Effectiveness of Constructivist and Behaviorist Approaches in Improving the Writing Skills of Grade 12 STEM Students with Writing Deficiency

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Abstract

Writing is an essential skill for interpersonal communication that enables people to share ideas, persuade, and convince one another. However, students struggle to express their ideas in writing. This study aimed to investigate the effectiveness of Constructivist and Behaviorist approaches in improving the writing skills of Grade 12 STEM students who have writing deficiency. This study employed a quasi-experimental research design involving fifty (50) participants exposed to the constructivist approach, and the other fifty (50) were exposed to the behaviorist approach. They were chosen through total enumeration. The researcher administered a pretest and posttest through an argumentative essay. Results reveal that students exposed to both approaches progressed from the "Developing" level before the intervention to the "Proficient" level in all sub-skills, such as topic development, organization, vocabulary, sentence structure, and mechanics after the intervention. Furthermore, a significant improvement in the participants' writing skills was observed after the interventions. The constructivist and behaviorist approaches were both effective in improving the writing skills of the participants. However, the constructivist approach appeared to have better results than the behaviorist approach, especially on the sub-skill sentence structure. It is recommended that English teachers expose students to activities using a constructivist approach, such as active participation, peer review, and reflection practices.

Introduction

Writing is an essential skill for interpersonal communication that enables people to share ideas, persuade, and convince one another. It is commonly known as a dynamic and productive skill among the basic language skills. However, writing effectively is a challenging skill to develop, especially in academic settings. Thus, enhancing the said skill by employing writing methods helps an individual through various means and gives an advantage in academic success.

In this study, writing deficiency refers to the specific challenges that Grade 12 STEM students encounter in several key areas of writing. These deficiencies include difficulties with topic development, where students struggle to fully explore and

articulate their ideas, often leading to superficial or underdeveloped content. Organization is another critical issue, as many students find it challenging to structure their writing logically, resulting in disjointed or incoherent narratives. Furthermore, students often grapple with appropriate vocabulary usage, either lacking the precision needed to convey complex concepts or over-relying on jargon without ensuring clarity. Issues with sentence structure are also prevalent, where students may write fragmented, run-on, or awkward sentences that hinder the flow and readability of their work. Lastly, mechanics-including grammar, punctuation, and spelling-pose significant obstacles, with frequent errors detracting from the overall quality and professionalism of their writing. Addressing these specific areas is crucial to improving the writing skills of STEM students and preparing them for the demands of higher education and professional careers.

Furthermore, writing abilities encompass many skills essential for effective communication in both professional and personal settings. According to Xavier (2020), proficient writing remains crucial to effective communication, enabling individuals to convey messages clearly and effortlessly. In the report formulated by Felipe (2020) regarding writing skills, merely 1% of Grade 5 students in the Philippines reached higher levels of proficiency, indicating that they met the study's most advanced standards. These students could compose coherent texts with well-developed ideas and a diverse vocabulary. On the other hand, nearly half, precisely 45%, of Grade 5 students in the Philippines fell into the lowest proficiency category, signifying they possessed limited skills when conveying ideas through writing. For this reason, Aliyu (2020) pointed out that writing skills are essential in English learning as they play a vital role in facilitating learners' academic achievement. Moreover, Chen (2022) stated that when teaching the English language, teachers must explore how students learn and consider using strategies in writing instruction.

In addition, Finlayson and Mccrudden (2019) also state that individuals lacking adequate fundamental writing abilities may encounter challenges when participating in everyday tasks involving school-related communication. The ability to write enhances and complements other skills related to learning. Deti et al. (2023) emphasized that writing tasks can enhance students' linguistic skills, cognitive abilities, and sociocultural proficiencies. Masrul et al. (2023) mentioned that language learners can derive advantages in academic writing by employing learning methods, whether in a second language or foreign language context. However, their specific learning goals may require unique strategies. Hence, to enhance their writing skills, it is essential to implement strategy instructions that offer precise, systematic tools to guide students through different stages of the writing process.

