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Shahid Chamran University of Ahvaz

Research Article

A Diachronic Perspective on Thematicity in Research Articles: A Systemic Functional Perspective

Leila Shoja[1] & Esmat Babaii[2]

[1]Corresponding author, English Language and Literature Department, Humanities Faculty, Ilam University, Ilam, Iran; *l.shoja@ilam.ac.ir*

[2]Department of Foreign Languages, Faculty of Literature and Humanities, Kharazmi University, Tehran, Iran; *babai@khu.ac.ir*

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Abstract

The Theme-Rheme system has been employed in synchronic discourse studies to analyze the profile of the research article (RA). However, while diachronic analyses can frame our understanding of discourse, such studies have not received due attention in research on thematicity. This study, therefore, examined thematic choices in the RAs of mechanical engineering and horticulture diachronically. The corpus consisted of 120 RAs from 1965-1975 and 120 RAs from 2005-2015, drawn from eight peer-reviewed journals. From a SFL perspective, the RAs were examined through Halliday's (1994) model alongside McCabe's (1999) analytical framework. Results revealed that the two time periods are associated with significant changes in thematic choices. Yet, the patterns of thematic progression (TP) have not altered in either discipline. The findings suggest implications for discourse analysis as well as richer academic writing instruction. We recommend further diachronic discourse studies which can contribute to the research base concerning academic disciplines, science, and genres.

Keywords: Theme; Thematic Progression; Diachronic Analysis; Academic Disciplines; Research Article.

1. Introduction

Academic writers are obliged to master the conventions of their respective communities including the writing practices to secure membership within their disciplinary community and find acceptance by it (Belcher, 2007; Flowerdew, 2000). English, the international language of science, plays an important role in this regard as multilingual scholars are under mounting pressure to publish their academic work in English (Curry & Lillis, 2004). English-medium publications, highly valued by institutions for promotions, affect researchers' careers (Lillis & Curry, 2006; Polo & Varela, 2009), give scholars the chance for their research to reach and engage a larger audience, and provide the research communities with worldwide contributions and perspectives (Curry & Lillis, 2010). Extensive research, thus, has been undertaken on academic literacy to document discursive and non-discursive resources necessary for securing publication in English to provide insights for educators and academic communities.

Genre analysis is among the approaches used to examine discourse communities which have their own conventional procedures of communication and genres (Swales, 1990). The research article (RA) as one of these genres plays a significant role in knowledge development and communication in academic discourse communities (Koutsantoni, 2006; Swales, 2004). Consequently, it has been studied with regard to a variety of macro and micro features including cohesion, a significant discourse concept (Rasikhovna Shakirova & Fakhrazovich Kharisov, 2023).

Thematicity, a key element in creating cohesion and coherence in texts (Martin & Rothery, 1993), assists readers with understanding the intended interpretation of the clause and the text as a whole, and extends the analysis of texts beyond the structure of single clauses. It is, therefore, one of the focal points for the generic analyses of academic writing (Forey, 2002) since it gives us a better profile of different genres (Fries, 1995), especially as they are not stable and change

over time (Bazerman, 1988). Disciplines also change over space and time (Becher & Trowler, 2001), thus, along with synchronic studies, diachronic research can inform our understanding of academic discourse.

Despite the benefits of diachronic studies of academic writing such as putting modern scientific writing in perspective, displaying the non-random and historically-determined development of discourse, and enabling language teachers to understand the structures and functions of the specialized languages (Banks, 2011), they are relatively rare. In the changing world of academic publishing (Atkinson, 1999), where scientific discourse communities are increasingly internationalized (Sheldon, 2011) and there is increasing pressure for publication in English, current writing practices may be different from those in previous decades (Lin & Evans, 2012). Thus, diachronic studies of academic writing would not only demonstrate the old and the current writing practices, but also help us understand how the academic writers have responded to the requirements of the evolving world of academia. They can enrich both the synchronic research of the language and the teaching of it. In this regard, as thematic elements play a major role in academic discourse, studying them with the aim of helping writers with writing processes in a competitive publishing context is important (Montemayor-Borsinger, 2001).

