

The Effects of Using Scientific Genre to Promote Undergraduate Students' English Academic Writing in an ESP Course

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Abstract

Argumentative writing is problematic for Thai EFL learners. This study aims to determine the effects of an argumentative correspondence writing course in an ESP for Science classroom. The course was designed from the genre-based approach, including stance and engagement by Hyland (2005) and ESP material design by Hutchinson and Waters (1987). The experiment involved 40 participants studying in a science field in a public university in Thailand. The study used a one-group pretest and posttest design. The research instruments were a knowledge test and a writing test for scientific argumentative correspondence. The results revealed statistically meaningful differences between the pretest and posttest scores, indicating that the students increased their abilities and gained higher test scores through completing the course. The findings suggest that instruction of writing scientific argumentative correspondences is effective and should be included in ESP science courses, especially as a foundation for writing longer texts in scientific genres.

Keywords: Genre-based, ESP, EFL Writing, Scientific correspondences

1. Introduction

1.1 Statement of the Problem

Learners of English as a foreign language (EFL) encounter numerous problems with all four skills (listening, speaking, reading, and writing), but the problems are more pronounced in writing (Al-Sawalha & Chow, 2012; Rahmat, 2020a), and they can be observed at all levels. At the micro-level, i.e., within paragraphs, difficulties are found with ensuring internal unity, thematic coherence, and organization of argument, among others. At the text organization level, i.e., the inter-paragraph level, students may exhibit inconsistencies regarding generic structure, points of view, balance of moves, highlighting key moves, arrangement of paragraphs, and presenting a persuasive conclusion, among others (AlTameemy & Daradkeh, 2019; Changpueng, 2009; Seensangworn & Chaya, 2017). Furthermore, at a much broader level, students have difficulty developing ideas in the first place, organizing their thoughts effectively, and completing the writing on time (Changpueng, 2009; Seensangworn & Chaya, 2017). Generally, writing is a cognitive process that demonstrates the writer's recollection, thinking competence, and capability for expressing ideas (Bryne, 1988). Thus, composition of a high-quality text in EFL is a clear manifestation of learning achievement in a foreign language (Kellogg & Raulerson, 2007).

While writing is an important element of linguistic competence to acquire at the tertiary level for a successful career (Raus, Malik, Rahim, Rosly, Sui-Lin, & Rahmat, 2023), Thai university students have been assessed as having considerable writing problems, and they have often been found to struggle with lack of grammatical competence (Boonyarattanasoontorn, 2017). In Thai university courses, academic articles are rarely used as target texts, and, as Bunyavejchewin (2017) notes, publishing response articles or correspondences has not been a popular practice in Thai academic journals.

Writing an academic article is a challenging yet very fulfilling endeavor (Kotz 2007). Most academic articles with high visibility are written in English, since they aim for wider audiences among the international scientific community. In this light, establishing guidelines for writing any kind of journal article will enable novice writers and researchers to compose their first academic article with relative ease, especially when writing correspondences in scientific journals with strict word count limits. Therefore, instruction for writing correspondences bears significance in ESP for students in scientific fields.

Problems and challenges in EFL writing result from numerous factors including students, teachers, and learning contexts. Students face a variety of challenges that impede efficient learning, such as the effects of L1 transfer, lack of reading, inadequate encouragement, and insufficient training. Lack of motivation is also named as a factor, sometimes caused by novice writers' insecurity about the value of their composition in the second language (Darling & Liang-Itsara, 2018; Dörnyei, 2005; among others). Similarly, teachers might lack effective instructional approaches to teaching writing, which involves sufficient stimulation, adequate feedback, and accurate evaluation of students' work. Furthermore, most teachers' greatest deterrent to effective writing instruction is reluctance to initiate and manage a writing course (Matsuda, 2023). Additional factors include large class sizes that impede structural and communicative efficiency of the students' writing

(Pineteh, 2014), inadequate textbooks that fail to bolster writing skills or provide opportunities for students to practice, and are not motivating for students (Haider, 2012), as well as excessive exam-oriented language preparation, especially in Asian EFL contexts, where emphasis is on achieving higher scores on exams through mostly rote memorization (Mansoor, 2005).

