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Exploring the Interface between Nonverbal Elements and Data Commentaries in Biology and Engineering Research Articles

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Abstract

The present study investigated the interface between nonverbal elements (NVEs) and data commentaries in the results sections of biology and civil engineering research articles. A corpus of 40 research articles published in peer-reviewed journals from both biology and civil engineering disciplines and semi-structured interviews with two researchers from the respective disciplines formed the data for this study. While the corpus data were analysed both manually and by using the UAM corpus tool, the data obtained from semi-structured interviews with specialist informants from both the disciplines were analysed thematically. The findings of manual analysis revealed that although there were slight variations in terms of type, proportion and position of NVEs in data commentaries, the process involved in establishing the interface between NVEs and data commentaries seems to have little variation. The findings of corpus analysis indicate that though the move structure of data commentaries is more or less similar in both the disciplines in terms of the major moves *Background information, Presentation of visual* and *Comment on result*, it was observed that there were a few variations in the type, sequence and occurrence of the submoves. The findings of thematic analysis show that the disciplinary variations when integrating NVEs and data commentaries into results sections of research articles were due to the nature of data generated and the different tools and techniques deployed in their disciplines reflective of their respective discursive practices. The findings of the study have implications for research scholars, novice researchers and ESP writing teachers.

Keywords: Nonverbal Elements, Data Commentaries, ESP, Move Structure

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Introduction

Engineering and science discourses get constructed by integrating written and visual modes of communication. In genres such as research articles, both engineering and science disciplines deploy a range of NVEs for presenting data and developing scientific arguments (Poe et al 2010). Though several critical decisions precede the presentation of the data in the visual form, the challenge does not stop there. In fact, the challenge gets more pronounced from here as it becomes essential for the author to interpret NVEs for the reader. In this context, the interface between NVEs and the accompanying written interpretation/comment assumes centrality in academic writing for all stakeholders involved in the production and consumption of engineering and science knowledge.

The importance of the interplay between NVEs and data commentaries in a variety of fields has been widely acknowledged by many scholars (e.g., Swales & Feak, 1994, 2012; Poe et al 2010; Sancho Guinda 2011; Wharton, 2012; Roth, 2013). Though there have been several studies on move structure of different sections of research articles in various disciplines (e.g. Brett, 1994; Hopkins & Dudley-Evans, 1988; Kanoksilapthamm, 2015; Swales, 1990; Samraj, 2002), fewer studies (Nordrum & Eriksson, 2015; Eriksson & Nordrum, 2018) have focused on data commentaries alone despite their acknowledgement of the central role played by the interaction between NVEs and data commentaries in engineering and science fields. A few move analysis studies in science and engineering (Kanoksilaptham, 2005, 2015; Maswana, Kanamaru, & Tajino, 2015; Stoller & Robinson, 2013) have examined the interface with a focus on the move structure of data commentaries against a larger frame of full-length research articles. There seems to be a lack of research on the interface between text and graphics, with Busch-Lauer (1998) being a notable exception, which was conducted on three medical research genres - research papers, review articles, and case reports. Since the results sections of a research article make use of both data commentaries and NVEs to highlight the key findings of a study and to narrate the story of scientific discovery (Stoller & Robinson, 2013), exclusive investigation on the interaction between NVEs and data commentaries in the results sections gains importance. Additionally, there appears to be scant research on the interplay between the text and the visual in civil engineering and biology. Given this research gap, the present study attempts to investigate the interface between

NVEs and data commentaries in the results sections of life sciences and civil engineering research articles.

The principal aim of the study was:

- to investigate the interface between nonverbal elements and data commentary in the results sections of biology and civil engineering research articles.

The specific objectives that would help achieve the principal objective were:

- to analyse the move structure of data commentaries
- to examine the occurrence and types of NVE in research articles;
- to study the NVE-location and NVE-arrangement in research articles;
- to explore types of data integration and data commentary.

Methodology

In order to investigate the interface between NVMs and data commentaries, a representative sample of 40 research articles published in peer-reviewed journals from both civil engineering (20) and biology disciplines (20) was carefully selected by consulting respective disciplinary researchers who have published in journals of high repute. A small specialized corpus was then created by using UAM corpus tool (O'Donnell, 2008).

In addition to this, insiders' perspectives were obtained from four semi-structured interviews with two specialist informants from each discipline for gaining ethnographic perspective. The semi-structured interviews covered questions on the following areas:

- Integration of NVMs in results section
- Types of NVMs used in their disciplines
- Move structure of data commentary
- Proportion of NVMs to the text

The two sets of data were analysed qualitatively. Since the focus of the study was on data commentaries and the NVEs that go with them, 'Results' or 'Results and Discussion' sections