As an English teacher in the Senior High School (SHS), the researcher has observed that the Grade 12 STEM students struggle with academic writing, especially when given writing activities. This difficulty arises from the need to create paragraphs in their assignments or essays. Even though they understand the topic they have studied, it is clear that these students need help in expressing their thoughts in written English, which makes it hard for them to convey their ideas clearly and comprehensively. The Constructivist and Behaviorist approaches were selected for this study because each uniquely addresses different aspects of the identified writing deficiencies in STEM students. The Constructivist approach was chosen for its effectiveness in promoting deep, reflective learning, By engaging students in active learning, this approach helps

them better understand and structure their writing. In contrast, the Behaviorist approach was selected for its strength in reinforcing specific writing skills through repetition and feedback. Implementing these approaches separately allows the study to explore how each method independently contributes to addressing distinct aspects of writing deficiencies.

According to Arnawa et al. (2023), in academic contexts, writing in English allows students to communicate their research discoveries to a worldwide audience, enabling them to present their ideas and research on an international platform. However, Raoofi et al. (2017) mention that writing represents a multifaceted and intricate process, mainly posing more significant difficulties for learners who engage in writing using a language that is not their native tongue. To achieve academic success, the research findings of Teng and Zhang (2020) have indicated that applying writing strategies and methods favorably impacts the development of writing skills in second language learning.

With the abovementioned information, the study aimed to determine the effectiveness of employing the Constructivist and Behaviorist approaches in enhancing the writing skills of Grade 12 STEM Senior High School students with writing deficiency. Specifically, the study tested two null hypotheses at a 0.05 significance level: that there would be no significant difference in writing skills before and after the intervention within each group, and that there would be no significant difference in the writing skills rating increments between the two groups.

Research Objectives

This study aimed to determine the effectiveness of the Constructivist and Behaviorist Approaches in enhancing the writing skills of Grade 12 STEM Senior High School students. It sought to address the following questions:

1. What is the writing skill improvement of the two groups of participants before and after the interventions in terms of:

1.1. topic development;

1.2. organization;

1.3. vocabulary;

1.4. sentence structure; and

1.5. mechanics?

2. How do the participants in each group compare in their writing skill improvement before and after the intervention?

3. "Is there a significant difference in the improvement of writing skills between the two groups after the interventions?"

Methodology

The present study utilized a quasi-experimental research design. The choice of a quasi-experimental design in this study is appropriate, as it enabled the examination of the effectiveness of the Constructivist and Behaviorist approaches on the Grade 12 STEM students' writing skills. The participants for this study were one hundred (100) Grade 12 senior high school students enrolled in one of the faith-based institutions and have taken the subject Inquiries, Investigation, and Immersion Class for the academic year 2023-2024. A total enumeration was utilized to select the participants. The question used in the writing test was a researcher-made instrument that has undergone

validity and reliability testing. The research instrument was an argumentative type of essay. Also, the study adopted the academic writing assessment rubric originally developed by Bauer-Ramazani (2013). The modifications were based on the proficiency levels (*Advanced, Proficient, Approaching Proficiency, Developing, and Beginning*) recommended in the Department of Education's DO No.32, s. 2012.

Before conducting the research study, the researcher sought approval from the Lourdes College Research and Ethics Committee (REC). Then, the researcher asked permission from the school principal to carry out the study in all participating sections. Then, the study followed the six (6) weeks of implementation. To determine the authenticity of the participants' output, the researcher had a face-to-face class with the participants four times a week. Three intensive instruction periods with short breaks to avoid cognitive load were implemented, and they were given a writing activity every fourth session of the week for monitoring purposes. In the first week, the researcher informed participants about the study's importance, risks, benefits, and purpose, and then conducted a pretest where participants wrote three paragraphs using a provided argumentative essay template. Over the next five weeks, the interventions were implemented: the Constructivist group engaged in activities including Socratic questioning, creative writing prompts, reflective practices, and peer reviews to enhance critical thinking and writing skills. The Behaviorist group participated in sentence completion exercises, timed writing, and outlining to improve grammar, writing fluency, and organization. The final session involved a post-intervention assessment to evaluate the effectiveness of the Constructivist and Behaviorist approaches.