This diachronic study, therefore, which can contribute to both Systemic Functional Linguistics (SFL) theory and genre analysis, is a thematic analysis of full-length RAs in the fields of horticulture and mechanical engineering to see how the authors employ the Theme position to organize their writing and, in turn, respond to the professional academic demands. Theme choices in terms of Theme composition (simple or multiple, with regard to the presence of any textual and/or interpersonal Themes before the topical Theme) as well as Theme status (marked or unmarked, considering the conflation of the Mood and Theme structures of the clause) and thematic progression (TP) patterns being the focus, this study sought to address the following questions:

- Is there a significant difference in the Theme status of mechanical engineering RAs across two time periods?
- Is there a significant difference in the Theme composition of mechanical engineering RAs across two time periods?
- Is there a significant difference in the Theme status of horticulture RAs across two time periods?
- Is there a significant difference in the Theme composition of horticulture RAs across two time periods?
- Is there a significant difference in the TP patterns of mechanical engineering RAs across two time periods?
- Is there a significant difference in the TP patterns of horticulture RAs across two time periods?
- For all the research questions, six null hypotheses were formulated.

2. Literature Review

The Theme-Rheme structure, the manifestation of one of the important metafunctions of the language, has been investigated in relation to different variables in different genres. It is regarded as an element of disciplinary variation since it can show the writer's beliefs and values (North, 2005), and a number of studies have investigated Theme in disciplinary contexts (e.g., Martinez, 2003; Shokri, 2015; Babaii et al., 2016). Theme choices in students' writing have also been the focus of research, which mostly aims to offer either suggestions for teaching or criteria for assessment. Both comparative (e.g., Jalilifar, 2010; Montemayor-Borsinger, 2003; Yang, Ramirez & Harman, 2007) and non-comparative studies (e.g., Ryshina-Pankova, 2011; Wang, 2007) have provided valuable findings. Yet, while diachronic discourse studies can yield important insights too, they are sporadic in SFL research (Banks, 2019), especially in studies on thematicity. A noteworthy exception is a study done by Banks (2008) who studied thematic choices in physical and biological RAs over three centuries. Chronological differences in the use of thematic structures were found in the articles, especially in physics. The researcher explains the differences with the focus of research in the fields and changes in the scientists' interests. The study provides significant findings; however, since the pressure for publication in English has been mounting in recent years, its possible effect on thematicity was not examined in the study by Banks. Therefore, considering constant changes in disciplines (Khedri & Kritsis, 2018), further diachronic studies of thematic elements which include more recent samples of RAs along with the old ones can be fruitful.

3. Methodology

3.1. Design of the Study

In this descriptive-analytic study, first, we identified different types of Themes as well as TP patterns, and then using descriptive and inferential statistics, we examined the frequencies and the potentially significant variable of time in relation to them. The analytical frameworks, based upon SFL, were Halliday's (1994) model of thematization and McCabe's (1999) TP model.

3.2. The Corpus

The corpus included 120 mechanical engineering RAs (60 articles from 1965-1975 and 60 from 2005-2015) and 120 horticulture RAs (60 articles from 1965-1975 and 60 from 2005-2015). The disciplines were selected using Biglan's (1973) three-dimensional classification of disciplines, a widely recognized framework for categorizing academic fields. Because of the goals of the study, different factors were considered in selecting the disciplines. First, since the life/nonlife dichotomy often poses a greater challenge to explain variance (Sinclair & Muffo, 2002) and is related to subject matter which can influence Theme selection, we focused on the dichotomy to clarify the differences it entails. Thus, the disciplines were held constant with regard to the other two dichotomies and were chosen to be applied and hard. Meanwhile, a look at many discourse studies on disciplines encouraged us to study fields that are comparatively under-researched. Second, we considered another factor, i.e., the developmental status of fields: established or nascent. This was relevant as the study is diachronic. In this regard, we also examined the publishing history of the disciplines and our accessibility. As the result of all this, we selected two established fields: horticulture and mechanical engineering.

Having selected the disciplines, we chose the journals for sampling the RAs. Four leading peer-reviewed journals in each discipline were selected according to their impact factors and the SJR factors. As previous research (e.g., Khany & Mansoori Nejad, 2010) has shown that the locality of journals can affect Theme choices, only international journals were included in the study.

After choosing the journals, RAs were sampled using a systematic random sampling method. Specifically, for each journal, the third issue was identified, and article number three within that issue was chosen to be included in the final corpus. When that article was not a RA—such as a technical note—the selection was adjusted using a plus-or-minus-one approach. Consequently, the sample was representative of RAs from the two disciplines. To ensure uniformity across the fields and mitigate potential variations in article structure that could influence thematic choices, the sample was reviewed. Those articles that did not adhere to the IMRD model—the standardized structure for RAs proposed by Swales (1990, 2004)—were substituted. Given the importance of the four sections, recognized variations of the IMRD model (Cargill & O'Connor, 2009) were deemed acceptable as well.

