

An Investigation on Scientific Writing Difficulties & Writing Process

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Abstract

Scientific writing is the process of conveying scientific information clearly. However, many students struggle with learning scientific writing, making it challenging for them to explain their findings in a clear and logical manner. This issue underscores the need for investigating scientific writing difficulties and the writing process, ensuring that students develop their writing skills. Thus, the purpose of this study is to investigate how learners perceive the application of learning strategies when writing scientific reports. This qualitative study aims to analyze the relationship between writing challenges and the composition process, as well as how learners perceive their writing issues and the composition process. This study employs a qualitative method, using questionnaires to collect data. The subjects were science and engineering students who needed to prepare scientific reports. 145 participants purposively responded to a qualitative survey from the science and engineering disciplines. The findings showed that paragraphing issues and writing uncertainty are the most common writing challenges. These data indicate that a lack of writing experience causes writing difficulties. The findings from this study contribute to the body of knowledge regarding why learners find their writing tasks difficult. Additionally, the results can be used to make improvements at the institutional or personal level.

Keywords: Writing Difficulty, Composing Process, Scientific Writing

Introduction

Background of Study

Scientific writing allows students to express their thoughts in writing so that others can understand them. Learners are the future generation of thinkers whose idealism must be

cultivated. The capacity to convey scientific discoveries in an accurate, informative, cohesive, and logical manner is a critical talent for scientists. It can have a significant impact on the success of journal article publication, report preparation, grant financing, and research communication. Scientific writing instruction incorporated into a laboratory course at the undergraduate level can substantially improve students' critical thinking and prepare them for future careers (Quitadamo & Kurtz, 2007). Moreover, it is recommended to start writing consistently early in a research project in order to create, clarify, and test concepts as experimental activity is being conducted (Lee et al., 2011; Martin, 2009). Regular writing has been found to promote creativity Boice (1983) and enhance productivity in research paper writing (Boice, 1989). Scientific writing pertains to the act of effectively conveying scientific knowledge (Deng et al., 2019). In scientific writing, information must be presented in a concise and organized manner, following a formal style that prioritizes objectivity, precision and logical information flow (Bordage, 2001; Sandercock, 2013). In higher universities, the scientific report is the prevailing genre of writing, emphasizing the critical need for students to master scientific writing skills early in their academic journey. Understanding the importance of this topic and why it merits study is paramount, as it equips learners with the necessary tools to express their thoughts clearly, contribute to scientific discourse and ultimately drive progress in their respective fields.

Scientific writing difficulties are relevant in Malaysia due to various factors. One study found that English as a Foreign Language (EFL) readers faced challenges in comprehending general English words in scientific texts, while known scientific terminology was easier to understand (Nadarajan, 2013). Another study focused on non-native English speaking international graduate students and found that they struggled with academic writing, particularly in English as a medium of instruction setting (Hamdan & Ahmad, 2023). Additionally, the teaching of Science in English in Malaysia lacks clarity on the specific language needed, leading to challenges for both teachers and students (Jeyaraj, 2018). Furthermore, the New Malaysia Education Blueprint acknowledges concerns about English proficiency among graduates, including science students. The findings of the studies emphasize the importance of addressing scientific writing difficulties in Malaysia to improve academic success and scientific literacy.

Scientific writing difficulties hold immense importance as it directly impact academic success and scientific reports, particularly in an increasingly globalized academic environment. By addressing scientific writing challenges, researchers can improve the clarity and effectiveness of communication within the scientific community. Understanding how and to whom this study benefits is essential; it not only aids EFL readers and non-native English speakers in comprehending scientific texts but also supports educators in refining language instruction strategies. The utility and effectiveness of this topic are to identify the problems encountered in writing reports and further improve scientific writing skills for students and educators in the field of science and technology in Malaysia.

Statement of Problem

In the context of learning to write scientific papers in higher education, the technology for learning becomes one of the devices that can support the success of the goals. However, a prevalent issue arises in higher education, many science students encounter challenges in mastering the intricacies of scientific writing, hindering their ability to communicate research

findings clearly and coherently (Ramzan et al., 2023). This problem underscores the need to investigate and enhance the current approach to teaching scientific writing in higher education, ensuring that students develop the essential skills for effective communication within the scientific community.

