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Genre Approaches to Comparable Discourses With a focus on Computer Science Research Article: A Review

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Genre Analysis

Genres consist of the demands to which their users rhetorically respond 'so that the genre function does not simply precede independently of us but is rather something we reproduce as we function within it'. (Bawarshi, 2000:354-55). 'Academic genres have regular repeatable patterns of organization and language' Dudley-Evans (1998:10) informs. Corpus linguistics not only provides opportunities to investigate the stylistic and linguistic preferences of individuals but also helps in exploring the ways in which genres favor some words, structure and patterns over others. 'Strong linguistic associations in one register often represent only weak associations in other registers', Biber, *et al.* (1996) point out. Whereas purposes of genres are 'recognized by the expert members of the parent discourse community, and thereby constitute the rationale for the genre' (Lewin *et al.* 2001).

Key words: Genre, discourse, computer science, corpus linguistics

Background of Genre Analysis

The tradition of genre can be traced back to Aristotle's Poetics which presented a classification system for literary forms, (Paltridge, 1997). Talking about the twentieth century, the root of genre analysis lies in the earlier work on register analysis such as: Gopink Barber (1962), (scientific prose); Halliday *et al*., (1964); Huddleston, (1971); Gopnik, (1972) (scientific English); Gustafsson, (1975) (legal English). This work was developed by Selinker *et al.* (1972, 1974) and Swales (1974) etc. through their work on linguistic analysis on textualization and the use of rhetorical devices and further enhanced by Widdowson, (1973); Candlin *et al*., (1974, 1976, 1980); Tadros, (1981); Hoey, (1983); Swales, (1981b) and Bhatia, (1982) etc. through their work on rhetorical and discourse organization.

Genre analysis gained popularity with the publication of Swales (1990) in the field of LSP research. Motta-Roth *et al.* (2003) rate Swales' work (1990) emblematic in genre analysis for its special emphasis on the communicative objective of an event as the central feature in defining a genre. Language is only a tool to realize this objective. Despite many other factors like content, form, intended audience, medium or channel, a genre is primarily characterized by the communicative purpose(s) that it is intended to fulfill. The language is organized and the internal structure takes shape according to this communicative purpose (s), (Bhatia, 1993). Bhatia (1993:13) defines genre based on Swales (1981b, 1985 and 1990) as follows:

It is a recognizable communicative event characterized by a set of communicative purpose(s) identified and mutually understood by the members of the professional or academic community in which it regularly occurs. Most often it is highly structured and conventionalized with constraints on allowable contributions in terms of their intent, positioning, form and functional value. (1993: 13)

Genre Analysis – a social reality

Genre is a social action (Miller, 1984). A text does not possess meaning on its own. Geertz (1973) admits genre as a social reality, including the linguistic behavior of any speech community, academic or professional. Bhatia (1993:18) regards it as 'an ongoing process of negotiation in the context of issues like social roles, group purposes, professional and organizational preferences and prerequisites and even cultural constraints'. Similarly Kress (1985) emphasized that the characteristic features and structures of the social occasions/ situations and purposes and goals of the participants made a great effect on the form of texts. Eggins and Martin (1997) claim that different genres are different ways of using language. The purpose is to achieve different culturally established tasks. Texts of different genres are the sites to achieve these different purposes in the text. Wennerstrom (2003:23) supports this view by explaining, 'Each genre has certain conventional linguistic and rhetorical features that reflect the social motivations and cultural ideologies of the community that produced them.' Although she acknowledges the preservative social function of the genres, she admits

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that they can change to incorporate new values with the changes in the societies. Sociological studies and linguistic analysis both help in the interpretation of the use of language in professional and academic contexts.

Variations Within and Across Disciplines

Academic and professional discourses are increasingly complex and dynamic these days because of the rapid growth of knowledge. Discourse analysis helps in making predictions about constitutive elements in different genres. Swales (1981a) for instance, showed that a simple rhetorical device like *definition* differs in terms of its function, distribution and linguistic realization in law, science and economics. Bhatia (1998) not only identifies variation across the boundaries of academic discipline but also within a specific discipline. For the latter he gives the example of a textbook and a research article. The communicative purpose of a textbook according to Bhatia (1998:17) is 'to arrange currently established knowledge into a coherent whole in a manner helpful to an uninitiated learner' whereas in a RA, a researcher makes claims and looks for recognition. RA as Swales (1990:125) rightly calls it is the 'key product of the knowledge manufacturing industry… so cunningly engineered by rhetorical machining… gives an impression of… a simple description of relatively untransmuted raw material'. Both genres of scientific English have their own lexico-grammatical and discoursal realizations. Meyer (1992) points out differences among RAs in the use of first person pronominals, tense usage, hedges, references and cohesion etc.