In view of these unfavorable factors, it is imperative to help students discover adequate and suitable original information, learn to paraphrase and summarize, and utilize appropriate academic writing patterns (Kalikokha, 2008). It is of particular importance that teachers, though unable to revolutionize education at large, can nonetheless boost students' writing ability by promoting enthusiasm, passion, and pleasure for writing (Graham & Perin, 2007). In addition, employing effective teaching approaches and creative tasks can trigger students' sustained interest in writing and motivate them to choose writing topics for supplementary practice (Pineteh, 2014). Properly timed rehearsals involving deliberate physical and cognitive skills enable writers to gain competence in language and content use, which facilitates the development of students' writing styles (Kellogg & Raulerson, 2007).

Given this background, the present study intends to foster the development of writing instruction conducive to enhancing the writing ability of EFL learners, particularly students in scientific fields. A further benefit is that as writing skills in the structured scientific genre develop, reading skills can also be enhanced due to the deep interrelation between the two skills (Atayeva, Putro, Kassymova, & Kosbay, 2019; Rahmat, 2020b). This study's contribution to the instruction of correspondence writing patterns and writing argumentative articles, especially in Thai ESP contexts, potentially extends to other EFL nations and cultures.

1.2 Importance of the Problem

As illustrated above, the problems addressed in this paper primarily relate to the significance of writing in EFL contexts, training scientific correspondence writing through genre-based instruction, and development and implementation of teaching material. In current Thai ESP contexts, the importance of these issues is self-evident.

While the need for English is universal for living and working in the contemporary globalized world, English has a particularly strong impact on scientific fields, because the discourse community in these fields, including scientific researchers and students, commonly read and write scientific documents in English. Thus, it is crucial that members of scientific fields combine English language competency with specialized content knowledge in order to produce acceptable academic work in their discourse community (Tampanich, 2016).

In a series of seminal works, Hyland (2002a, 2002b, 2005, in particular) has noted that there is an increasing interest in applying genre concepts to language teaching and learning, and this application requires comprehension of the relationship between language and its usage contexts. The purpose of this application is to utilize these concepts and principles in service of language and literacy pedagogy. In particular, genre theories are useful with regard to research and instruction in diverse scientific genres. John Swales, the pioneering researcher of genre studies, presented the first genre-based analysis in 1981 and offered a four-move model. He affirmed that introductions in articles comprise a series of moves in a certain sequence and that each move contains several phases. Expository and argumentative writings are the most challenging genres as compared to information reports, personal anecdotes, and narrative genres (Derewianka, 2003). Among diverse methods for instructing genre, special emphases have been given to employing simpler lexis, adequate grammar, and persuasive rhetorical organization with shorter texts (Derewianka, 2003). Argumentative genre illustrates an essential claim and its supports, elicited from verifications and justifications. In this genre, writers attempt to prove that their point of view, theory, or hypothesis about a particular point is correct or more reliable than that of other writers (Azizi & Ghonsooly, 2015), hence the significance of move-based argumentative genre instruction.

Another important aspect of argumentative genre instruction is the linguistic elements for enhancing persuasive power, i.e., rhetorical features. Successful argumentative writing results from learning and utilizing not only general grammatical and structural patterns, but also precise vocabulary, sentence characteristics, and interactional strategies between writers and their audience (Hyland, 2002a, 2002b, 2005). In other words, writers need to make rhetorical choices to evaluate propositions and persuade the audience. Hyland's model of interaction (2005), consisting of stance and engagement markers, bears significance in metadiscourse, which lies beyond the propositional level. The structure of the writing reflects the writer's attempts to negotiate academic knowledge in ways that are meaningful and appropriate to a particular disciplinary community. It also expresses the writer's assessment of the cognitive demands the text makes on the reader and an acknowledgement of the community's interpersonal conventions (Hyland, 1998).

The significance of the problem as addressed in this paper relates to the context of Thai EFL and ESP. Thailand is categorized among low English proficiency countries. For instance, the most recent English proficiency index dated 2022 rates Thailand 97th out of 111 countries, with an average CEFR score of 423 (upper half of B1), indicating a 'very low' proficiency level. In terms of individual cities' ratings, Bangkok, the capital of Thailand, is rated as a 'low' English proficiency city, represented by a CEFR score of 483 (EF, 2022; for literature on the cause of low proficiency, see Ruanklai & Yodmonkol, 2017; Sasum & Weeks, 2018; et al.). Furthermore, there is a regionality issue within Thailand. The northern region is less populated than the eastern, southern, or the middle parts, where English is considered necessary for interaction in commercial contexts and with tourists. Students in the northern area, therefore, generally lack enthusiasm to study English because they do not perceive its usefulness in their immediate environment. Consequently, students in universities in rural areas of Thailand generally have lower English proficiency than those in urban areas. An extension of this problem can be seen in non-English majors, who experience even more difficulties in attaining proficiency in English than do English majors because of less exposure to the language. Similarly, students majoring in science fields experience difficulties using English in their field of expertise, mainly due to the relatively weaker emphasis on English for academic purposes in their curriculum. For this reason, the present study