Information in scientific writing must be clear and well-structured, according to a formal style that values objectivity, accuracy, and logical information flow. The scientific report is the most common type of written work in higher education. A common problem in higher education, though, is that many science students find it difficult to learn the nuances of scientific writing, making it difficult for them to present their findings in an understandable and logical manner (Rönnebeck et al., 2016). To ensure students develop the skills required for effective writing, this issue highlights the necessity to look into and improve how scientific writing is taught in higher education.

Objective of the Study and Research Questions

This study is done to explore perception of learners on their use of learning strategies. Specifically, this study is done to answer the following questions;

- How do learners perceive their writing difficulties ?
- How do learners perceive their composing process?
- Is there a relationship between writing difficulties and composing process?

Literature Review

Composing Process

The composing process is also known as writing process. The core of the composing process is using writing to discover new ideas (Brown & Briggs, 1991). Writers in scientific writing notice the composing process is one of important component in the preparation of students in future undertaking. Kobayashi and Rinnet (1992) stated the composing process in writing involves various stages such as planning, formulating, evaluating, synthesizing and revising. These stages may include editing and revising to complete the process. Students that have positive attitudes towards composing something will have a confident to write (Brown, 2009).

Writing Difficulties

Majority University students nowadays faced difficulties in scientific writing skills. Different people might report different level of difficulties. According to Nandiyanto et. al (2022) about 91.50% still had difficulty in writing this scientific articles that consist of components abstract, introduction, result discussion and conclusion. A good scientific writing requires reading about the topic, brief the outline and decide what should be written in the introduction, main body and conclusion (Ghulamuddin et al., 2021). There are various factors that cause difficulties in writing. The difficulties in writing involve generating and organizing ideas as well as using a right grammar (Agdia & Syafei, 2020). Moses and Mohamad (2019) reported difficulties in writing among students are due to lack of vocabulary, poor grammar and wrong spelling. They may less exposure to reading and less demotivated in finishing the writing task. Rahmat (2023) reported lack of idea, knowledge and confident are some factors contribute to writing difficulties. Bryne (1988) categorized the writing difficulties into Linguistic (language, grammar, vocabulary), physiology (content) and cognitive (spelling, punctuation, paragraphing).

Past Studies on Writing Difficulties

Many Studies have been done to investigate the difficulties in writing. According to Bulqiyah et.al (2021) the difficulties in the process of writing are considered as cognitive problems. This study was conducted based on questionnaire by 21 undergraduate students and 6 interviewees. The findings reveal that writing difficulties are categorized into affective problems, cognitive problems linguistic. In another study by Sulaiman, et.al. (2019), from the questionnaire on 44 English Education students registered at the UMI Faculty of Literature, grammar's aspect, scientific writing style, vocabulary, spelling and compilation of writing were some difficulties that occurred in the process of writing.

Rini et al (2023) studied the ability to write scientific papers of students from common mistakes and writing styles. Data were collected from the responses of 30 students. The findings show that the parts with the most errors which are introduction and discussion considered difficult for students. Aldabbus (2017) conducted research related to the experience of some Bahraini Teachers College students in the perspective of reading and writing skills. This research involves 22 students in the Foundation Program at the (BTC), during the academic year 2015/2016. The findings reveal their major weaknesses in writing are due to a lack of organization and outlining the ideas.

Next, Abdulkareem et al (2013) investigated the common writing challenges encountered by 85 postgraduate Arab students at Universiti Teknologi Malaysia. According to their findings, the most common mistakes made by participants were in sentence structure, vocabulary, and communicating concepts. Most errors occur in spelling. Shah and colleagues (2009) investigated the writing experiences of a group of rookie researchers, conducting sixteen interviews. Responses revealed four significant themes: cognitive strain, group support and mentoring, difficulties distinguishing between content and structure, and backward report design.

Conceptual Framework

Academic writing, particularly in scientific fields, presents unique challenges to writers. The difficulties that academic writers face are real. Different writers face difficulties in different aspects and for different types of writing (Rahmat, 2023). Figure 1 presents the conceptual framework of the study. This study investigates factors that writers perceive as difficulty Petric & Czlar (2020) in academic writing, a domain that encompasses scientific writing. It also explores how writers perceive the composing process which is integral to scientific writing. According to Flower & Hayes (1981), in scientific research, the composing process involves planning (the activities that the writer does before writing), transferring (the activity where writers transfers oral thoughts into written thoughts) and evaluating (the activating when the writers are revising their work).