Descriptive Statistics such as mean, and standard deviation were used to identify the writing skill improvement of the two groups of participants before and after the interventions. To analyze the effectiveness of the interventions, a paired sample t-test was employed to compare the participants' writing skill performance before and after the interventions within each group, as this test is suitable for assessing changes in the same group over time. Additionally, an independent sample t-test was utilized to compare the score increments between the two groups, allowing the study to determine whether the differences in improvement between the groups were statistically significant.

Research Results

In the study, students utilizing the Constructivist Approach showed significant improvement in writing skills, with scores increasing from a "Developing" to a "Proficient" level across all categories. Conversely, students exposed to the Behavioristic Approach also demonstrated progress, advancing from "Developing" to either "Proficient" or "Approaching Proficiency" in various categories.

The significant differences between the pretest and posttest results for students exposed to the Constructivist and Behaviorist approaches suggest that both methods were effective in enhancing the writing skills of the students.

The increments in writing skill ratings between the two groups did not differ significantly for most sub-skills, indicating that both the constructivist and behavioristic approaches were effective in improving topic development, organization, vocabulary, and mechanics. However, the constructivist approach showed a significant difference in enhancing sentence structure, likely due to its emphasis on peer review, reflection, and collaborative learning.

Discussion

Problem 1. What is the writing skill improvement of the two groups of participants before and after the interventions?

Table 1 presents the concise overview of the the students' writing skills performance before and after the interventions in both constructivist and behaviorist approaches.

The data show that both groups demonstrated increased performance in writing skills, which is evident in the increase in the respective overall means. The overall pretest mean score for the constructivist approach group is 2.14, classified as the "Developing" stage. This indicates that participants faced challenges in effectively communicating ideas and adhering to correct grammar and writing conventions. However, following the intervention, the overall posttest mean score of 3.90, interpreted as "Proficient," demonstrating a substantial increase. This indicates that participants acquired the ability to communicate the ideas clearly and coherently, employing correct grammar and writing conventions.

Table 1

Participants' Writing Skill Performance before and after the Interventions

Writing Skill Performance Test	CONSTRUCTIVIST APPROACH						BEHAVIORISTIC APPROACH					
	Pretest			Posttest			Pretest			Posttest		
	$\bar{x}$	SD	Desc	$\bar{x}$	SD	Desc	$\bar{x}$	SD	Desc	$\bar{x}$	SD	Desc
1. Topic Development	2.31	0.45	D	4.27	0.67	P	2.35	0.39	D	4.08	0.57	P
2. Organization	2.33	0.58	D	3.99	0.67	P	2.33	0.47	D	3.94	0.57	P
3. Vocabulary	2.11	0.44	D	3.76	0.69	P	2.17	0.39	D	3.55	0.59	P
4. Sentence Structure	1.98	0.45	D	3.76	0.72	P	2.12	036	D	3.45	0.55	AP
5. Mechanics	2.01	0.41	D	3.75	0.65	P	1.97	0.33	D	3.61	0.51	P
Overall	**2.14**	**0.37**	**D**	**3.90**	**0.60**	**P**	**2.18**	**0.27**	**D**	**3.73**	**0.45**	**P**

Legend: *Ad- Advanced: 4.51-5.0*   *P -Proficient: 3.51-4.50*   *AP- Approaching*
       Proficiency: 2.51-3.50   *D- Developing: 1.51-2.50*   *B- Beginning: 1.0-1.50*

A study by Martin (2022) found that the constructivist approach significantly improved the descriptive writing skills of fourth-grade students. Similarly, Taufik (2020) observed a significant improvement in student performance in writing literary works, while Ebedy (2021) highlighted the effectiveness of a constructivism-based program in developing English reading and writing skills. These findings collectively suggest that the constructivist approach enhances writing skills.