On the other hand, variation across disciplines has its evidence too. 'A discourse community's norms, epistemology, ideology and social ontology' to use Berkenkotter and Huckin's words (1995), 'are not necessarily same as those of another discourse community'. Here it is to be noted that Swales (1990) *discourse community* is different from Hymes' (1974) *speech community*. Swales stresses that one chooses to join a particular discourse community depending upon one's goals, interests and education etc. Whereas Hymes' speech community is the one in which one is born, is more general and defined by its members' shared dialect and linguistic behavior. 'And there is evidence that each discipline is also a "rhetorical community"… a field with certain norms, expectations and conventions with respect to writing', Purves (1986:39) asserts.

Now the question arises whether a research article RA is similar to a lab report as an instance of scientific English and if they are different genres because of their differing communicative needs, are RAs in sociology, science, engineering or education different or similar in their generic conventions? Swales (1981b) in his analysis of 48 RA introductions from various journals including electronics, chemical engineering, radiology, educational psychology, management and linguistics provided the evidence that a RA introduction from engineering is as good an example of this genre as the one from education or psychology.

Analyzing Unfamiliar Genres

'Genres offer a systematic way of looking at the linguistic structure of various types of communication, provide a window for understanding and critiquing the cultural values of the community that produced them and show how specific goals can be appropriately achieved within that community' Wennerstrom (2003:23) describes. In order to take a comprehensive investigation of any genre, Bhatia (1993:22) recommends the following steps:

Placing the given genre text in a situational context

This can be done by placing the genre-text intuitively in a situational context, getting the textual clues and by the encyclopedic knowledge of the world one has.

Surveying existing literature

This includes:

a. Linguistic analyses of the genre or similar genres
b. Tools, methods or theories of linguistic/ discourse/ genre analysis
c. Practitioner advice, relevant guidebooks and manuals etc.
d. Discussions of the social structure, interactions, history, beliefs, goals etc. of the professional or academic community which uses the genre in question

iii. Refining the situational/ contextual analysis

The situational/ contextual framework can be refined by:

a. Defining the speakers/ writer of the text, the audience, their relationship and their goals
b. Defining the historical, socio-cultural, philosophical and/or occupational placement of the community in which the discourse takes place
c. Identifying the network of surrounding texts
d. Identifying the topic/subject/extra-textual reality which the text is trying to represent

After refining the situational / contextual analysis according to the above principles, the next step is the selection of corpus.

Selecting corpus

One should have a reasonable criterion for the adequate selection of corpus such as:

a. A long single text
b. A few randomly chosen texts
c. A large statistical sample with easily identified indicators

Studying the institutional context

The institutional context involves the system and/or methodology in which the genre is used and the rules and conventions (linguistic, social, cultural, academic, professional) that govern the use of language in this setting. This becomes more important if data is collected from a particular organization having organizational (in the present case, IEEE) constraints and requirements for genre construction.

Specialist information

Selinker (1979:190) very realistically admitted the problem and raised the question: 'What are we to do as ESL teachers in the normal situation where we ourselves just do not understand the English language scientific textbooks and professional articles our students are required to grapple with?' He and Huckin and Olsen (1984) present the solution in the form of consultation with a specialist informant, which was extensively used by Bhatia (1982) who later (1993:35) listed three characteristics of a good specialist informant:

a. Be a competent and trained specialist member of the disciplinary culture in which the genre under study is routinely used.
b. Should be open about the use of specialist language and various aspects of the genre under study.
c. Should be able to explain how expert members of the disciplinary culture exploit language in order to accomplish their generic goals.