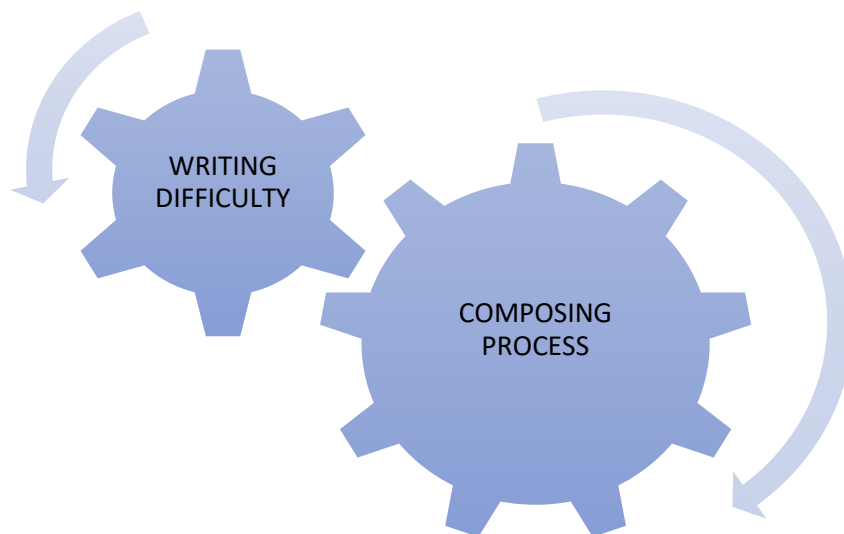


Figure 1. Conceptual Framework of the Study-Writing Difficulties and the Composing Process

Methodology

The purpose of this quantitative study is to investigate students' motivational elements for learning. 145 people who were part of a purposive sample answered the survey In order to reveal the variables in table 1 below, a 5-point Likert scale survey was employed, which was adapted from Abeeleh and Al-Sobh (2021) on reading comprehension issues and Amer, AL Barwani, & Ibrahim (2010) on readers' perceived use of online reading tactics. There are four sections in the survey. There are items on the demographic profile in Section A. Fourteen entries in Section B address reading challenges. There are 17 items about global strategies in Section C. Section E contains nine items on assistance tactics, and Section D contains eight things on problem-solving techniques.

Table 1

Distribution of Items in the Survey

SECTION	MAIN CATEGORY	SUB-CATEGORY	NO OF ITEMS	Cronbach Alpha
B	WRITING DIFFICULTY (Petric & Czalr, 2003)		7	0.864
C	COMPOSING PROCESS (Flower & Hayes, 1981)	Planning (Before Writing)	8	0.847
		Transferring (While Writing)	14	
		Evaluating (When Revising)	12	
			45	0.835

Table 1 also demonstrates how reliable the survey is. The analysis shows that the Cronbach alpha for section B's writing difficulty and section C's composing process are 0.864 and 0.835, respectively. This demonstrates the instrument's good reliability. Further analysis is performed using SPSS to offer findings that address the research questions for this study.

Findings

Findings for Demographic Profile

Table 2 shows the findings for the gender of the respondents where 34.5% of the participants in this study are male and 65.5% of the participants are female. For the discipline, 66.2% are Science students while another 33.8% are Engineering students.

Table 2

Percentage for Demographic Profile

Q1	Gender	Male	Female
		34.5 %	65.5%
Q2	Discipline	Science	Engineering
		66.2	33.8%

Findings for Writing Difficulty

This section presents data to answer research question 1- How do learners perceive their writing difficulties?

Table 3

Mean for WRITING DIFFICULTY

NO	ITEM	MEAN
1	Rhetorical situation WDQ1I find writing difficult because I am not familiar with different types of writing	2.8
2	Goal setting WDQ2I find writing difficult because the goal for the essay writing is sometimes hard to achieve	2.9
3	Teaching instruction WDQ3The teacher’s instruction on what to do is sometimes not clear and that makes the essay writing difficult	2.6
4	Teacher explanation WDQ4Sometimes the teachers explanation makes me feel that writing is difficult	2.5
5	Long term memory WDQ5Writing essays are difficult because I do have background knowledge of the topic given	2.3
6	Individual paragraph WDQ6Writing essays are difficult because I have to know what to write in each paragraph	3.0
7	Writing Process WDQ7I find the writing difficult because I am unsure of the writing process	3.0