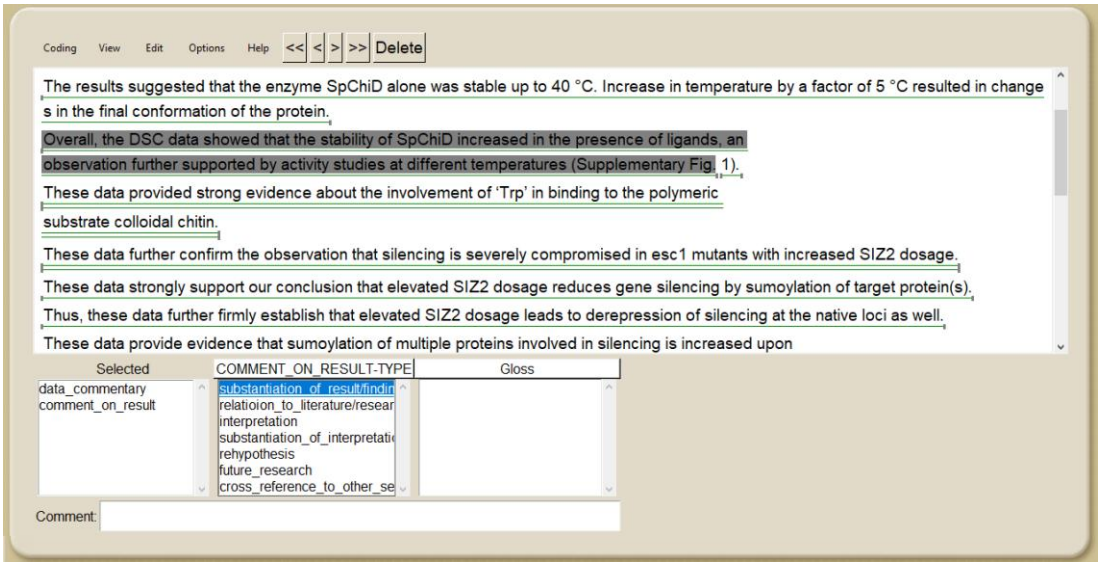
were considered for analysis. To corroborate the findings obtained from text analysis, data gathered from semi-structured interviews were analysed thematically for bringing in ethnographic perspective.

Data related to texts were analysed step-by-step as described below:

1. 'Results' or 'Results and Discussion' sections were extracted manually from the research papers, cleaned and saved as plain text files.
2. These text files were uploaded to the UAM corpus tool.
3. A layer was created as per Nordrum & Eriksson's (2015) moves model of data commentary (see Figure 1).
4. The corpus created thus was used to explore move structure.

Nordrum & Eriksson's (2015) moves model of data commentary was adapted for this study. This model presents three major moves in data commentary: *background information, presentation of visual* and *comment on results*. Each move branches out into two or more sub-moves or stages and some sub-stages may have further delicacies. Based on this model, a layer was created in the UAM corpus tool to annotate the select texts. A snapshot of a stage in the procedure of annotation is presented in the figure below:

Figure 1: Snapshot of annotation in the UAM corpus tool



As can be seen in Figure 1, the larger box on the top displays the text from research articles fed into the corpus and the three small boxes under the text display the moves as per the design from the layer created. The section highlighted in grey is identified as the major move, *comment on results*. The second box below the text displays seven sub-moves, of which the segmented text in grey is identified as *substantiation of results*. Such an annotation was carried out for all the texts to analyse the move structure of data commentaries in the research articles of both the disciplines.

Data related to NVEs were analysed manually as follows:

- NVEs were segregated from the research articles and categorised into types.
- Similarities and differences in the use of NVEs between civil engineering and life sciences research articles were noted.
- Captions and legends associated with NVEs were compared.
- Interface between NVEs and data commentaries was tracked.

Semi-structured interview data were processed by listening to the recordings several times; and notes were made keeping in mind the objectives of the study. The notes made were grouped into four broad areas covered in the semi-structured interviews mentioned in the beginning of the section. The themes identified through this categorisation were mapped to the findings of the manual analysis to add ethnographic perspective to the study.

Findings and Discussion

The analysis of data revealed that there was considerable variation in the interface between nonverbal elements and data commentaries in results sections of research articles in both civil engineering and biology. This variation was observed in terms of the type, proportion and position of NVEs and the move structure in data commentaries. The reasons for such a variation were observed in the analysis of semi-structured interview data alongside some insights into their disciplinary culture and practices.

Interface between NVEs and data commentaries in both the disciplines

Though NVEs present complete findings and are visually appealing, they need to be interpreted for the reader by the researcher with respect to the objectives/ hypotheses/ research questions of a given study. Therefore, they occur together in the results sections of research papers. The deployment of NVEs seems to vary depending on the nature of the discipline and its epistemic discursive culture and practices and the type of research reported. In this study, such disciplinary variations in the deployment of NVEs were observed in terms of their type, proportion and occurrence.

A closer examination of the results sections of both the disciplines revealed that biology research articles use a wide variety of NVEs compared to those of civil engineering. Results sections in biology research articles included tables, graphs, data plots, microscopic images, chromatographs/ spectrographs, 3D models, schematics, photographs, pie charts, and bar charts whereas the range of NVEs used in civil engineering is limited to tables, graphs, bar charts and photographs. The reasons for the use of wide range of NVEs in biology may be attributed to the typical research techniques employed and the variety of evidence generated from various research tools. To present such a variety of evidence in the results sections in a condensed manner, biology tends to use a wide range of visuals. However, the nature of data civil engineering research processes appears to be condensed by using a limited range of NVEs.

Table 1: Types and proportion of NVEs

Types of NVEs	**Civil Engineering**	**Biology**
Tables	104	84
Pie charts	0	3
Bar charts	58	61
Graphs	98	112
Schematics	0	13
Photographs	46	11
Data plots	0	55

Microscope images	0	57
Chromatographs/ spectrographs	0	46
3D models	0	8
Total	**306**	**450**

Table1 presents the types and proportion of NVEs found in the results sections of research articles of both the disciplines. As can be seen from the table, the number of NVEs in biology articles is more and the distribution is also wide across the types. On the other hand, not only the number of NVEs is less in civil engineering articles but also the distribution is limited to only four types of NVEs. NVEs such as microscopic images, chromatograph/ spectrographs, data plots, schematics and 3D models are typical of results sections in biology research articles and their absence in civil engineering articles may be attributed to the absence of research practices that generate these kinds of NVEs in the discipline.

In biology results sections, it is common to see multiple NVEs put together as a single figure. The reasons for such a practice were found to be i) same finding having multiple evidences, ii) graphically quantifying visual information present in data plots, iii) to track trends or a series of events. This disciplinary convention appears to make the results sections of biology research articles distinctly different from those of civil engineering.