3.3. Procedure

In research on thematization, researchers employ various units of analysis—such as clauses, sentences, and T-units—depending on the type of corpus and their aim (McCabe, 1999). For this study, the T-unit was chosen as the analytical unit as it is considered the most effective when the goal is to examine entire texts to identify TP patterns (Fries, 1994, as cited in Thompson, 2004; Fries & Francis, 1992). A T-unit consists of a main clause together with all its hypotactically connected subordinate clauses. When adopting T-units as the analytical unit, clauses joined paratactically are assigned separate independent Themes, whereas clauses connected hypotactically share a single, unified Theme for the entire clause complex. Consequently, if a subordinate clause precedes the main clause, it assumes the role of the Theme for the entire clause complex. However, when the main clause appears first, its Theme is regarded as the principal Theme, with the remaining portion of the clause, including any succeeding subordinate clauses, forming the Rheme (McCabe, 1999).

Having chosen the unit of analysis, in this study's initial phase, we applied Halliday's (1994) model to identify Themes and Rhemes within T-units. According to this framework, the Theme occupies the clause's initial position, with each clause containing one—and only one—topical Theme. The Theme extends to encompass this element, meaning that the subject is not necessarily an obligatory component of the Theme. The remaining portion of the clause constitutes the Rheme. Furthermore, the Themes were classified based on their status (marked or unmarked) and composition (simple or

multiple). A simple theme and a multiple theme from the corpus, whose references and those of the examples presented later are listed in the Appendix, include the following:

> [1] *Soft polymetric materials* have received much attention during recent years due to their unique properties and promising application. *For example, hydrogels* are fabricated that are very soft, but also durable and wear resistant, including double network hydrogels. (Journal of Mechanics and Physics of Solids 2013, p. 1295)

The multiple Theme consists of a textual Theme (i.e*., for example*) and a topical Theme (i.e., *hydrogels*). While *soft polymetric materials*, a simple Theme, is also an unmarked Theme, where the subject is the Theme, an example of marked Themes from the corpus, where an adverbial phrase is the Theme is as follows:

> [2] *Inherent within this formulation* is the unique definition of displacements along each boundary by only those displacement parameters at the ends of that boundary. (International Journal of Solids and Structure 1970, p. 326)

In the second phase, McCabe's (1999) framework was used to examine thematic development within T-units. The model comprises four patterns: constant Theme, simple linear progression, split Rheme, and split Theme. In Example 3 of the constant Theme pattern, the same Theme is used in three consecutive T-units.

> [3] *One basic discontinuous pressure element* has been selected. *The mixed element* is the $P2^{+}/P1_{disc}$ (see Fig. 2). *This element* is composed of a quadratic displacement enriched by a cubic bubble function and a linear discontinuous pressure. (Computer Methods in Applied Mechanics and Engineering 2012, p. 21)

In the following example, to form a simple linear pattern, a part of the Rheme in one T-unit is used as the Theme in the subsequent T-unit.

> [4] Accordingly, the elastic field of a dislocation in the bimaterial can be separated into *two parts* associated with the two point-force Green's functions (Akarapu and Zbib, 2009). *Generally, both parts* can be evaluated by surface integrals. (Journal of the Mechanics and Physics of Solids 2012, p. 419)

Example 5 of the split Rheme pattern shows how the Rheme in a T-unit is divided into two Themes for subsequent T-units, while Example 6 depicts a somewhat similar process in the split Theme pattern, where a Theme in one T-unit is divided into two for subsequent T-units.

> [5] In terms of applied loads, the thin-walled beam is admitted to be subjected to *a set of distributed forces along the axis and to a set of tractions applied at both beam end sections*. *The distributed forces* are defined by a set of vectors that gather the corresponding densities defined on the thin-walled middle surface [formula deleted]. *The forces applied to the beam model* are obtained by integrating the density forces over the thin-walled cross-section by adopting for weights the displacement filed approximation. (International Journal of Solids and Structures 2014, p. 578)

> [6] *At both storage temperatures* the fresh weight/dry weight ratios for the shoots and daughter bulbs declined from the start of storage until about 60 days after planting. *At 9°C* the ratios for the three components increased from this time until anthesis. *In contrast, at 18°C* the ratios scarcely altered between 100 days and anthesis. (Scientia Horticulturae 1975, p. 311)

A T-unit may participate in multiple TPs, and those T-units that do not conform to any identifiable pattern are categorized as peripheral Themes. In line with McCabe (1999), thematic chains were not extended to include gaps exceeding three T-units, as such discontinuities were not considered part of the TP.