Levels of Linguistic Analysis

Three levels of linguistic analysis have been listed by Bhatia (1993:24). In the first level, lexico-grammatical features are analyzed quantitatively, that are predominantly used in the variety to which the text belong. For example, Barber's work (1962) on the measurable characteristics of scientific prose (tenses) and Gustafsson's findings (1975) on dependent clauses in law language. However, such analysis does not tell us much about the textualized aspects of the genre.

The second level of analysis is what Widdowson (1979) calls textualization. Rather than looking at the statistical significance of a particular linguistic feature it is more interesting and significant to know as to what aspect of the genre it textualizes. Swales (1974) through his examples;

'…a *given* substance varies with temperature.'
'…a *certain* substance varies with temperature.'
'…*any* substance varies with temperature.'

shows that pre-modifying en-participles textualize two aspects, exemplification and generalization, in chemistry text. This view is further strengthened by Swales and Bhatia (1983) and Bhatia (1993:29) who believes that the scientific writer's use of complex NPs is dynamic, 'He creates new nominals as he builds new information.'

The most sophisticated level of genre analysis is the analysis of structural organization. Swales' findings (1981b.) on the similarities of RA introductions across varying disciplines made him present a four move structural model for writing introductions that he later (1990) called Research Space Model for Article Introductions.

Move 1: Establishing the research field
Move 2: Summarizing the previous research
Move 3: Preparing for present research
Move 4: Introducing the present research

In his 1994 model he has reduced the four move modal to a three one.

Move 1: Establishing a Territory
a. by showing that the general research area is important, central, interesting, problematic, or relevant in some way. (optional)
b. by introducing and reviewing items of previous research in the area. (obligatory)

Move 2: Establishing a Niche
a. by indicating a gap in the previous research, raising a question about it, or extending previous knowledge in some way. (obligatory)

Move 3: Occupying the Niche
a. by outlining purposes or stating the nature of the present research. (obligatory)
b. by announcing principal findings. (optional)
c. by indicating the structure of the RP. (optional)

Each move has its own typical intention that contributes to the achievement of the overall purpose. A writer may use rhetorical strategies to fulfill the communicative intention at the move level. This cognitive structuring can be compared to the schematic structuring in schema theory. Both are similar except that the former is the ' conventionalized and standardized organization used by almost all the members of the professional community whereas in the latter, it is often a reader's individual response to the text in question, (Bhatia, 1993).

Structure within Structure

Swales (1990) and Swales and Feak (1994) present not only an overall structural organization of RAs (IMRID) but also establish means and ways to reach every structure within that organization. Although a hierarchical model for RA introductions was given by Paltridge (1997) and a formal schemata associated with particular text types in the form of Situation, Problem, Solution or Response and Evaluation by Hoey (1994), but Swales (1990, 1994) remains the most authentic and the most referred to.

Anthony (2002) very rightly comments that Swales (1981b) describes RA introductions as 'genre

specific' and sees them as a fairly standardized communicative event independent of the discipline in which they were written. As a result, various studies of the individual structures of RAs have been carried out, such as: Result sections of medical RAs by Williams (1999); Discussion sections of RAs by Hopkins and Dudley-Evans (1988), Hozayen (1994); Dudley-Evans (1995); Abstracts by Salager-Meyer (1990), Ayers (1993), Posteguillo (1996). Even the titles or RAs have been analyzed by Dudley-Evans (1984), Fortanet *et al.* (1997), Posteguillo (1998), Anthony (2001).

Thus the studies of these scholars demonstrate that the individual sections of a complete text can be termed as a genre since they intend to describe a single communicative event. Here comes the Swales' (1990) concept of 'prototype'. Using Anthony's words (2002:7), 'text will be assigned to a category depending on how similar they are to prototypical examples of that category'. A category's internal structure assigns features or properties to be included in category membership (Rosch, 1975 in Swales 1990:52). This view is clarified by Paltridge (1997:53) who explains that 'people tend to categorize in relation to prototypes which have a common core at the center and fade off at the edges'. And that if the representation of a genre is closer to the prototypical image of a genre, the better an example it is of that particular genre. About the placement of texts in a particular genre, another point of view says that the membership is not decided by a fixed set of obligatory features. Rather, the structural elements are selected from a common repertoire and these elements tend to form a highly probable pattern. Martin, 1985, 1992 and Ventola 1987, 1988, 1989 in Lewin *et al.* (2001:21).