With respect to the position of NVEs in results section, there are three possibilities of presenting NVEs in relation to the accompanying text -- pre-text position, parallel position, and post-text position. In this study, it was found that both the disciplines have predominantly used NVEs in post-text position. This choice seems to be in congruence with the nature of discourse in these disciplines because *background information* as move structure of data commentaries precedes NVEs. It was also observed that there were a few instances of NVEs in parallel text position, the choice of which seems to have been determined by the layout of the content in the paper rather than the deliberate choice made by the researchers. However, positioning NVEs parallel to the accompanying data commentaries facilitates the process of reading as they are in close proximity to each other. In this study, there was little evidence of NVEs in pre-text position as it seems

essential for *background information* as a move structure to precede NVEs so as to enable the reader to relate to the context of findings.

Move structure of data commentaries in both the disciplines

Move structure analysis revealed that both the disciplines include all the three major moves – *background information, presentation of visual* and *comment on results* – as established in Nordrum & Eriksson's (2015) moves model of data commentary in results sections of research articles. However, there appears to be noticeable variation between sub-moves in both the disciplines in terms of their type, sequence and occurrence.

The background information move

It was observed that in the *background information* move, in both the disciplines, the occurrence of all the three sub-moves – *procedure/method, disciplinary knowledge* and *explanation of choice of visual presentation* – was not uniformly distributed. In both the disciplines, sub-moves related to *procedure/ method* and *disciplinary knowledge* were observed to be present in different sub-sections of results sections. Interestingly, in both the disciplines, the occurrence of the third sub-move, *explanation of choice of visual presentation* in the background information move was scarce in this data and hard to establish from it.

The following excerpt from biology research article illustrates an instance of *disciplinary knowledge* as part of the major move, *background information.*

Excerpt 1

Previous studies have shown that mutations in HMR locus silencer elements (ORC, Rap1, or Abf1 binding sites) that abolish repression can be bypassed by tethering of Sir proteins to the deleted silencers in the form of Gal4 DNA binding domain (Gbd) fusions (11, 33). Remarkably, silencer mutations can also be bypassed by tethering of the locus to the nuclear periphery, through overexpression of several different Golgi apparatus/endoplasmic reticulum (ER) proteins, such as Yif1, Yip1, and Yip3, fused to Gbd (1). Targeted silencing by these Gbd fusion proteins is also Sir dependent and requires at least one functional silencer element at the HMR-E silencer. It was hypothesized that these proteins establish silencing by placing the defective HMR locus in the milieu of Sir proteins, which normally accumulate at the nuclear periphery. (Source: Mishra, K, 2012: 454)	*Background Information (BI)*

Interestingly, the highlighted segment of the text relates to restating the hypothesis of the study, which is not included in the *background information move* of the move structure model adopted in this study.

The following excerpts are examples that illustrate the sub-move, *procedure/ method* of the move, *background information* in both civil engineering (a) and biology (b).

Excerpt 2 (a &b)

a.	The AAC stage can be considered as the main processing unit since the major utilization and treatment of PSS were performed during this stage. (Source: Hait, S, & Vinod Tare, 2011: 2814)	*BI_ Procedure/method* Civil Engineering
b.	In order to identify novel proteins that are involved in maintaining Sir protein accumulation at the nuclear periphery, we set up a screen for factors that when overexpressed would lead to a decrease or loss of silencing by Gbd-Yif1. Briefly, YSB35 expressing Gbd-Yif1 was transformed with a yeast genomic library in a high-copy-number vector (a gift from K. Nasmyth) and screened for transformants that showed robust growth on medium lacking tryptophan. (Source: Mishra, K, 2012: 454)	*BI_ Procedure/method* Biology

From these findings, it can be concluded that the *background information move* in both civil engineering and biology tends to include the sub-moves, *procedure/ method* and *disciplinary knowledge* and that there is very little possibility of the third sub-move, *the choice of explanation for visuals*. There appears to be no trace of interface between NVEs and data commentaries in the *background information* move.

At times, though uncommon, it is quite possible to see the co-occurrence of the moves, *presentation of the visual* and the *background information* move together in a single sentence. The following is an example of such a co-occurrence where the sentence begins with procedural details followed by a finding and a reference to NVE.

Excerpt 3

We isolated a plasmid from one candidate transformant (named D4) that reproducibly conferred a modest level of derepression of the *TRP1* marker (Fig. 1B). (Source: Mishra, K, 2012: 454)	*BI_ Procedure/method* *Presentation of the visual (PoV)*

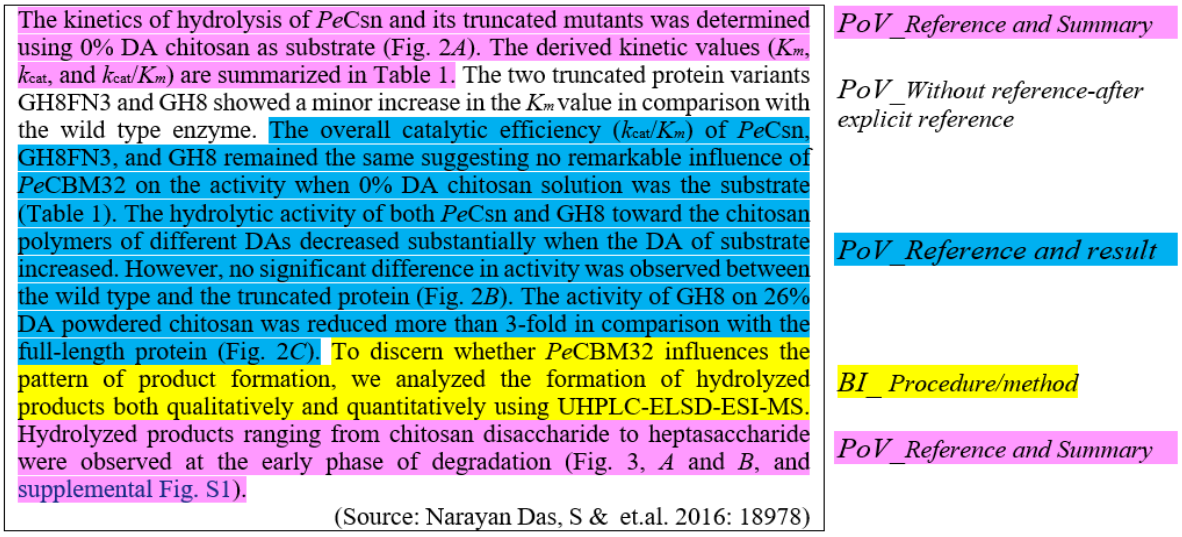
It can be concluded that it is customary to both the disciplines to include the move, *background information,* with varying types and sequence of sub-moves and at times, it is quite possible to