targeted a university in the northern rural region of Thailand, focused on students majoring in science, and involved writing correspondences in scientific journals as the subject area for intervention. This study thus bears significance by investigating whether low-proficiency students in science fields at a rural university attain improvement through the intervention of a scientific correspondence writing course, short in length but highly cohesive in structure, with a design incorporating diverse considerations informed from earlier studies.

1.3 Relevant Scholarship and Literature Review

1.3.1 Materials Design

Designing teaching materials is among the most important and laborious of educational processes. According to Jones (1990), needs analysis, materials research, and material development are necessary elements to which ESP instructors should devote their preparation. Authentic materials, which have been developed by practitioners of English as a Second Language (ESL), English as a Foreign Language (EFL), and ESP of various specializations are useful resources for designing specific ESP materials. It is imperative that the material developers carefully consider incorporating elements of occupational competence, generalized academic skills, as well as general communicative competence (Gatehouse, 2001). At the same time, as Hutchinson and Waters (1987) noted, teaching materials should motivate and stimulate students to learn.

Teaching materials must assist the teaching and learning process and support appropriate patterns of language application. Hutchinson and Waters (1987) have suggested seven step-by-step procedures for constructing learning materials: (i) conducting needs analysis, (ii) writing the syllabus, (iii) developing the materials, (iv) developing a teaching methodology, (v) trying out the materials, (vi) evaluating the materials, and (vii) revising the materials. The material design model overarching these procedures consists of four components: input, content, language focus, and task.

1.3.2 Genre-based Approach

Since genre is either a determined pattern of language use or activities for communication among particular discourse community members (Swales, 2004; Hyland, 2008), genre-based approaches focus on the ways that audience and purpose shape the organization or staging of texts belonging to a particular genre, as well as the kind of language used (White, 2018). Genre-based approaches consist of five significant traits: (i) exhibiting a clear pedagogy which displays what points or themes are to be studied; (ii) demonstrating how language use varies due to the conditions and circumstances; (iii) perceiving teaching as facilitation or correlation; (iv) highlighting the purpose of instruction as preparing students; and (v) promoting the investigation of the ways that texts are organized (Hyland, 2008).

In language teaching, the genre-based approach plays an important role because it emphasizes language use in particular social and cultural situations, and it studies the patterns of rhetorical organization as well as lexico-grammatical purposes of particular text types (Paltridge, 2001; Pryde, 2015). The genre-based model consists of three main teaching procedures: (i) building knowledge in which teachers provide applicable vocabulary and help students in their explorations of specific topics; (ii) joining construction of knowledge in which specific text structures and functions will be identified; and (iii) constructing knowledge in which students compose their writing by applying their exposure and gained experiences from the previous phases (Painter, 2001; Paltridge, 2001; Pryde, 2015).

In order to prepare a syllabus for a genre-based class, instructors first need to identify the genre which students will need to produce as well as the socio-cultural context in which they will produce it. Next, instructors should record or gather samples of the genres, and finally, they should develop units of work related to these genres (Burns & Joyce, 1997). Derewianka (2003) has stressed the practical importance of using simpler lexis, grammar, rhetorical organization, and shorter texts. To teach expository or argumentative genres, certain essential components of typical language and text organization need to be considered, specifically, for text organization, opinion structure, reaction, evidence, and suggested resolution, etc., and for sentence production, passive/active voice for verbs, formal lexis, complex sentences, and linking words, etc. (Derewianka, 2003). With mastery of these major components, instructors of genre-based writing can enable their students to comprehend a writers' organization and patterns for particular texts, and, further, to get involved with the professional world of genre-writing in their field of study.