3.4. Data Analysis

Data were analyzed manually in both phases of the study. To test the hypotheses, the raw dataset was adjusted to accommodate differences in the total count of T-units among the RAs representing each discipline; six Chi-square tests were also conducted through IBM SPSS 22.

4. Results

4.1. The First Phase

In the first phase, the Themes were identified according to Halliday's (1994) model. In addition to determining their category (e.g., subject, adjunct), we analyzed their status and composition. The results are reported in terms of ten

categories including subject, complement, adjunct, dependent clause, verb, predicated Theme, thematic equative, extraposition, there (existential), and Wh-word (interrogative).

4.1.1. Themes in the Mechanical Engineering RAs

Sixty mechanical engineering RAs of 1965-1975 comprised 9872 T-units and those of 2005-2015 included 15799 T-units. Thus, the overall count of T-units in the mechanical engineering RAs was 25671. The adjusted data are reported in Table 1.

Table 1. *Theme Categories in the Mechanical Engineering RAs (per 10000 T-units)*

	Subject	Adjunct	Compl.	Dep. clause	Verb	Predict. Theme	Them. equa.	Extrap.	There	Wh-word
Mechanical engineering 1965-1975	6346.23	2124.18	27.35	754.65	195.5	9.11	1.01	470.01	68.88	3.03
Mechanical engineering 2005-2015	6512.43	2285.58	9.49	551.93	281.66	4.43	3.16	281.03	65.19	5.06
Total	6448.52	2223.52	16.36	629.89	248.52	6.23	2.33	353.7	66.61	4.28

According to Table 1, the most frequent categories in the mechanical engineering RAs in both periods are subject, adjunct, and dependent clauses, while the least frequent ones are thematic equatives, Wh-word, and predicated Themes. Self-mentions were 6.27% of the subjects and 3.9% were themes referring to other writers. Dependent clauses, as the third most frequent category, form only 6.2% of the Themes. Besides, 77.77% of the existential clauses were positive and 22.23% were negative.

As mentioned before, the composition and status of the Themes were also examined in the first phase. The results for the mechanical engineering RAs are presented in Table 2.

Table 2. *Theme Composition and Status in the Mechanical Engineering RAs (per 10000 T-units)*

		Theme status		Theme composition	
		Unmarked	Marked	Simple	Multiple
Mechanical engineering	1965-1975	6544.77	3455.22	8058.14	1941.85
Mechanical engineering	2005-2015	6800.43	3199.56	7974.55	2025.44
Total		6702.11	3297.88	8006.7	1993.29

As Table 2 reveals, in the mechanical engineering RAs, the simple Themes greatly outnumber the multiple ones. Among the latter during both periods, the textual Themes were the most frequent and outnumbered the interpersonal ones by a significant margin (90.1% vs. 9.9%). Moreover, the unmarked Themes were more prevalent than the marked ones.

To see if the differences in the status and composition of Themes between the two periods are significant, two Chi-square tests were run (Tables 3 and 4).

Table 3. *Chi-Square Test for Theme Status in the Mechanical Engineering RAs of Two Periods*

	Value	df	Asymp. sig. (2-sided)
Pearson Chi-Square	14.643	1	.000
Likelihood ratio	14.646	1	.000
Linear-by-linear association	14.643	1	.000
N of valid cases	20000		

As evident from the table, since the p-value is less than 0.05, the first null hypothesis is rejected, and thus a statistically significant difference exists in the Theme status of mechanical engineering RAs between the periods 1965-1975 and 2005-2015. In both, unmarked themes outnumbered marked themes; however, marked themes were comparatively more common in 1965-1975.

Table 4. *Chi-Square Test for Theme Composition in Mechanical Engineering RAs of Two Periods*

	Value	df	Asymp. sig. (2-sided)
Pearson Chi-Square	2.166	1	.141
Likelihood ratio	2.166	1	.141
Linear-by-linear association	2.166	1	.141
N of valid cases	20000		

The Theme composition of mechanical engineering RAs does not exhibit a significant difference between the two periods. In both, simple Themes heavily outnumber multiple ones.

4.1.2. Themes in the Horticulture RAs

Sixty horticulture RAs of 1965-1975 comprised 5217 T-units and those of 2005-2015 had 10451 T-units. The total number is 15668 T-units. Table 5 contains the adjusted data.