have the co-occurrence of the *background information* with the *presentation of visual* in the same sentence. In the next section, how findings relating to the interface of NVEs and data commentaries happen through the move, *the presentation of visual,* are discussed.

Presentation of visual move

The next move of the data commentary, *presentation of visual*, can establish the interface between NVEs and the accompanying text in two ways: *with reference* and *without reference*. When the interface between NVEs and the accompanying text is established *with reference to visual*, this can manifest as *reference and summary*, *reference and result* and *reference and explanation / interpretation of visual.* When the interface between NVEs and the accompanying text is established *without reference to visual*, the interface can be realized either as *after explicit reference* or *no explicit reference*. The findings from this study indicate that both the disciplines seem to include this move structure in terms of both *with reference to visual* and *without reference to visual* though such occurrence might not happen in all the sub-sections of the results section. The excerpt below illustrates how this move structure comes about:

Excerpt 4

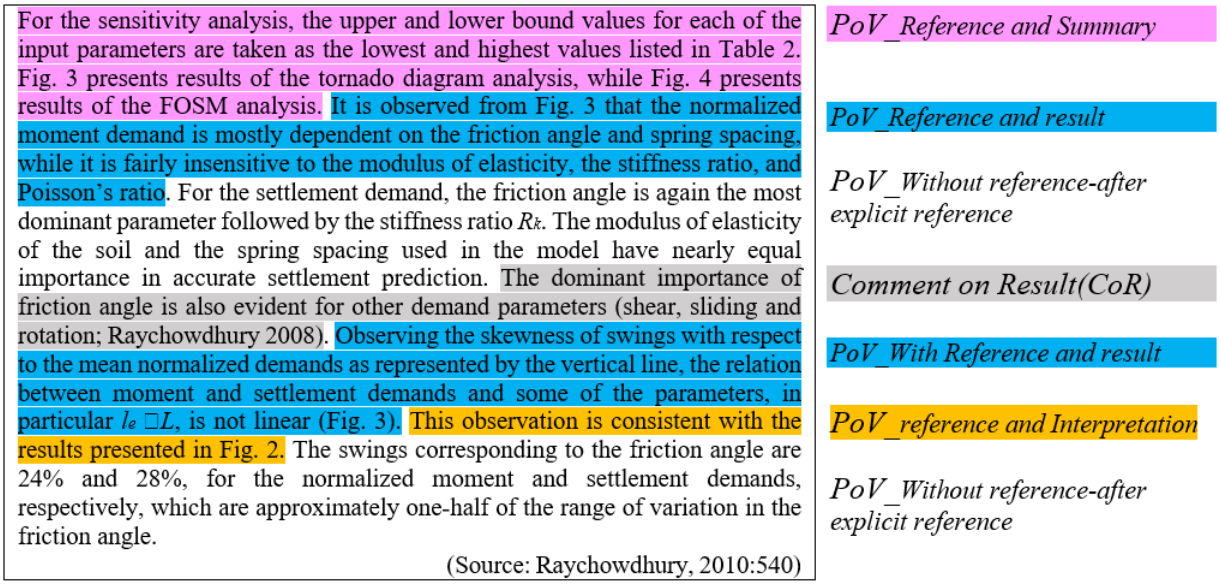


As can be seen from the colour-coding of the excerpt above, a clear interface between NVEs and data commentaries can be observed in terms of both *with reference to the visual – reference and*

summary, reference and result and *without reference to the visual – after explicit reference*. The textual segments in pink indicatively present results with reference to NVEs whereas the textual segment not highlighted in colour presents important results without reference to the visual but after explicit reference to the visual in the previous sentence. It appears that results sections in biology research articles tend to begin this move structure with these sub-moves highlighted in pink colour. It is clear from the textual segment in blue that informative statements are used for presenting important findings by explicitly making a reference to NVEs and results. However, one anomaly can be observed in the textual segment in yellow which relates to the move, *background information,* specifically about procedure. The occurrence of *background information* move within the *presentation of visual* does not seem to be unusual to results sections in biology research articles.

The following excerpt from results section of a civil engineering research paper illustrates how the presentation of visual as a move structure brings about interface between NVEs and data commentaries in the discipline.

Excerpt 5



As can be observed from the excerpt, there appears to be quite a good deal of similarity between the results sections of biology and civil engineering research articles with regard to *the presentation of visual* as a move structure. Just as in biology, *the presentation of visual* move in civil engineering clearly establishes interface between NVEs and the data commentaries. This interface can be observed in the colour-coding of the excerpt in terms of *reference and summary* in indicative statements highlighted in pink and *reference and result* in informative statement highlighted in blue. Besides these, it can also be observed that there was the inclusion of the important finding without making explicit reference to NVEs. However, the interface with the visual was made implicitly understood through anaphoric reference.