1.3.3 Argumentative Writing

Correspondence as a textual genre is a type of writing involving noteworthy re-reasoning of previously published articles, books, or any expository writing in the same or different journals. This type of text belongs to the category of response articles, and is characterized by reflective discussion. Gee (2017) has noted that reflective discussion essentially incites readers' appreciation for discovering how others reflect on the expressed ideas. Two notions are relevant to reflective discussion: (i) requesting ideas and values to support beliefs and opinions, and (ii) negotiating with other people who have different ideas concerning similar sorts of topics and actions. For these reasons, correspondence should be objective, constructive, and purposeful, and, in addition, provide new or useful information that deserves publication, or provide supplementary, novel perspectives or knowledge of a previously published text (Peh & Ng, 2010).

As a general principle, attention to logical thinking and argumentation should be promoted in writing, because readers first have to determine whether the propositions known or believed in most disciplines are true (Hillocks, 2010). Furthermore, crucial skills for students' academic achievement are competence in determining a critical argument and its claim, justifications, and evidence through reading, as well as the skill to compose an excellent argument and its claim, justifications, and evidence in writing (Newell, Beach, Smith, & Van Der Heide, 2011). The argumentative genre presents an essential claim and supports it using an argument derived from evidence

and warrant. In this type of genre, writers attempt to persuade readers in a direct and straightforward way to adopt their point of view (Azizi & Ghonsooly, 2015).

While argumentative writing is of great importance in academia, students, especially EFL students, generally encounter great difficulties with it. Further, argumentative writing remains an under-researched area in ESL/EFL writing (Pessoa, Mitchell, & Miller, 2017). The underrepresentation in research and the consequent lack of application of research findings account, in part, for ESL/EFL students' inadequacy in terms of familiarity and knowledge of the genre and low genre-specific language proficiency (Zhang, 2018).

1.4 Research Questions

In order to test the efficacy of implementing a writing course in the genre of scientific argumentative correspondence, incorporating linguistic and rhetorical features, this study was conducted to answer the following research questions:

RQ1: Is there a significant difference in the writing knowledge test between pretest and posttest?

RQ2: Is there a significant difference in the quality of writing before and after the intervention?

2. Method

2.1 Research Design

The study used the one-group pretest-posttest design, also known as 'a quasi-experimental research design' (Johnson & Christensen, 2019); thus, there was no control group. The absence of a control group was largely due to logistical reasons, namely that all classes had to be conducted online as part of the COVID-19 pandemic measure. In order to ensure the obtainment of valid data, the subjects were provided with a pretest, followed by the intervention, and last with the posttest, in that order (cf. McMillan & Schumacher, 2010). The pretest and posttest consisted of the same content, and were administered at different times. The duration of the intervention was 10 weeks, or 30 hours.

2.2 Participant (Subject) Characteristics

The participants of the intervention were 40 students aged between 18 and 23 years, consisting of 31 female and 9 male students. All were 4th year students studying Occupational Health and Safety at a university in northern Thailand. Their participation in the study was in the 1st semester of academic year 2021. They had registered in the English for Specific Purposes course as a compulsory course. The interventional course, titled Writing Argumentative Correspondences in Scientific Contexts, focused only on writing skills. The students voluntarily participated in this experiment as an extra course activity, without implication on their regular course grades.

2.3 Sampling Procedures

2.3.1 Tools

In order to assess the achievement of the participating students, this study made use of two types of tests: a scientific correspondence writing knowledge test and a scientific correspondence writing test, each administered before and after the intervention.

The knowledge test was a multiple-choice test composed of questions regarding students' knowledge of academic correspondence writing. In order to prove the course effectiveness in terms of the students' progress, the students were required to complete the pretest and posttest as assessments of the degree of improvement that occurred through attending the course. The pretest and posttest were designed in an equivalent form using the goals and objectives of the course as the scope of the tests.

The knowledge test consisted of two parts. Part 1 of the test was a writing component for genre-specific features, and was based on the components of the ESP test: target language use (TLU), language ability, background knowledge, and principles of the genre-based approach (GBA) (Bachman & Palmer, 1996; Douglas, 2000; Hyland, 2005). Therefore, all the areas of language ability and background knowledge were chosen to be reflected in the test. The test was a four-point multiple-choice test consisting of 20 items, and was constructed closely following the genre-based study with detailed rubric by Changpeung (2009), with the aim of measuring five aspects: (i) background knowledge, (ii) functional knowledge, (iii) textual knowledge, (iv) sociolinguistic knowledge, and (v) grammatical knowledge. Part 2 of the knowledge test consisted of 10 four-point multiple choice items aiming to assess reading knowledge and comprehension. The targets of the assessment were: students' reading comprehension, identification of main idea, and definitional knowledge of the vocabulary used in the text.