Table 5. *Theme Categories in the Horticulture RAs (per 10000 T-units)*

	Subject	Adjunct	Comp.	Dep. clause	Verb	Predi. them.	Them. equa.	Extrap.	There	Wh-word
Horticulture 1965-1975	7316.46	1780.71	13.41	438.94	11.5	9.58	3.83	287.52	136.09	.91
Horticulture 2005-2015	7635.6	1703.18	6.69	345.42	6.69	1.91	.95	190.41	106.2	.91
Total	7529.35	1729	8.93	376.56	8.29	4.46	2.55	222.74	116.6	.91

As the results indicate, subject, adjunct, and dependent clauses are the most frequent Theme categories in the horticulture RAs in both periods, while the least frequent ones are Wh-word, thematic equatives, and predicated Themes. Self-mentions were 1.5% of the subjects and 2.44% were thematization of other writers. Dependent clauses, the third most frequent category, form just 3.7% of the Themes. It should also be mentioned that 67.58% of the existential clauses were positive and 32.42% were negative.

The results for the composition and status of Themes in the horticulture RAs are presented in Table 6. Across both periods, the simple Themes vastly outnumber the multiple ones. Among the latter, the textual Themes are notably more prevalent than the interpersonal ones (90.34% vs. 9.66%). Besides, the unmarked Themes are much more frequent than the marked ones.

Table 6. *Theme Composition and Status in the Horticulture RAs (per 10000 T-units)*

	Theme status		Theme composition	
	Unmarked	Marked	Simple	Multiple
Horticulture 1965-1975	7333.71	2666.28	8407.13	1592.86
Horticulture 2005-2015	7647.11	2352.88	8080.56	1919.43
Total	7542.76	2457.23	8189.3	1810.69

To check if there are significant differences between these frequencies, two Chi-square tests were run (Tables 7 and 8).

Table 7. *Chi-Square Test for Theme Status in the Horticulture RAs of Two Periods*

	Value	df	Asymp. sig. (2-sided)
Pearson Chi-Square	26.059	1	.000
Likelihood ratio	26.072	1	.000
Linear-by-linear association	26.058	1	.000
N of valid cases	20000		

Table 8. *Chi-Square Test for Theme Composition in the Horticulture RAs of Two Periods*

	Value	df	Asymp. sig. (2-sided)
Pearson Chi-Square	36.706	1	.000
Likelihood ratio	36.751	1	.000
Linear-by-linear association	36.705	1	.000
N of valid cases	20000		

The results show statistically significant differences: Although unmarked Themes are more frequent in both periods, marked Themes were more common in 1965-1975. A marked Theme from the corpus is as follows, where an adjective phrase, rather than the subject, is the Theme.

> [7] *Most striking* is the fact that kinetin in the supraoptimal concentration of 5×10^{-10} M, inhibitory for the germination also reduced the inhibition brought about by Phosfon D as measured after the first 24 hours. (BIOLOGIA PLANTARUM 1967, p. 217)

Similarly, while in both periods, simple Themes outnumber multiple ones, in the second interval, multiple Themes are far more common than those in the first period. In other words, compared with the older horticulture RAs, in the recent ones, the multiple Themes are noticeably more frequent.

4.2. The Second Phase

In the second phase, we identified the TP patterns based on McCabe's (1999) model, which includes four patterns. Initially, we employed the original model; however, as the analysis progressed, we frequently encountered a modified form of constant Theme progression. This variant, identified by Hawes and Thomas (1997), is referred to as *constant Theme plus gap* (Hawes, 2015). Within this variation, one or more unrelated T-units are interposed between T-units that maintain a constant Theme. Example 8 from the corpus shows this pattern.

> [8] *This method* was evolved by Brazier (9) specifically for convective heat transfer problems in which CS≫CN and CW≫CE in the computing eq. (A.21) for a node. *The method, which is applicable to formulation A*, is summarised in Appendix 6. *In the rest model for this work* all the computing coefficients are of the same order, *but the method* was initially applied directly to the test set of 100 equation. (Computer Methods in Applied Mechanics and Engineering 1975, p. 320)

Additionally, we identified a novel pattern that essentially represents the inverse of the split Theme pattern and involves the amalgamation of the Themes from multiple consecutive T-units to generate the Theme of the following T-unit. We name this the *convergent Theme progression* pattern, which is illustrated by Example 9 from the corpus.