Table 3 presents the mean scores for seven different factors contributing to writing difficulty, as reported by the participants. Findings indicate the participants find writing difficult because they are not familiar with different types of writing (Mean=2.8). They find it challenging to meet the goals set (Mean=2.9). Furthermore, the instructions provided by their teachers are not clear (Mean =2.6). Finding also shows participants feel that writing is difficult due to the way their teachers explain it (Mean=2.5) while they do not have sufficient prior knowledge of the topic (Mean=2.3). The highest factors that contribute to the difficulty in writing (Mean =3.0) are caused by paragraphing problems and unsure the writing process. These findings suggesting pertains to the difficulty in writing is caused by a lack of familiarity and knowledge in the writing process.

Findings for Composing Process

This section presents data to answer research question 2- How do learners perceive their composing process?

Table 4

Mean for BEFORE WRITING (BW)

No	Items	Mean
1	BWQ1 I make a timetable/schedule for the writing process	2.7
2	BWQ2 Before I start writing, I revise the requirements of the assignment	4.1
3	BWQ3 I look at a model written by a proficient writer	4.3
4	BWQ4 I start writing without a written or mental plan	2.2
5	BWQ5 I think about what I want to write and have a plan in my mind, but not on paper	3.3
6	BWQ6 I note I down words and short notes related to the topic	3.6
7	BWQ7 I write an outline of my paper	2.9
8	BWQ8 I write notes or an outline in my native language	2.5
Overall		3.2

Table 4 shows the mean scores for the before writing (BW) stage of scientific writing. The mean scores for BW range from 2.2 to 4.3. The highest mean score is BWQ3, which indicates that most participants look at a model written by a proficient writer before starting to write (mean = 4.3). It implies that students acknowledge the need of analysing excellent writing samples to acquire insights into effective writing strategies and techniques. Meanwhile, the lowest mean score is BWQ4, suggesting that participants tend to start writing without a written or mental plan (mean = 2.2). There is a group of students who may partake in this behaviour, which could potentially result in disorganised or ineffective writing methods. Furthermore, the overall mean score from 145 respondents for BW is 3.2, which suggests that students engage in a range of strategies and behaviors before initiating scientific writing.

Table 5

Mean for WHEN WRITING (WW)

No	Items	Mean
1	WWQ1 I start with the introduction	4.1
2	WWQ2 I stop after each sentence to read it again	3.7
3	WWQ3 I stop after a few sentences or a whole paragraph , covering one idea	3.8
4	WWQ4 I reread what I have written to get ideas to continue	4.3
5	WWQ5 I go back to my outline and make changes in it	3.5
6	WWQ6 I write bits of the text in my native language and then translate them in English	2.7
7	WWQ7 I am very confident with my grammar and vocabulary	3.2
8	WWQ8 I simply what I want to write if I don't know how to express my thoughts in English	3.5
9	WWQ9 If I don't know a word in English, I write it in my native language and later try to find an appropriate English word	3.5
10	WWQ10 If I don't' know a word in English, I find similar English word that I know	3.8
11	WWQ11 If I don't' know a word in English, I stop writing and look up the word in a dictionary	3.5
12	WWQ12 I use bilingual dictionary	2.8
13	WWQ13 I use a monolingual dictionary	2.3
14	WWQ14 I ask somebody to help out when I have problems while writing	3.8
Overall		3.5

The mean scores for the when writing (WW) stage of scientific writing are illustrated in Table 5. There are fourteen questions related to this stage, covering various aspects of the writing process. The mean scores range from 2.3 to 4.3, indicating varying levels of agreement or disagreement with each statement. Statement from WWQ1 ("I start with the introduction") has the highest mean score of 4.1, suggesting that most participants agree with this statement. This high mean score indicates a strong awareness of the importance of establishing the context and purpose of their writing from the outset. However, the statement WWQ13 ("I use a monolingual dictionary") has the lowest mean score of 2.3, indicating that participants are less likely to use a monolingual dictionary while writing. When encountering language-related difficulties while writing, it could suggest alternative strategies or resources. Overall, the fourteen questions about the WW stage gave an average score of 3.5. This gives us useful information about how people behaved and what they liked during the writing process of scientific writing.