The test design was evaluated by three experts to ensure content validity and assess consistency between the questions and objectives. The evaluators assigned points for each item according to Ritjaroon's (2012) three-point scheme, consisting of +1, 0, and -1, based on each item's degree of conformity to the course objectives. The results of the expert review were calculated to obtain the conformance index between the test and its objectives. A content validity index score of 0.50 or higher was required to ensure consistency between the test questions and objectives (Pinyoanunthaphong, 1983). The test designed for this study showed an index of 0.87, confirming high content validity.

In addition to the measures taken to ensure validity of the knowledge test, it was also subjected to a reliability test wherein it was piloted with 30 university students in scientific fields whose language ability was comparable to that of the participants in the intervention course. The reliability of the test was examined by way of the Kuder-Richardson Formula 20 (KR-20), and the results, a KR-20 value of 0.94, indicated a high degree of reliability.

The other component of assessment of student achievement was the writing test, which consisted of a pretest and a posttest, administered before and after the treatment, respectively. The objectives of the course were used to scope the test, with an aim of measuring the students' skills in writing scientific argumentative correspondences. The construction of the test involved an adaptation of Changpheung's (2009) model of test construction. All areas of language ability and background knowledge were chosen as the constructs of the test. As was the case with the knowledge test, the writing test was developed to pass content validity measurement before being administered. The three experts who had validated the knowledge test also validated the writing test. In order to be considered valid, an IOC index score of 0.5 or higher was required. The test results indicated a content validity score of 0.77, confirming high validity.

The item analysis of this study can be explained with reference to item difficulty, because this test was a criterion-referenced test, and thus calculation of discrimination was unnecessary. The item difficulty was calculated based on Scannell and Tracey's (1975) formula for index of difficulty (IDiff). The IDiff of the test items in the present study was 0.58, falling within the appropriate IDiff index range of between 0.20 and 0.80, thus indicating acceptability of the test items without further modification.

The grading criteria (scoring scheme) for the writing test in this study were adapted from a rubric for genre-based writing in ESP for Engineering (Changpeung, 2009), which, in turn, is an adapted version of the genre-analysis principles of ESP test construction (Douglas, 2000), and the concept of language ability (Bachman & Palmer, 1996). The criteria for establishing the scoring scheme included background knowledge, functional knowledge, textual knowledge, grammatical knowledge, word choice, and sociolinguistic knowledge. In addition, since the writing was genre-specific in nature, various assessment criteria of argumentation were applied, specifically, the writing's accurate reflection of the intended message, appropriate selection of supporting ideas to which to respond, expression of the writer's own opinion, effective defense or support of the opinion, conforming to expected length of writing, following expected conventions for the argumentative genre, conveying purpose, goal, or main idea, and demonstrating rhetorical fluency (Brown & Abeywickrama, 2010).

Since two raters evaluated this test, an inter-rater reliability test was necessary (Alderson, Clapham, & Wall, 1996). The reliability of the two raters was assessed by means of Pearson's Product Moment Correlation and independent sample *t*-test. The correlation value between the two raters of the writing test was 0.96, falling between the acceptable value range of 0.5 and 1, and indicating no significant difference between the two raters; thus, their evaluations had a high level of reliability.

2.3.2 Data Collection

The data collection procedure involved a pretest and a posttest. These were used to assess students' ability before and after taking the course. The pretest and posttest contained the same test material but were administered at different times. The difference between the pretest and posttest was examined to evaluate the effectiveness of the course.

2.3.3 Experimental Intervention

In compliance with the 'new normal', enforced as part of the COVID-19 pandemic measures with respect to classroom management, classes were required to be held online. Therefore, during the intervention of the course, three online programs were used: Microsoft Teams, Microsoft Forms, and Learning Management System (LMS). LMS was the online platform for instructors in conducting their courses, assigning tasks, providing learning materials, tracking students' participation and progress, and record-keeping (cf. Ellis, 2009). The experimental tools used in the teaching implementation included teaching materials, lesson plans, and online programs.

