It's unlikely that the limited amount of texts in JBI, JK, JFISA, and JIPI is the sole reason that they don't necessarily cover all five movements.

Although 150 to 250 words is the recommended length for abstracts in publication standards (APA, 2010), longer and shorter abstracts are documented in JBI, JK, JFISA, and JIPI. The data's longest abstract (IPA), which totaled 2344 words out of a possible 10, indicates repeats and complex information, whilst the data's shortest abstract (Physics), which totaled 1928 words, demonstrates accuracy in terms of content and structure. Later, it was determined that the author's method of information organization rather than the number of words determines how well the abstract is constructed.

CONCLUSION

The study examined 40 abstracts from four contemporary publications in science education. Analysis of abstract rhetorical structures reveals that few of them adhere to Hyland's recommended structure in its entirety. Five motions are present in only eleven abstracts. The most often utilized steps, despite variations in pattern, are moves 2, 3, and 4, although not all abstracts include information about these three steps. Additionally, move 5 (explanation of findings), which prior research determined was not required, changes significantly across the abstract, with step 5 continuing to be the least popular and least used component. According to this research, the three stages in the abstract give the reader a good idea of what to expect from the actual article, but any less movement could leave the reader with insufficient information. JIPI appears to adhere to a closer and more comprehensive five-step framework when comparing the similarities and differences between biology, chemistry, physics, and abstract science, even though individual deviations are visible in terms of movement cycles and the length of each movement.

This can be mandatory, conventional, or mandatory since the move serves as a functional unit for information communication. It is doubtful that all five movements are included in the written texts of biology, chemistry, physics, and science because the journal in which they are published has a word limit. Additionally, the order of movements discovered in the abstract shows how irrelevant long texts are for the development of rhetorical movements. The data demonstrate that abstract rhetorical movement patterns within JIPI groups generally mirror conventions, despite the fact that the five movements are not frequently utilized in writings produced on JBI, JK, JFISA, and JIPI. This distinction in genres may result from the fact that original works are written in English as opposed to non-original texts.

This study uses the Hyland model (2000) and other comparable research models to advance research knowledge, utilizing both qualitative and quantitative analyses. To better grasp writing and refine the writing process, novice writers should carefully examine the language used elsewhere as well as the research community. This study also helps professional researchers understand how crucial it is to write concise abstracts that draw readers to their work, especially when it is published in a journal.

Future studies will examine journals besides the four employed in this analysis (JBI, JK, JFISA, and JIPI) to determine whether there are any parallels and differences across the four projects. Additionally, for additional study in related subjects, in the introduction, method, result, and conclusion.

The role of researchers in research the rhetorical structure of research article abstracts in science education journal is very important in very dynamic educational situations to provide theoretical guidance, and monitor and improve abstract writing for students.

References

Ahmad, Z. (2022). Negotiating Meaning Relationships in the Rhetorical Structure of EFL Argumentative Writing through Text Cohesion. *Education Quarterly Reviews*, 5(3), 523-533.

Amnuai, W. (2019). Analyses of Rhetorical Moves and Linguistic Realizations in Accounting Research Article Abstracts Published in International and Thai-Based Journals. *Rajamangala University of Technology Isan*, Nakhon Ratchasima, Thailand.

Arévalo, M.-J.; Cantera, M.A.; García-Marina, V.; AlvesCastro, M. Analysis of University STEM Students' Mathematical, Linguistic, Rhetorical–Organizational Assignment Errors. *Educ. Sci.* 2021, 11, 173. https://doi.org/10.3390/educsci11040173.

Arikunto, S. (2008). *Metodologi Penelitian. Journal of Organizational Behaviour*. 25(10), 293-315.