> [9] *A thin sheet of elastomer* is first prestretched, *crossed-wire electrodes* are then attached to the two surfaces of the elastomer, *and both the elastomer and the electrodes* are embedded in a stiff polymer. (Journal of Mechanics and Physics of Solids 2015, p. 53)

Thus, here the results of the study's second phase are shared, organized by six patterns along with the number of peripheral Themes.

4.2.1. TPs in the Mechanical Engineering RAs

Of 9872 T-units in the mechanical engineering RAs of 1965-1975, 4600 were involved in the TP patterns and the rest, 5272 T-units (53.4%), were peripheral. Moreover, 274 T-units (2.77%) took part in more than one pattern and, thus, were counted more than once. As regards the mechanical engineering RAs of 2005-2015, out of 15799 T-units, 7122 T-units were identified within the TP chains and the rest, 8677 T-units (54.92%), were peripheral. Out of the former, 849 T-units (5.37%) participated in multiple patterns. To see how different types of TPs were distributed in the mechanical engineering RAs, the results are presented in Table 9.

Table 9. *TPs in the Mechanical Engineering RAs (per 10000 T-units)*

	Simple linear	Constant theme	Constant theme gap	Split rheme	Split theme	Convergent theme
Mechanical engineering 1965-1975	588.23	317.02	37.72	25.59	22.90	8.54
Mechanical engineering 2005-2015	599.46	286.96	43.62	29.53	38.03	2.40
Total	595.28	298.15	41.43	28.07	32.40	4.67

According to the table, in the mechanical engineering RAs, the most frequent TP patterns are simple linear and constant theme while the least frequent pattern is the convergent theme pattern. The results of a Chi-square test, Table 10, show that no significant difference among the patterns in the mechanical engineering RAs across the two periods is observed.

Table 10. *Chi-Square Test for TPs in the Mechanical Engineering RAs (per 10000 T-units)*

	Value	df	Asymp. sig. (2-sided)
Pearson Chi-Square	10.459	5	.063
Likelihood ratio	10.862	5	.054
Linear-by-linear association	.200	1	.655
N of valid cases	2000		

4.2.2. TPs in the Horticulture RAs

Out of 5217 T-units, 2804 T-units in the horticulture RAs of 1965-1975 formed patterns, and 353 (6.76%) of them were counted more than once. The remaining 2413 T-units, 46.25% of the T-units in the horticulture RAs of 1965-1975, were not identified as parts of any patterns. In the horticulture RAs from 2005 to 2015, out of 10451 T-units, 6141 participated in TP chains, while the remaining 4310 T-units (41.24%) were classified as peripheral. The frequencies of the patterns are reported in Table 11.

Table 11. *TPs in the Horticulture RAs (per 10000 T-units)*

	Simple linear	Constant theme	Constant theme gap	Split rheme	Split theme	Convergent theme
Horticulture 1965-1975	451.46	412.23	43.88	37.24	50.54	4.65
Horticulture 2005-2015	463.73	401.40	35.15	43.15	53.70	2.87
Total	459.74	404.93	37.99	41.23	52.66	3.45

As seen in Table 11, in the horticulture RAs, simple linear and constant theme patterns were the most frequent, whereas the least common was the convergent theme pattern. The results of the Chi-square test indicate that there is no significant variation in these patterns within the horticulture RAs across the two periods.

Table 12. *Chi-Square Test for TPs in the Horticulture RAs (per 10000 T-units)*

	Value	df	Asymp. sig. (2-sided)
Pearson Chi-Square	2.395	5	.792
Likelihood ratio	2.403	5	.791
Linear-by-linear association	.035	1	.852
N of valid cases	2000		

5. Discussion

The findings of this study delineate the patterns of Theme selection in RAs from two disciplines and aligns with the existing literature in confirming the typical occurrence of certain thematic forms, particularly simple and unmarked Themes. They give a thematic profile of the RA genre as "the texts belonging to the same genre present a similar contextual configuration, that is, they show common characteristics in linguistic elements related to the field, mode, and tenor of discourse" (Shokri, 2015, p. 150). In the RAs of the two disciplines, the most frequently employed Themes were

subjects, adjuncts, and dependent clauses, in descending order of frequency, whereas thematic equative and predicated Themes exhibited the lowest prevalence. The predominance of subjects as the most frequent Theme throughout the corpus corroborates Halliday and Matthiessen's (2004) observation about the overlapping of Theme and Subject as a characteristic of declarative clauses. It is also noteworthy that, although subordinate clauses ranked third in frequency among Themes, their occurrence was considerably lower compared to the first two categories, constituting only a small proportion of the Themes in the articles. This finding aligns with the results reported by Lovejoy (1991) that in disciplines with complex topics like biology, writers tend to use fewer subordinate clauses as Themes to maintain readability through simpler sentences.