The experimental intervention involved multiple streamlined processes, from teaching material development, course and syllabus design, implementation, and assessment.

The teaching materials were constructed through a combination of findings from a needs analysis, analysis of writing problems and errors, and results from the genre analysis of correspondences and analysis of linguistic features. The needs analysis was based on a meta-analysis of existing literature in Thai and other Southeast Asian contexts, notably research by Changpueng (2009), Fatimah (2018), and Niamsuwan (2017). The analysis of problems and errors was based on a body of literature addressing issues in Thai EFL contexts, notably Changpueng (2009), Phuket and Othman (2015), Seensangworn and Chaya (2017), Sermsook, Liamnimit and Pochakorn (2017), and Kaweera (2013). The genre analysis of correspondences and the analysis of linguistic features were based on a sample of 240 articles published in the scientific journal *Nature* between 2016 and 2019, with consideration given to Swales's (1981) four-move model as well as the stance and engagement features in Hyland's (2005) model of interaction.

Results from the preparatory analysis were used as input for material design. This procedure was performed closely following Hutchinson and Waters' (1987) material design model which consists of input, content, language, and task. In designing the course, the objectives were established first; next, various aspects of the course were described; finally, the design of teaching materials followed. The first step in creating teaching materials involved establishing objectives, and was performed unit by unit. Activities were selected and sequenced, and language used in the authentic texts, i.e., those taken from the sample correspondences published in *Nature*, were excerpted for use in each lesson's activities.

This study has closely followed the principles of ESP course design and the genre-based development process. Genre-based syllabi focus on a unit text, which is precisely tailored to an appropriate proportion, to fit an ideal language learning program for the duration of one unit, which in this study was six hours. The text for each unit in the proposed course consisted of lexical, grammatical, and rhetorical-functional items. A genre-based syllabus often emphasizes the acquisition of knowledge of syntax and lexis at the sentence

level, leading to the creation of meaning at the whole text level; it also observes the ways that meaning accumulates and evolves over a stretch of text (Derewianka, 2003). This consideration provides students with achievable and clear targets to successfully produce ideal examples of particular genres. The teaching material thus created consisted of five units: (i) components of argumentative correspondences, (ii) claim section, (iii) premise section, (iv) conclusion section, and (v) writing process for argumentative correspondences. The validity of the teaching material was measured by three experts in ESP, who had been teaching the English language in Thailand for more than 10 years.

The experimental intervention was implemented using concrete lesson plans that were designed from a combination of teaching procedures and techniques as well as the content details from the teaching materials. These were developed from the genre-based approach, explicit instruction, and Gagné and Brigg’s (1974) instructional design. In order to ensure the validity of the lesson plans, their details were reviewed and measured by three experts by means of a checklist. The instruction of each lesson lasted for three hours, with two lessons for each unit (six hours total). As a result, all of the lesson plans covering five units were implemented for 30 hours in total.

The assessment of the implementation was performed by means of various statistical devices: descriptive statistics, the Kolmogorov-Smirnov test, the Wilcoxon signed-rank test, the paired sample *t*-test, and content analysis. The Kolmogorov-Smirnov test, that quantifies a distance between the empirical distribution function of the sample and the cumulative distribution function, was used for testing normality. The Wilcoxon signed-rank test, a non-parametric statistical hypothesis test, was used to investigate the test scores before and after the study within the group of students to see if the data were distributed normally. In cases where the data were distributed normally, the paired-sample *t*-test was used to measure the scores. In cases where the data were not distributed normally, the Wilcoxon signed-rank test was used to analyze the data.

3. Results

The effects of implementing the course have been measured by a knowledge test and a writing test. As indicated in the methodology section, the data were obtained from the 40 participants enrolled in the course, which had been designed as an interventional course.

3.1 The Scientific Correspondence Writing Knowledge Test (the Knowledge Test)

The knowledge test was employed to measure the effects of the course, and consisted of a pretest and a posttest. A normality test of the pretest and posttest rendered the results shown in Table 1.