Arsyad, S., Hakim, H., & Astria, H. (2021). Rhetorical structure and linguistic features of abstracts: a comparative study of local, national and international journals in English education written by Indonesian authors. *Jurnal Pendidikan, Bahasa, Sastra dan Seni*, 22(1), 1-16. DOI: https://doi.org/10.24036/kompos isi.v22i1.109987

Ashofteh, Z., Elahi , M., & Golparvar, S. E. (2020). The Move Structure of Abstracts in Applied Linguistics Research Articles in Light of the Distribution and Functions of Metadiscourse Markers. *Journal of Language and Linguistic Studies*, 16(4), 2077-2096.

Aziz, A. (2021). A corpus-based study of genre specific discourse: M.A. TEFL thesis abstracts. *Journal of Language and Linguistic Studies*. 17(Special Issue 2), 884-898.

Catherine G. P. Berdanier. (2021). Linking current and prospective engineering graduate students' writing attitudes with rhetorical writing patterns. *Journal of Engineering Education.* Volume 110, Issue 1. https://doi.org/10.1002/jee.20368.

Creswell, J. (2012). *Education Research: Planning, Conducting, and Evaluating Quantitative Research*. Boston: Pearson Education.

Deng, L., Wannaruk, A. (2021). A Contrastive Study of Rhetorical Move Structure of English Medium Instruction Lectures Given by Native. *LEARN Journal: Language Education and Acquisition Research Network,* Volume: 14, No: 2.

English and Chinese Lecturers

Doró, K. (2013). The Rhetoric Structure of Research Article Abstracts in English Studies Journals. *Prague Journal of English Studies*. Volume 2, No. 1, 2013 ISSN: 1804-8722'2

Ebadi, S . (2019). Rhetorical Structure Variations in Abstracts and Introductions of Applied Linguistics Master's Theses by Iraqi and International Students. *Iranian Journal of Language Teaching Research*. 7(1), (Jan., 2019) 101-117.

Huh, Myung-Hye, & Lee, Inhwan. (2019). A search for EFL college students' culture-related rhetorical templates of argumentative writing. *English Teaching*, 74(3), 55-77.

Kaya, F., & Yağız, O. (2020). Move analysis of research article abstracts in the field of ELT: A comparative study. *Journal of Language and Linguistic Studies*. 16(1), 390-404. Doi: 10.17263/jlls.712854

Kheryadi, & Suseno, M. (2017). Analysis of rhetorical moves of journal articles and its implication to the teaching of academic writing. Prosiding TEFLIN. FTK Banten Press. http://repository.uinbanten.ac.id/1407/ 1/Prosiding%20TEFLIN.pdf

La-o-vorakiat, A. & Singhasiri, W. (2021). Move analysis of chemical biology research article introductions. *LEARN Journal: Language Education and Acquisition Research Network*, 14(2), 313-341.

Ozmen, K. (2016). Rhetorical Analysis of The Doctoral Abstracts on English Language Teaching in Turkey. *I-manager's Journal English Language Teaching*. Vol. No. 1 2016.

Pujiyanti, I. A., Arsyad, S., Arono. (2018). Rhetorical Structure Analysis on Introduction Chapters of English Master Theses by Indonesian Postgraduate Students. *IJEE (Indonesian Journal of English Education)*, 5(2), 143-164. doi:10.15408/ijee.v5i2.8423.

Sahan, A. (2020). Rhetorical Structure of The News Story and Implication for Language Teaching. *International Journal of Language Education*. Volume 4, Number 3, 2020, pp. 442-458.

Sladojev, T. A., Kolic, S. (2022). Effects of searching for rhetorical relations on university-level text comprehension in L2. *Read Writ* 35, 1035–1057 (2022).

Swales, J. M. (1990). *Genre analysis: English in academic and research settings*. Cambridge: Cambridge University Press.

Viera, R. T. (2019). Rhetorical Move Structure in Abstracts of Research Articles Published in Ecuadorian and American English-Speaking Contexts. *Arab World English Journal*, 10 (4) 74 -87. DOI: https://dx.doi.org/10.24093/awej/vol10no4.6

Wang, S., & Tu, P. (2014). Tense Use and Move Analysis in Journal Article Abstracts. *Taiwan Journal of TESOL*. Vol. 11.1, 3-29, 2014