Furthermore, across the two disciplines, the frequency of textual Themes significantly exceeded that of interpersonal Themes. This is in line with the findings reported in earlier research on RAs from different disciplines (e.g., Khany & Mansoori Nejad, 2010; Whittaker, 1995), with the RA being an analytical genre seeking objectivity. Textual Themes play a crucial role in producing coherent texts, and their prevalent use reflects proficiency in academic writing (Mellos, 2011). The scarcity of interpersonal Themes can also be interpreted as a marker of increased impersonality within the texts (Martı´nez, 2003) as well as "authority and distance" (Eggins, 2004, p. 322).

Regarding the TP patterns, a new variation was detected within the corpus, which is termed the convergent theme. The discovery of new patterns enables researchers to fine-tune current frameworks and gain a deeper understanding of coherence. Concerning the manifestation of these patterns, our analysis revealed that the linear progression and the constant theme pattern overwhelmingly dominated the two corpora of RAs. This observation aligns closely with the findings of Khany and Mansoori Nejad's (2010) investigation into applied linguistics RAs and partially corroborates Nwogu's (1997) results, which highlighted the constant theme as the predominant pattern in medical RAs. The simple linear pattern gives a hierarchical and cumulative presentation of information in texts while the constant theme pattern, as a basic development method, creates a clear and strong topical focus in texts (Eggins, 2004) and can be important in persuasive discourse (Hawes, 2015). Thus, we see how the RA as a scientific information-oriented genre is characterized by the heavy use of typical thematic choices including simple unmarked Themes and the TP patterns of simple linear and constant theme to structure the text and achieve continuity and cohesion.

In the diachronic analysis, the two time periods were associated with differences in the thematic choices in the RAs. The mechanical engineering RAs included far more unmarked Themes than marked ones in both time intervals, but comparatively, in the 1965-1975 interval, marked Themes were more commonly used. This was also true about the horticulture RAs. As the pressure to publish articles in English has increased in recent years and a competitive academic environment has been created, the Theme position with its potentials can be exploited in this regard (Montemayor-Borsiner, 2001). Thus, using less marked Themes in the 2005-2015 articles can show the writers' tendency to write the articles more simply to attract more readers in the era when they face large amounts of input and may skim texts rather than reading them carefully (Hawes, 2015). Of course, other influential factors like changes in the focus of research in disciplines and in the interests of researchers (Banks, 2008) may be behind this decreased use of marked Themes, but they are beyond the scope of this research to investigate.

With regard to the Theme categories, while in the mechanical engineering RAs of 2005-2015, the occurrence of self-mentions as Themes substantially exceeded that of references to other researchers, in the 1965-1975 interval, the latter outnumbered the former. The high frequency of self-mention as Themes in the recent articles is in line with the results of Hyland (2001) who found that in the RAs of a group of soft and hard disciplines including mechanical engineering, first person Themes were common. He states that the thematization of author in RAs makes him or her a visible agent in the research process and has a persuasive effect, and specifically in the science and engineering papers shows "a more authoritative stance" (p. 219). The lower frequency of thematic selection of authors in the early mechanical engineering papers may be related to the dominant view of RA as a forum for presenting abstractions and producing information (Biber, 1988) in that period and to the fact that until relatively recently, scientific writing was primarily regarded as an objective representation of an independently existing external world (Hyland, 2001). Unlike Theme status, Theme composition and TP patterns were not distinguishing features in the sampled mechanical engineering RAs.

In the case of horticulture RAs, while in both time intervals thematizing other researchers was far more common than self-mentions as Theme, in the 1965-1975 articles, the difference was considerably larger. It seems that unlike the authors of mechanical engineering RAs, the writers of horticulture RAs still mainly regard RAs as a forum for presenting

their work as science, and by thematizing other writers more commonly, they try to connect their work to other related work to give a constructed view of knowledge. Yet, a slight increase in the number of thematic self-mentions in the recent papers can signal a move towards adopting the new views of scientific discourse, especially in a competitive academic environment where writers need to present themselves as credible members of the discipline (Hyland, 2001). Another finding of the current study is that positive *there* clauses occurred with greater frequency than the negative ones in both periods, but comparatively, in the 2005-2015 interval, the negative existential clauses occurred more frequently. This could be a sign of more consideration of readers' expectations and a more reader-aware writing in the current academic contexts. Besides, while in both time periods, simple Themes were significantly more prevalent than the multiple ones, compared with the early RAs, in the recent RAs, the multiple Themes were noticeably more frequent. This could be explained by the greater establishment of the discipline. Unlike the Theme status and Theme composition, TP was not a distinguishing feature in the horticulture articles sampled in the two time periods.