Table 1. Test of normality of pretest and posttest scores

	K-S	Sig.
Pretest	0.103	0.200*
Posttest	0.131	0.082

**p* < .05

As Table 1 shows, the *p*-values of the pretest (0.200) and posttest (0.082) were higher than 0.05, indicating that the data had normal distribution. With this established, parametric statistics could be utilized, and a paired-sample *t*-test was used to analyze the data. The test result is shown in Table 2, which indicates that there was a significant difference (*p* < 0.01) between the pretest and posttest scores, again confirming the students’ progress as a result of the intervention.

Table 2. Paired-sample *t*-test of pretest and posttest

	<i>f</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	Sig.
Pretest	40	8.32	2.48	-13.406	39	0.00*
Posttest	40	18.77	4.71			

**p* < .05, two-tailed

3.2 The Scientific Correspondence Writing Test (the Writing Test)

The writing test also consisted of a pretest and a posttest. A normality test rendered the results shown in Table 3.

Table 3 Test of normality of writing pretest and posttest scores

	K-S	Sig.
Pretest	0.270	0.000*
Posttest	0.123	0.128

**p* < .05

As shown in Table 3, the *p*-value of the pretest (0.000) was smaller than 0.05, thus rejecting the null hypothesis stipulating that the data have normal distribution. Since the data were found not to have normal distribution, the Wilcoxon signed-rank test was used to analyze the data. The test results, shown in Table 4, indicated that there was a significant difference (*p* < 0.01) between the pretest and posttest scores of the students. The set of tests clearly indicated that the students made significant progress as a result of the intervention of the proposed program.

Table 4. Wilcoxon signed-rank test

	<i>f</i>	Mean Rank	<i>Z</i>	Sig.
Posttest-Pretest	40	21.5	-5.47	0.00*

**p* < .05, two-tailed

4. Discussion

4.1 The Knowledge Test

The first research question of this study asks whether there is a significant difference in the pretest and posttest scores of the knowledge test. As shown in Table 1 in the preceding exposition, the statistical differences between the pretest and posttest scores ($p < 0.01$) clearly revealed that the students increased their knowledge about the content of scientific argumentative correspondence writings through the intervention of the designed course instruction. Since the learning process is generally complex, the components of learning, i.e., teachers, learners, syllabus, sponsors, and content, all play various roles. Thus, the students' progress could not be attributed to a single factor in the intervention, which involved consideration of multiple factors in planning and implementation. However, at the same time, it is evident that careful considerations given to material design, syllabus design, core teaching method, and students' engagement, among other factors, were conducive to increasing knowledge about the content.

The material design in this study was modeled after Hutchinson and Waters's (1987) ESP material design model. The four main components of input, language, content, and task were adopted in design structure and applied to the intervention. Balanced deployment of these major components is thought to have contributed to the students' progress. The use of authentic materials, namely, scientific correspondences from a prestigious journal, was also an important consideration in the process of creating content and activities. Authentic materials can give students the feeling of immediate relevance and enhance their motivation for learning.

Syllabus development is the first step in exploring how to teach the target material (Monteri, 2009). The present study used a genre-based syllabus design, which highlights a unit of corresponding texts of a specific genre on which to base a language learning program (Paltridge, 2001). Burns and Joyce (1997) have proposed three procedures for genre-based syllabus design: (i) identify the genres that students will need to produce and the socio-cultural context in which they will need to produce them; (ii) record or gather samples of the genres; and (iii) develop units of work related to these genres. Based on these guiding principles, the five units of the course were planned: (i) general concepts of scientific argumentative correspondences; (ii) claim; (iii) premise; (iv) conclusion; and (v) integration of reading and writing argumentative correspondences. Also considered in syllabus design was the suggestion by Derewianka (2003) that the optimal way to teach genre is to use simpler lexis, uncomplicated grammar, and straightforward rhetorical organization initially, i.e., teaching genres associated with shorter texts first. In this light, scientific argumentative correspondences are among the most suitable with their relatively short length (*Nature* stipulates a word limit of 250-500 words) and uncomplicated lexis, plain grammar, and streamlined rhetorical organization, which generally promote clarity of argumentation.

One of the defining characteristics of this study has been the adoption of explicit instruction as a core teaching method. One of the difficulties that EFL students encounter when they compose academic texts is inadequate understanding of organizing texts to convey different communicative purposes (Hyland, 2008). Therefore, explicit teaching on text organization is integral to the genre-based approach, which provides writers with an explicit understanding of how target texts are structured and why they are written in particular ways (Hyland, 2007). Explicit instruction signifies a process of teaching students skills or concepts using direct and structured training. It provides clarification of lessons by facilitating students' learning with respect to the ways of starting and succeeding on a task, and providing them with ample time to practice the activities. This insight helps students make the appropriate linguistic and rhetorical choices when they write in diversified genres.