As can be seen from the excerpt, a segment of the text in grey falls outside the move structure under discussion. However, its occurrence within this move does not seem to be uncommon in results sections of science and technology discourse. This segment of the text relates to the move, *comment on results*, specifically, *relation to literature*.

From these findings, it can be concluded that *presentation of visual* as a move in both the disciplines tend to include both the sub moves alongside traces of other moves such as the *background information* and *comment on results*. The move structure *comment on results* is analysed in terms of all its sub moves as presented in the following section.

Comment on results move

Like the *background information* move discussed in the previous section, the move, *comment on results*, hardly has any interface with NVEs. This move usually gets configured in terms of its sub-moves such as *substantiation of result/finding, relation to literature/research question/other data, interpretation, substantiation of interpretation, (re)hypothesis, future research* and *cross reference to other sections.* However, in this study, it was found that not all these sub-moves were present in the research articles of both the disciplines. The sub-moves that are commonly found in the research articles of the disciplines investigated in this study were *substantiation of results, interpretation, cross-reference to other sections*, and *relation to literature.* Another interesting finding observed from this study was that these sub-moves seem to occur quite elaborately when both 'results and discussion' sections are combined rather than when they are treated

independently. Since most of the papers analysed for this study treated results section independently, the sub-moves relating to *comment on results* were found to be less elaborate.

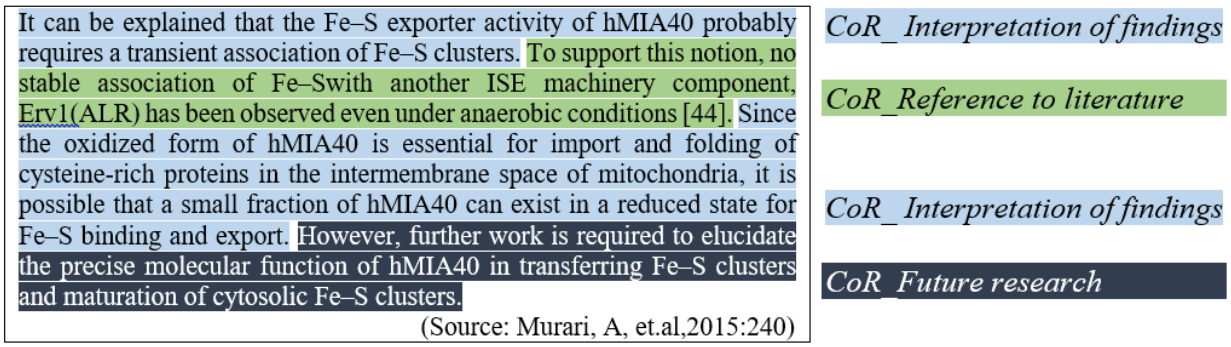
The two excerpts given below from civil engineering illustrate some of the sub-moves of *comment on results* move. While excerpt a) includes *substantiation of findings,* excerpt b) has the sub-moves, *interpretation of findings* and *reference to other sections* as part of the move.

Excerpt 6 (a &b)

a. The column failure initiated due to CFRP rupture because of hoop stress followed by inter-surface failure of core concrete and cementitious grout. The failure was due to complete de-lamination of cover concrete indicating the strong interface developed between the cover concrete to FRP and weak interfacial link between the core concrete and the cover concrete. Due to lesser degradation in concrete core, the effective stiffness is better restored as compared to other strengthening techniques. (Source: Jain, et.al. 2017:758)	*CoR_Substantiation of findings*
b. Once again, the abnormal increase in the quantity of gypsum indicates the formation of secondary gypsum from the direct attack on C-S-H. This was confirmed by SEM, which is reported in the next section. (Source: Manu Santhanam, 2011: 1009)	*CoR_ Interpretation of findings* *CoR_Reference to other section*

Similarly, the following excerpt from biology illustrates three sub- moves of the move, *comment on results: interpretation of findings, reference to literature* and *future research.* Interestingly, as can be observed from the excerpt, there are two instances of the sub-move, *interpretation of findings*

Excerpt 7



It can be concluded from these findings that *comment on results* move seems to have low probability of having interface with NVEs as there is less scope for referring to NVEs while commenting on results in both these disciplines.

Based on the findings discussed in this section, it may be possible to conclude that of all the moves in data commentaries in both the disciplines, it is only in the move, the *presentation of the visual* that instances of having interface with NVEs was evidenced and that the other moves tend to have less occurrences of interface with NVEs.

Ethnographic perspective drawn from semi-structured interviews with disciplinary researchers

The findings of the thematic analysis of semi-structured interview data with disciplinary researchers indicate that the interface between NVEs and data commentaries gets influenced by the type of research each individual researcher carries out and also the journal in which the article is published.

It is known that there are broad differences between biology and civil engineering as two distinct disciplines. The findings from the semi-structured interviews revealed that there are further finer differences across specializations in each discipline. These finer differences call for use of different tools and techniques while doing research which in turn results in deployment of different types of NVEs in each specialized research. It was reported that the majority of the biology research uses multiple tools in a single experiment for gathering multiple evidence for a single phenomenon and

hence the results sections are replete with the different combinations of NVEs in a single figure. When asked the similar question to civil engineering researchers, it was reported that they too use multiple graphs together to trace the trends related to a given experiment. Besides, the responses of researchers confirmed the findings from the manual analysis related to the variation in the proportion of NVEs used in each discipline.

When asked about their decisions regarding the integration of NVEs in data commentaries, it was reported that the choice of placing NVEs is dependent on the journal house-style sheet. It was also reported that some journals insist that the authors send NVEs as separate document indicating their preferred position in the final publication. It was also indicated that sometimes the layout of the page in the journal may alter the position of the NVEs preferred by the author.
When asked about how they organize the data commentary with respect to the NVEs presented, their explanation reflected an intuitive sense of the major moves that make up the data commentary which are in line with the move structure of the model used in the study. Researchers from both the disciplines appeared to follow a similar procedure while establishing an interface between NVEs and data commentaries.