In the behavioristic approach group, the overall pretest mean score stood at 2.18, categorized as "Developing," indicating that students faced challenges regarding structure, coherence, and adherence to conventions. During the posttest, the group achieved a mean score of 3.73, indicating "Proficient" performance. This suggests that the behavioristic approach, characterized by structured practice and reinforcement, effectively enhanced students' ability to craft well-structured, coherent, and effective written compositions. These findings underscore that both groups had increased writing performance across all sub-skills.

Research has shown that the behaviorist approach can improve writing skills. Calkin (2017) demonstrated the effectiveness of direct instruction in teaching writing to students, while Hansen (2014) found that performance-based interventions such as goal setting and contingent reward can increase the number of correctly spelled words and complete sentences. These studies collectively suggest that the behaviorist approach, focusing on observable behaviors and environmental events, can be a valuable tool in enhancing writing skills.

Problem 2. How do the participants in each group compare their writing skills before and after the intervention?

H_{o1}: There is no significant difference in the writing skills of the participants in both groups before and after the intervention.

Table 2 presents the test results of the differences in the participants' writing skills before and after the interventions. The overall post-test results for both interventions showed significant differences with the p-value of 0.000 in the students' overall writing skill in all sub-skills, which indicates an improvement in the writing skill performance between the pretest and post-test of the students for both groups. Consequently, the null hypothesis is rejected.

Table 2

Test of Difference in the Participants' Writing Skill before and after the Interventions

Writing Skill	CONSTRUCTIVIST APPROACH					BEHAVIORISTIC APPROACH				
	Pre Test $\bar{x}$	Post Test $\bar{x}$	t	p	Effect Size	Pre Test $\bar{x}$	Post Test $\bar{x}$	t	p	Effect Size
1. Topic Development	2.31	4.27	19.84**	.00	**.26**	2.35	4.08	18.86**	.00	**2.67**
2. Organization	2.33	3.99	16.12**	.00	**.27**	2.33	3.94	18.21**	.00	**2.58**
3. Vocabulary	2.11	3.76	14.64**	.00	**.22**	2.17	3.55	16.93**	.00	**2.39**
4. Sentence Structure	1.98	3.76	17.42**	.00	**.23**	2.12	3.45	14.99**	.00	**2.12**
5. Mechanics	2.01	3.75	17.54**	.00	**.22**	1.97	3.61	19.80**	.00	**2.80**
OVERALL	**2.14**	**3.91**	**20.44****	**.000**	**.11**	**2.18**	**3.73**	**24.06****	**.00**	**3.38**

**significant at 0.01 level   *significant at 0.05 level

The significant difference observed in both pretest and posttest scores across all sub-skills within the constructivist approach group, with a p-value of 0.00, underscores the effectiveness of the intervention in enhancing the students' writing skill development. Employing the Socratic Method during the intervention allowed participants to actively engage in learning, encouraging them to discover information and develop topics autonomously. Additionally, incorporating creative wiring prompts facilitated narrative development, particularly in the organization and vocabulary sub-skills. Furthermore, active participation, peer review, and reflection practices further enriched the learning experience, allowing students to refine their sentence structure

and writing conventions. By engaging in collaborative activities and receiving feedback from both the researcher and peers, students could identify areas for improvement and make necessary adjustments to their writing. However, the effect sizes, though statistically significant, revealed relatively small differences. The overall effect size of .11 is very small, suggesting that while the Constructivist approach improved writing skills across all sub-skills, the overall impact was minimal.

Multiple studies have shown that using a constructivist approach improves writing skills. In a study conducted by Ardiasih (2019), it was discovered that learners reported a meaningful learning experience and showed enhanced skills in writing argumentative essays through online collaborative writing. Similarly, Taifuk (2020) reported a notable rise in student achievement in composing literary works, attributing it to a constructivist approach. These studies collectively confirm the efficacy of the constructivist approach in writing essays.