Needless to say, the learners themselves constitute the most important factor in the success of learning because they are the agents of their education, and successful instruction depends on their internalization of the content. Thus, opportunities to practice are instrumental for successful language learning (Oxford, 1990). In this regard, considerations of student activities in planning and executing the course are of prime importance. This study, adopting Hutchinson and Waters' (1987) ESP material design model, developed each unit to be taught in six hours with seven to eight activities. As has been already noted, too many exercises or too few activities would be disruptive (Graves, 2000).

4.2 The Writing Test

The second research question of this study asks whether there is a significant difference in the quality of students' writing before and after the intervention. As shown in Table 2 above, the statistical differences between the pretest and posttest scores of the writing tests ($p < 0.01$) revealed that the students gained higher scores after completing the course, clearly indicating that they increased their writing abilities.

The improvements manifested in the writing test were due to the instruction of genre and the structured input of specific genre features. This was self-evident because the students' writing was genre-specific, focusing solely on scientific correspondence. The participants' increase in genre-awareness was particularly noteworthy. Before the teaching implementation, most or nearly all students had no knowledge about argumentative correspondence writing or its rhetorical moves and specialized linguistic devices. Thus, during the entry stage of the course, some students wrote only one sentence in response to the assigned prompts. The majority of students wrote at most a few sentences, and those generally did not exhibit coherent structure.

In ESP contexts, teaching genre is beneficial for writing (Henry & Roseberry 1996). Teaching stance and engagement markers enables students to effectively deploy their arguments in the most persuasive ways. Furthermore, teaching genre-specific vocabulary helps students to acquire an array of building blocks necessary for expressing specialized knowledge content. In addition, teaching ways to express authorial voice allows students to demonstrate their information as originating from themselves, and convey professional attitudes

(Hyland, 2005, 2008). In argumentative writing, students must take a position on an issue and give strong rationale for their stance. This type of writing requires describing something to various extents and at the same time proposing their opinions and ideas to support their adopted stance. In short, argumentative writing requires students to demonstrate their voice, specifically the voice of the position and the reasons why they have taken one position over another (cf. ‘authorial self’ Ivanič, 1998; Li & Deng, 2019). In this study, the student participants were in the field of sciences, in particular, the field of occupation and safety, which is a subdiscipline of public health. It was intended that through intervention their ability to write argumentative correspondence would be enhanced, and this result was confirmed to have been achieved. The participating students were trained to express their identity as members of a discourse community of health scientists by explicitly and efficiently demonstrating their stance with effective linguistic and rhetorical devices.

5. Conclusion

Thai students in general have a low level of English proficiency, and scientific argumentative writing is an area of particular weakness for them due to the relative lack of emphasis on ESP genre-writing. This problem is more pronounced with students at universities in rural areas. This study has incorporated the ESP material design model of Hutchinson and Waters (1987) and the genre-based approach with stance and engagement features elaborated in Hyland (2005). The models of writing were short (250-500 words) argumentative correspondences sampled from the journal *Nature*. The interventional experiment involved 40 participants studying in a science field at a public university in Thailand, and involved the one-group pretest and posttest design, for a course duration of 30 hours. A set of assessments for knowledge and writing abilities showed statistically meaningful differences between the students’ performance before and after the intervention. These findings suggest that instruction of writing scientific argumentative correspondences promotes a meaningful level of learning and thus should be included in ESP science courses, especially as a foundation for writing longer texts in the scientific genre.

Due to logistical reasons imposed by the COVID-19 pandemic, the intervention of this study was conducted online with a single-group pretest-posttest design. An investigation as to whether a more comprehensive study involving control and experimental groups yields the same results warrants future research.

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Authors contributions

Kultida Khammee was responsible for study design, experiment execution, data collection and manuscript writing. Prof. Aphiwit Liang-Istara and Prof. Singhanat Nomnian were responsible for study design and manuscript writing. Prof. Seongha Rhee was responsible for data interpretation, data analysis, and manuscript writing and is the corresponding author. All co-authors equally contributed to the study, consulting with each other at every major step of the study.

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