The findings from the manual analysis of NVEs in results sections, corpus analysis of data commentaries in results sections and thematic analysis of data gathered from semi-structured interviews with disciplinary researchers revealed that though there were slight variations in terms of type, proportion and position of NVEs in data commentaries, the process involved in establishing the interface between NVEs and data commentaries seems to be more or less the same.

Conclusion

The present study investigated the interface between NVEs and data commentaries in the results sections of biology and civil engineering research articles and found that though there are a few variations, there appear to be many similarities with regard to the interface between NVEs and data commentaries in both the disciplines.

The findings of the present study indicate that the disciplinary researchers have intuitive sense of the textual elements in the results section, which they might have developed through osmosis over a period of engagement with the texts. However, novice researchers may find it frustrating to integrate the NVEs with data commentaries appropriately as they lack such an engagement with disciplinary texts for a long duration. Making novice researchers understand the move structure explicitly as indicated in the analysis of the present study may help them navigate the texts with ease and also integrate the NVEs and data commentaries in accordance with the disciplinary expectations of their discourse communities. Experienced disciplinary researchers can also benefit from explicit awareness as it gives them greater access to their intuitive sense of the interface between verbal and visual elements in results section.

Research in the area of English for Academic Purposes (EAP) can take a cue from the present study in terms of combining the analytical tools and extending the ethnographic perspective beyond interviews to include interdisciplinary collaboration across disciplines to explore various issues such as developing specialized courses for novice researchers, exploring disciplinary practices with respect to writing across disciplines and demystifying the disciplinary procedures involved in publishing research.

Future research can attempt an interdisciplinary collaboration to understand disciplinary practices better. Longer collaboration between ESP researchers and disciplinary researchers would provide deeper insights into discursive practices of respective disciplines, which can lead to the development of materials and courses catering for the specific needs of the target students (for example, see Robinson et.al., 2008). Future research can extend the investigation beyond results sections to understand the multimodal nature of science and technology discourse throughout the research article.

References

Brett, P. (1994). A genre analysis of the results section of sociology articles. *English for Specific Purposes*, *13*(1), 47-59.

Busch-Lauer, I. (1998). Non-verbal elements and data commentary in English medical texts. *Genres studies in English for academic purposes. Castelló: Publicacions de la Universitat Jaume I*, 109-132.

Eriksson, A., & Nordrum, L. (2018). Unpacking challenges of data commentary writing in master's thesis projects: an insider perspective from chemical engineering. *Research in Science & Technological Education*, *36*(4), 499-520.

Hopkins, A., & Dudley-Evans, T. (1988). A genre-based investigation of the discussion sections in articles and dissertations. *English for specific purposes*, *7*(2), 113-121.

Kanoksilapatham, B. 2005. Rhetorical structure of biochemistry research articles. *English for Specific Purposes* 24(3): 269–292.

Kanoksilapatham, B. 2007. Rhetorical moves in biochemistry research articles. In *Discourse on the Move: Using Corpus Analysis to Describe Discourse Structure* [Studies in Corpus Linguistics 28], D. Biber, U. Connor & T.A. Upton (eds), 73–119. John Benjamins.

Kanoksilapatham, B. (2015). Distinguishing textual features characterizing structural variation in research articles across three engineering sub-discipline corpora. *English for Specific Purposes*, *37*(0), 74-86.

Martin, J. R. (1992). *English text: System and structure*. Benjamins.

Martin, J. R. (1995). Text and clause: Fractal resonance. *Text & Talk*, *15*(1), 5-42.

Maswana, S., Kanamaru, T., & Tajino, A. (2015). Move analysis of research articles across five Engineering fields : What they share and what they do not. *Ampersand*, 2, 1–11.

Nordrum, L., & Eriksson, A. (2015). Data commentary in science writing: Using a small, specialized corpus for formative self-assessment practices. In *Learner corpora in language testing and assessment* (pp. 59-84). John Benjamins Publishing Company.

Eriksson, A., & Nordrum, L. (2018). Unpacking challenges of data commentary writing in master's thesis projects: an insider perspective from chemical engineering. *Research in Science & Technological Education*, *36*(4), 499-520.

O'Donnell, M. (2008) The UAM CorpusTool: Software for corpus annotation and exploration. In Bretones Callejas, Carmen M. et al. (eds) *Applied Linguistics Now: Understanding Language and Mind*, 1433–1447. Universidad de Almería.

Poe, M., Lerner, N., & Craig, J. (2010). *Learning to communicate in science and engineering: Case studies from MIT*. MIT Press.

Roth, W.-M. 2013. Data generation in the discovery sciences – learning from practices in an advanced research laboratory. *Research in Science Education* 43(4): 1617–1644. DOI: 10.1007/s11165-012-9324-z

Samraj, B. (2002). Introductions in research articles: Variations across disciplines. *English for specific purposes*, *21*(1), 1-17.

Sancho Guinda, C. (2011). Integrating approaches to visual data commentary: an exploratory case study. In *Researching specialized languages* (pp. 115-136). John Benjamins Publishing Company.

Sancho Guinda, C. (2012). Proximal positioning in students' graph commentaries. In *Stance and voice in written academic genres* (pp. 166-183). London: Palgrave Macmillan UK.

Scardamalia, M., & Bereiter, C. (1987). Knowledge telling and knowledge transforming in written composition. *Advances in applied psycholinguistics*, *2*, 142-175.