6. Conclusion

The current study shows the application of Halliday's SFL theory to authentic written discourse to investigate the construction of texts. The findings also reveal characteristic patterns of Theme selection in English, particularly in scientific texts. Further, the commonalities between the RAs of the two disciplines can reflect the profile of RA as a genre since Theme-Rheme analysis as a means of genre identification can assist us with establishing the features of a genre and distinguishing it from other genres (Vande Kopple, 1991). In this regard, diachronic discourse studies can provide insights which complete the findings of synchronic investigations. In the case of RA, the studies show that although several formal features of the genre have changed over time, the genre stays the same and, in fact, its generic label remains unchanged (Shokouhi & Kamyab, 2004). Yet, with historical context being among the defining features of "communication situation" in discourse (V Muradova, 2023, p. 250), changes in the features of the genre through history reflect the authors' attempts to respond to both academic and non-academic changes in wider communities. This can range from the changing views of science and scientific work to the internal efforts of disciplinary communities at establishment to the professional demands of academic communities. Given the findings of the diachronic part of the analysis, this work confirms the contributions such analyses can make to the related body of discourse research. They help us put science and its different elements like scientific discourse in perspective, and examine the forces affecting scientific units and endeavors. The results of this research can also serve disciplinary research. Because of their significance, disciplines have been studied for a long time with different perspectives, and have been among popular research trends in ESP (Ghanbar & Rezvani, 2024).

At a more practical level, the current study can have pedagogical implications, too. First, the Theme-Rheme construct plays a significant role in text structuring. Therefore, the findings of studies like this can be used to inform the design of both general and technical writing courses and enrich their content and processes by contextualizing them (Hernandez, 2023). In this respect, the findings about TP patterns are especially important as according to Alonso and McCabe (1998), EFL teachers mostly just focus on grammatical errors at the clause level and overlook errors that result in incoherent discourse. To enable learners to write cohesive texts, writing instructors should direct the students' attention to the development of information in texts (Alonso & McCabe, 2003), and raise their awareness of them in RAs. In the same vein, writing materials can benefit from the studies on thematic organization of texts by providing learners with authentic language examples (Shahab et al., 2018). Second, as studies have shown how the Theme-Rheme construct affects the readers' judgments about the quality of texts, as long as it is included in writing courses, it should also be included in the criteria for writing assessment. It can complete other conventional yardsticks of writing evaluation. It is helpful to relate the construct to certain genres like the RA and then evaluate the writings against the requirements of the genre, especially since research shows writing assessment can be focused excessively on grammar at the expense of discourse (Martín-Monje & Barcena, 2024). Third, as this study included two disciplines, its findings can feed EAP reading and writing courses, especially in genre-based courses. Finally, considering the diachronic analysis, the findings of this study may inform richer academic writing instruction since knowledge of contextual processes of discourse construction, rather than simply being exposed to discourse, can help learners develop an in-depth understanding of discourse in their disciplinary communities. Such instruction can focus on "the historically-situated concerns of disciplinary practice" (Dressen-Hammouda, 2019, p.102). This is especially true about SFL-based studies as SFL delves

into different social and contextual factors and constraints of meaning-making (Don, 2021), and has been drawn upon for genre-based pedagogy (Jodairi Pineh, 2022).

This study took a genre-based approach to Theme-Rheme analysis and parts of our findings are explained with reference to the concept of genre. However, as McCabe (1999) suggests, to establish whether the explanation for the differences in the thematic choices is, in fact, because of the genre, it would be useful to compare the findings with those about other genres. Besides, for the diachronic part of the analysis, the researchers had to determine the time periods based on not only the publishing status of the journals and the publishing tradition of the disciplines but also their own access. Diachronic studies should also be combined with other research approaches like in-depth interviews to conclude with reliable explanations for their findings (Dressen-Hammouda, 2019). Therefore, future researchers interested in conducting diachronic discourse analysis may include longer time periods in research on Theme in different genres and sub-genres using a mixture of research approaches.

Author Contributions

The first author did the data analysis which was checked by the second researcher. The second author was also in charge of supervising the whole research process.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Appendix

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