Still there are genres in which exists variation among its different members, (Ayer, 1993). For instance, Posteguillo (1999) in his study about the computer science RAs has shown that they lack an overall systematic pattern. 'Some computer scientists resort to comments in order to guide their readership through RAs with no clearly recognizable structural model, while others try to follow more closely well-established models common in other disciplines, or at least to use some of the sections in these patterns'(1999:156).

The First Computer Science Research Article

The first issue of the first research journal in the field of Computer science was published in December 1952 by the name of IRE Transactions on Electronic Computers. The journal contained papers presented at the Western Electronic Show and Convention in Long Beach, California on August 27- 29, 1952. The journal was published by IRE Professional Group on Electronic Computers. It was decided that in future, selected convention papers will be included along with the direct submissions. However, all papers would be subject to review by the Board of Reviewers of the Professional Group.

The First Article

The first article was written by Eldred C. Nelson of the Hughes Aircraft Company, California. The title was, A Digital Computer for Airborn Control System. The length of the article was two typed pages plus pictures on two pages at the end of the article. The Introduction was of 40 words.

Introduction: A digital computer has been developed for use in airborn control systems. This application presents many problems. The computer must be small, light weight, and very reliable. It receives its input signals from instruments in the rest of the system.

These signals are of the 'analogue' continuous type and must be converted into the discrete electric signals used in the computer. The problems of analogue- digital conversion are problems in the measurement of the physical quantities that define the state of the system and in the transformation of the results of these measurements into digital signals. The digital members representing the input quantities are processed by the computer which performs in real time the computational representation of the control problem. The results of these calculations are numbers representing the signals used to control the system. These output numbers are converted into the analogue type signals used in the control operations.

The next issue of the journal was published in June 1953 and then it started getting published on quarterly basis. In February 1965, the name of the journal was changed to IEE Transactions on Electronic Computers and it started getting published bimonthly. This change was the result of the mergence between the Institute of Radio Engineers (IRE) and the American Institute of Electrical Engineers. The first article after this change was on A Graphical Interpretation of Realization of Symmetric Boolean Functions with Threshold Logic Elements written by C. L. Sheng. It is interesting to note that after a decade, the length of the article increased from two pages to eleven pages (typed two columns). The Introduction had 378 words.

Soon another change took place. The name of the journal was changed to what we know it of today, IEEE Transactions on Computers and from January 1968 it started as a monthly publication. The rationale for this change was given in the Editor's Notice:

This Transaction has a new name. At the Administrative Committee meeting held during the 1967 Fall Joint Computer Conference at Anaheim,

California, it was decided to delete the word 'Electronic' from the title, calling it simply the "IEEE TRANSACTIONS ON COMPUTERS". This new title is more consistent with the broad scope of this journal and the name of the IEEE Computer Group.

____ Harry D. Huskey

The first article under the new publication was, An Iteratively Structured General Purpose Digital Computer written by Joel N. Sturaman. This was comprised on eight typed pages (in two columns). The Introduction was of 140 words.

So we see that the earlier articles in Computer science were brief, didn't contain many references (the first of 1952 did not have any reference at all) and did not follow IMRD or any other well defined structure. However, they did care about the Introduction and included it in their articles.

Linguistic Analyses of Computer Science Research Articles

Thus the genre of Computer Science research article that started in 1958 unfortunately could not attract the due attention of linguists for a long time. However, recently substantial work in the introduction of CS RA has been done.

As compared to the linguistic investigation carried out in other sciences, linguistic analysis of computer science discourse has been limited. For instance, the two main studies of the eighties, Cooper (1985) and Hughes (1989) were limited to one sub-genre, Introductions and so were the other two; Simpson (1989) focused on professional documentation and Mulcahy (1988) on computer instructions. Beside, Cooper's corpus included articles from Electrical and Electronics engineering only, which despite having a great influence on the field of Computer Science, is not the 'true' representation of the field.

Cooper (1985) analyzed 15 RA from IEEE. In comparison to Swales, (1990) four move model she presented a new two step model based on her analysis.