Stoller, F. L., & Robinson, M. S. (2013). Chemistry journal articles: An interdisciplinary approach to move analysis with pedagogical aims. *English for Specific Purposes, 32*(1), 45-57.

Swales, J.M. 1990. *Genre Analysis. English in Academic and Research Settings*. Cambridge: CUP.

Swales, J.M. 1994. *Academic Writing for Graduate Students. Essential Tasks and Skills*, Ann Arbor MI: University of Michigan Press.

Swales, J. M., & Feak, C. B. (1995). From information transfer to data commentary. *TESOL France Journal*, *2*(2), 79-93.

Swales, J.M. & Feak, C.B. 2012. *Academic Writing for Graduate Students. Essential Tasks and Skills*, 3rd edn. Ann Arbor MI: University of Michigan Press.

Wharton, S. (2012). Epistemological and interpersonal stance in a data description task: Findings from a discipline-specific learner corpus. *English for Specific Purposes*, *31*(4), 261-270.

Appendix: Source texts for corpus

Biology research articles

1. Allu, P. K., Marada, A., Boggula, Y., Karri, S., Krishnamoorthy, T., & Sepuri, N. B. V. (2015). Methionine sulfoxide reductase 2 reversibly regulates Mge1, a cochaperone of mitochondrial Hsp70, during oxidative stress. *Molecular biology of the cell*, *26*(3), 406-419.
2. Bugide, S., David, D., Nair, A., Kannan, N., Samanthapudi, V. S. K., Prabhakar, J., & Manavathi, B. (2015). Hematopoietic PBX-interacting protein (HPIP) is over expressed in breast infiltrative ductal carcinoma and regulates cell adhesion and migration through modulation of focal adhesion dynamics. *Oncogene*, *34*(35), 4601-4612.
3. Das, S., Wagenknecht, M., Nareddy, P., Bhuvanachandra, B., Niddana, R., & Balamurugan, R. et al. (2016). Amino Groups of Chitosan Are Crucial for Binding to a Family 32 Carbohydrate Binding Module of a Chitosanase from Paenibacillus elgii. *Journal Of Biological Chemistry*, *291*(36), 18977-18990.
4. Ganguly, K., Giddaluru, J., August, A., & Khan, N. (2016). Post-transcriptional regulation of immunological responses through riboclustering. *Frontiers in immunology*, *7*, 161.
5. Ganji, R., Dhali, S., Rizvi, A., Rapole, S., & Banerjee, S. (2016). Understanding HIV-Mycobacteria synergism through comparative proteomics of intra-phagosomal mycobacteria during mono-and HIV co-infection. *Scientific reports*, *6*(1), 1-14.
6. Hannan, A., Abraham, N. M., Goyal, S., Jamir, I., Priyakumar, U. D., & Mishra, K. (2015). Sumoylation of Sir2 differentially regulates transcriptional silencing in yeast. *Nucleic acids research*, *43*(21), 10213-10226.
7. Haque, N., & Prabhu, N. P. (2016). Lid closure dynamics of porcine pancreatic lipase in aqueous solution. *Biochimica et Biophysica Acta (BBA)-General Subjects*, *1860*(10), 2313-2325.
8. Kumar, D., Rampuria, S., Singh, N. K., Shukla, P., & Kirti, P. B. (2015). Characterization of a vacuolar processing enzyme expressed in Arachis diogoi in

resistance responses against late leaf spot pathogen, Phaeoisariopsis personata. *Plant molecular biology*, *88*(1-2), 177-191.

9. Kumar, E. K., & Prabhu, N. P. (2014). Differential effects of ionic and non-ionic surfactants on lysozyme fibrillation. *Physical Chemistry Chemical Physics*, *16*(43), 24076-24088.
10. Kumar, P., Lakshmi, Y. S., Bhaskar, C., Golla, K., & Kondapi, A. K. (2015). Improved safety, bioavailability and pharmacokinetics of zidovudine through lactoferrin nanoparticles during oral administration in rats. *PloS one*, *10*(10), e0140399.
11. Lakshmi, Y. S., Kumar, P., Kishore, G., Bhaskar, C., & Kondapi, A. K. (2016). Triple combination MPT vaginal microbicide using curcumin and efavirenz loaded lactoferrin nanoparticles. *Scientific reports*, *6*(1), 1-13.
12. Madhuprakash, J., Bobbili, K., Moerschbacher, B., Singh, T., Swamy, M., & Podile, A. (2015). Inverse relationship between chitobiase and transglycosylation activities of chitinase-D from Serratia proteamaculans revealed by mutational and biophysical analyses. *Scientific Reports*, *5*(1).
13. Mudalkar, S., Golla, R., Ghatty, S., & Reddy, A. R. (2014). De novo transcriptome analysis of an imminent biofuel crop, Camelina sativa L. using Illumina GAIIX sequencing platform and identification of SSR markers. *Plant molecular biology*, *84*(1-2), 159-171.
14. Murari, A., Thiriveedi, V. R., Mohammad, F., Vengaldas, V., Gorla, M., Tammineni, P., ... & Sepuri, N. B. V. (2015). Human mitochondrial MIA40 (CHCHD4) is a component of the Fe–S cluster export machinery. *Biochemical Journal*, *471*(2), 231-241.
15. Pasupala, N., Easwaran, S., Hannan, A., Shore, D., & Mishra, K. (2012). The SUMO E3 ligase Siz2 exerts a locus-dependent effect on gene silencing in Saccharomyces cerevisiae. *Eukaryotic cell*, *11*(4), 452-462.
16. Peddireddy, V., Doddam, S. N., Qureshi, I. A., Yerra, P., & Ahmed, N. (2016). A putative nitroreductase from the DosR regulon of Mycobacterium tuberculosis induces pro-inflammatory cytokine expression via TLR2 signaling pathway. *Scientific reports*, *6*(1), 1-9.