Table 6

Mean for WHEN REVISING (WR)

No	Items	Mean
1	WRQ1 I read my scientific writing report aloud.	2.7
2	WRQ2 I only read what I have written when I have finished the whole paper/report.	3.0
3	WRQ3 When I have written paper/report, I hand it in without reading it.	1.5
4	WRQ4 I use a dictionary when revising	2.7
5	WRQ5 I make changes in vocabulary	3.3
6	WRQ6 I make changes in sentence structure	3.5
7	WRQ7 I make changes in the structure of the scientific report writing.	3.2
8	WRQ8 I make changes in the content or ideas	3.2
9	WRQ9 I focus on one thing at a time when revising (eg. content, structure)	3.6
10	WRQ10 I drop my first draft and start writing again	2.7
11	WRQ11 I check if my scientific report matches the requirements.	4.1
12	WRQ12 I leave the text aside for a couple of days and then I can see it in a new perspective.	3.0
Overall		3.0

Table 6 presents the mean scores for the when revising (WR) stage of scientific writing. It consists of twelve statements that assess various aspects of the revising process, such as reading aloud, using a dictionary, making changes in vocabulary and sentence structure, focusing on specific aspects of the writing, checking if the report matches the requirements, and leaving the text aside for a few days. The mean scores range from 1.5 to 4.1, indicating the average level of agreement or disagreement with each statement. Among the statements, WRQ11 ("I check if my scientific report matches the requirements") has the highest mean score of 4.1, This indicates that most participants agree with this statement, suggesting a strong tendency to review their scientific reports to ensure alignment with the given requirements during the revision process. Meanwhile, statement WRQ3 ("When I have written paper/ report, I hand it in without reading it") has the lowest mean score of 1.5, indicating that most participants disagree with this statement. This statement reflects the participants' tendency to submit their paper or report without thoroughly reviewing it after completion. Also, the average score for the WR stage is 3.0, which means that most of the statements are somewhat agreed upon. Thus, this study offers valuable insights into the behaviours and preferences of participants during the revision stage of scientific writing.

Findings for Relationship between writing difficulties and composing process

This section presents data to answer research question 3 ("Is there a relationship between writing difficulties and the composing process?"). To determine if there is a significant association in the mean scores between writing difficulties and composing process, data is analysed using SPSS for correlations. Results are presented separately in Table 7 below.

Table 7

Correlation between Writing Difficulty and Composing Process

		WRITINGDIFFI CULTY	COMPOSINGP ROCESS
WRITINGDIFFICULTY	Pearson Correlation	1	.067
	Sig. (2-tailed)		.420
	N	145	145
COMPOSINGPROCESS	Pearson Correlation	.067	1
	Sig. (2-tailed)	.420	
	N	145	145

Table 7 shows there is no association between writing difficulty and composing process. Correlation analysis shows that there is no significant association between writing difficulty and composing process ($r = 0.067$) and ($p = 0.000$). According to Jackson (2015), coefficient is significant at the 0.05 level and positive correlation is measured on a 0.1 to 1.0 scale. Weak positive correlation would be in the range of 0.1 to 0.3, moderate positive correlation from 0.3 to 0.5, and strong positive correlation from 0.5 to 1.0. In this case, the correlation coefficient of 0.067 falls within the range of weak positive correlation (0.1 to 0.3), suggesting a moderate positive relationship between writing difficulty and the composing process. However, since the p-value is less than 0.05, the correlation is considered statistically significant.

Conclusion

Summary of Findings and Discussions

Current studies reveal that science and engineering learners face difficulties in writing Scientific reports. The highest factors that contribute to the difficulty in writing are caused by paragraphing problems and unsure the writing process. These findings suggesting pertains to the difficulty in writing is caused by a lack of familiarity and knowledge in the writing process. These results are similar to those from earlier studies, where students had difficulty distinguishing between a structure report and a design report, as well as with organising their ideas and preserving them on track. There were also problems with the scientific writing style, vocabulary, spelling, and putting the writing together. The findings of the composing process indicated valuable insights into the behaviours and preferences of students before, during and after the revision stage of scientific writing.

Pedagogical Implications and Suggestions for Future Research

This study adds to understanding why students have difficulty with writing. Results might be used to better institutions or individuals. The results can be used to make improvements at the institutional or personal level.

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