1. Placing Steps, which are orientational or topographical in function. They place the reader by providing

a. content background
b. context background
c. an article summary

2. Justificatory Steps, which provide the reader with reasons for the work undertaken by

a. justification by demonstration of use or application
b. justification by contrast
c. justification by demonstration of the consequences of the work

It was not until 1990s that the comparative work with CS started. Corbett (1992) studied a corpus of RAs in three disciplines: history, biology and computing. This was perhaps the first attempt to distinguish the peculiarities of CS discourse across disciplines.

This line of investigation was further developed by Posteguillo (1995). Among his conclusions, he maintained that ' scientific discourse in computing has a set of common distinct features which distinguish it from the scientific discourse characteristics of other academic disciplines', (1995:26) but ' various genres analyzed specifically within the field of CS show distinct schematic structures and resort to different rhetorical and linguistic choices' (226).

A RA is a dynamic genre that adapts itself to or is adjusted by scientists, to meet the particular rhetorical demands of a specific discipline, Posteguillo (1995) rightly comments. So the rhetoric and communicative demands of a computer scientist do not require an IMRD pattern, generally followed by many for the writing of RAs. He found only two sections Introduction and Conclusion consistently being used in CS RAs. Results were also identified but used as independent section less frequently. The rest of the sections varied according to the personal preferences of the researcher and the specific characteristics of the product presented. He phrases the overall schematic structural pattern of the CS RAs as the *New device—description of its characteristics*, but quotes the *Problem—solution* pattern in Abstracts, *presentation of the evolution of a product* in Byte type articles and the *Analysis of a problematic situation* in Popular articles.

Another important figure in the study of CS RAs is Anthony (2000) who studied the structure and linguistic features of RA Titles in CS and structural differences and linguistic variations in RA Abstracts of CS. Using the 'Modified CARS Model' the structure of Abstracts was investigated and shown to be largely similar in 408 articles from 6 journals, with small differences in the step usage. Earlier, (1999), Anthony had applied CARS modal to Introductions of 12 articles from a single journal IEEE Transactions on Software Engineering. As an overall framework, he found the modal successful except that the classification of definitions and examples into an appropriate step was missing.

Shehzad (2007 a.) studied the author's voice in CS RAs with reference to the personal pronoun 'we' and its inclusive and exclusive use. Contrary to Hyland's (1999 a, 2000, 2001 a) view of more measurable and replicable research in hard sciences, author's voice is passive and impersonal. Shehzad (2007: 68) reported that although computer scientists present calculated, measurable and testable items but 'by foregrounding the author's voice which is explicit, firm and assertive".

Creation of a gap to enhance the significance of the present research is another area discussed by Shehzad (2008). These are not brief announcements neither are they fixed in their physical or rhetorical nature. To keep a pace with the fast developments taking place in CS research, 'Computer scientists have to find a strong niche' to increase the chances of their audience's acceptability and the target community's recognition of their research work which is essential for scientific progress' (Shehzad, 2008: 47).

Before the creation of the gap research needs to be situated in the appropriate context which Swales (1990) called 'Establishing a niche' meaning the area chosen is significant and worth exploration. . Shehzad (2006:130) reported 89.28% occurrence of this step in CS RAs which was higher than the earlier studies such as Swales (1990) 50%, Posteguillo (1995) 41.7% and Anthony (1990) 47.5 % . Claims of centrality in CS are made by explaining that the area is problematic, challenging, useful, common, popular, important, widely adopted, recent, interesting and active etc.' Shehzad (2006: 132).

The conclusion of the introduction of a CSRA bears the obligatory status in CS rhetoric. This is done by outlining the structure of the steps 'to inform the audience about the rhetorical organization of the subsequent text while also functioning to summarize the information to be provided in the rest of the paper' (Shehzad, 2007 b: 232). They usually follow the following formula:

The {rest/ remainder} of {the / this} paper / is {organized / structured} as / follows:

Conclusion

'Explicit knowledge of the configuration of genres as communicative events can be an asset in material writing and course design in that it can offer valuable insight about particular linguistic features that assume special importance in specific genres' (Motta- Roth et al. 2003: 387). In ESP teaching we should consider how the writers represent the conventions of the discipline and within the discipline to the conventions of various genres. The present findings can help the prospective research article authors to understand the way introductions in Computer science research articles are written. If students become acquainted with the conventions of this part genre, their experiential knowledge already existing in their schemas will be activated.

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