17. Shukla, P., Subhashini, M., Singh, N. K., Ahmed, I., Trishla, S., & Kirti, P. B. (2016). Targeted expression of cystatin restores fertility in cysteine protease induced male sterile tobacco plants. *Plant Science*, *246*, 52-61.
18. Srikumar, A., Krishna, P. S., Sivaramakrishna, D., Kopfmann, S., Hess, W. R., Swamy, M. J., ... & Prakash, J. S. (2017). The Ssl2245-Sll1130 toxin-antitoxin system mediates heat-induced programmed cell death in Synechocystis sp. PCC6803. *Journal of Biological Chemistry*, *292*(10), 4222-4234.
19. Undi, R. B., Gutti, U., & Gutti, R. K. (2016). Role of let-7b/Fzd4 axis in mitochondrial biogenesis through wnt signaling: In neonatal and adult megakaryocytes. *The international journal of biochemistry & cell biology*, *79*, 61-68.
20. Vemula, M. H., Ganji, R., Sivangala, R., Jakkala, K., Gaddam, S., Penmetsa, S., & Banerjee, S. (2016). Mycobacterium tuberculosis zinc metalloprotease-1 elicits tuberculosis-specific humoral immune response independent of mycobacterial load in pulmonary and extra-pulmonary tuberculosis patients. *Frontiers in microbiology*, *7*, 418.

Civil Engineering research articles

1. Chandiramani, N. K. (2016). Semiactive control of earthquake/wind excited buildings using output feedback. *Procedia Engineering*, *144*, 1294-1306.
2. Chandiramani, N. K., & Purohit, S. P. (2012). Semi-active control using magnetorhelogical dampers with output feedback and distributed sensing. *Shock and Vibration*, *19*(6), 1427-1443.
3. Choudhary, P., & Velaga, N. R. (2017). Mobile phone use during driving: Effects on speed and effectiveness of driver compensatory behaviour. *Accident Analysis & Prevention*, *106*, 370-378.
4. Hait, S., & Tare, V. (2011). Vermistabilization of primary sewage sludge. *Bioresource technology*, *102*(3), 2812-2820.
5. Hussain, A., Ahmad, Z., & Ojha, C. S. P. (2016). Flow through lateral circular orifice under free and submerged flow conditions. *Flow Measurement and Instrumentation*, *52*, 57-66.

6. Jain, S., Chellapandian, M., & Prakash, S. S. (2017). Emergency repair of severely damaged reinforced concrete column elements under axial compression: An experimental study. *Construction and Building Materials*, *155*, 751-761.
7. Kanagasabapathi, B., Rajendran, C., & Ananthanarayanan, K. (2010). Scheduling in resource-constrained multiple projects to minimise the weighted tardiness and weighted earliness of projects. *International Journal of Operational Research*, *7*(3), 334-386.
8. Kaul, D. S., Gupta, T., & Tripathi, S. N. (2014). Source apportionment for water soluble organic matter of submicron aerosol: A comparison between foggy and nonfoggy episodes. *Aerosol and Air Quality Research*, *14*(5), 1527-1533.
9. Khan, A. A., Mehrotra, I., & Kazmi, A. A. (2015). Sludge profiling at varied organic loadings and performance evaluation of UASB reactor treating sewage. *Biosystems Engineering*, *131*, 32-40.
10. Kongarapu, R. J., Nayak, A. K., Khobragade, M. U., & Pal, A. (2018). Surfactant bilayer on chitosan bead surface for enhanced Ni (II) adsorption. *Sustainable Materials and Technologies*, *18*, e00077.
11. Krithika, D., & Philip, L. (2016). Treatment of wastewater from water based paint industries using submerged attached growth reactor. *International Biodeterioration & Biodegradation*, *107*, 31-41.
12. Rajesh, S., & Khan, V. (2018). Characterization of water sorption and retention behavior of partially saturated GCLs using vapor equilibrium and filter paper methods. *Applied Clay Science*, *157*, 177-188.
13. Ram, K., Tripathi, S. N., Sarin, M. M., & Bhattu, D. (2014). Primary and secondary aerosols from an urban site (Kanpur) in the Indo-Gangetic Plain: impact on CCN, CN concentrations and optical properties. *Atmospheric Environment*, *89*, 655-663.
14. Ramnavas, M. P., Patel, K. A., Chaudhary, S., & Nagpal, A. K. (2015). Cracked span length beam element for service load analysis of steel concrete composite bridges. *Computers & Structures*, *157*, 201-208.
15. Raychowdhury, P., & Hutchinson, T. C. (2010). Sensitivity of shallow foundation response to model input parameters. *Journal of geotechnical and geoenvironmental engineering*, *136*(3), 538-541.

16. Roy, K., Ogai, H., Bhattacharya, B., Ray-Chaudhuri, S., & Qin, J. (2012). Damage detection of bridge using wireless sensors. *IFAC Proceedings Volumes*, *45*(23), 107-111.
17. Santhanam, M. (2011). Effect of solution concentration on the attack of concrete by combined sulphate and chloride solutions. *European journal of environmental and civil engineering*, *15*(7), 1003-1015.
18. Senthilkumar, V., & Varghese, K. (2013). Case study–based testing of design interface management system. *Journal of Management in Engineering*, *29*(3), 279-288.
19. Undi, R. B., Gutti, U., & Gutti, R. K. (2016). Role of let-7b/Fzd4 axis in mitochondrial biogenesis through wnt signaling: In neonatal and adult megakaryocytes. *The international journal of biochemistry & cell biology*, *79*, 61-68.
20. Vignesh, R., Jothiprakash, V., & Sivakumar, B. (2015). Streamflow variability and classification using false nearest neighbor method. *Journal of Hydrology*, *531*, 706-715.