The participants exposed to the behaviorist approach showed a significant difference across all subskills in their pretest and post-test with a p-value of 0.00, which is lower than a 0.05 significance level. The intervention allowed the participants to systematically focus on their writing skills through various activities, including outlining paragraphs, repetitive writing practices and grammar drills, and positive reinforcement for their participation. Those activities helped the participants improve their writing skills and performance. Furthermore, consistent feedback from the researcher during the face-to-face sessions played a crucial role in guiding students' learning and addressing areas for improvement. This personalized feedback loop gave students timely guidance and support, facilitating their understanding of writing conventions and mechanics. Thus, this approach facilitated the gradual and systematic learning process that effectively built students' writing competence through structured activities. Regarding the effect sizes, the analysis indicates very large differences, suggesting a significant improvement in the participants' writing skills. These substantial effect sizes underscore the notable impact of the behavioristic approach in fostering the development of writing skills through structured activities.

Meanwhile, several researches have examined the behavioristic method in essay writing. In a study conducted by Callinan (2017), it was discovered that conventional feedback and self-efficacy play vital roles in developing essay writing skills, while the influence of observational learning is minimal. This aligns with Gallagher's (2016) contention that the emphasis should be placed on particular, quantifiable behaviors in writing. In 2016, Kempenaar put up a theoretical framework combining transactional and system perspectives to analyze academic writing habits. In Abdollahzadeh's (2017) study, the author examined the writing behavior of English as a Foreign Language (EFL) learners and emphasized the significance of argument parts in determining the overall quality of their writing. These studies highlight the importance of particular actions, feedback, and self-confidence in developing essay writing abilities.

Problem 3. Do the two groups of participants differ significantly in writing skills rating increment?

H_{o2}: There is no significant difference in the writing skills rating increments of the participants in both groups.

Table 3 presents the results of the test of difference in the two groups of writing skill rating increments. As shown in the table, the p-values for topic development (.09), organization (.56), vocabulary (.06), and mechanics (.54) exceed the 0.05 alpha level, indicating that there is no statistically significant difference between the constructivist and behavioristic approach groups in terms of improvement in these specific writing sub-skills. Based from the overall p-value, the null hypothesis is rejected. This suggests that both instructional approaches enhanced the sub-skills: topic development, organization, vocabulary, and mechanics. However, the p-value for sentence structure is 0.00, below the 0.05 alpha level, suggesting a significant difference indicating that the constructivist strategies, emphasizing peer review and reflection practices, were efficient in fostering mastery of sentence patterns among the students compared to the behavioristic approach. The emphasis on peer review and reflection practices within the constructivist approach contributed to the deeper understanding and application of sentence structure concepts, leading to significant improvement in this area. Upon closer examination, these findings suggest that the constructivist approach, emphasizing collaborative learning, active exploration, reflection practices, and the Socratic method, offered distinct advantages in fostering comprehensive writing skills compared to the behavioristic approach. By providing opportunities for students to engage actively in the writing process, reflect on their work, and receive feedback from peers, the constructivist approach fosters a deeper understanding and application of writing conventions, enhancing overall writing performance.

Table 3

Test of Difference in the Two Groups of Participants' Writing Skill Increment

Writing Skill Performance Test	CONSTRUCTIVIST Approach		BEHAVIORIST Approach		t	p-value	Effect Size
	$\bar{x}$	SD	$\bar{x}$	SD			
1. Topic Development	1.96	.70	1.73	.65	1.70	.09	.70
2. Organization	1.69	.74	1.61	.62	.58	.56	.74
3. Vocabulary	1.65	.80	1.38	.58	1.94	.06	.80
4. Sentence Structure	1.78	.72	1.33	.63	3.33**	.00	.72
5. Mechanics	1.74	.70	1.66	.59	.62	.54	.70
Overall	**1.76**	**.61**	**1.54**	**.45**	**2.07***	**.04**	**.61**

** significant at 0.01 level, * significant at 0.05 level

Furthermore, the p-value for the overall writing performance of the participants also falls below the 0.05 alpha level, suggesting a significant difference in the writing skills increment between the two groups. This indicates significant differences in writing proficiency between the constructivist and behavioristic approach groups. While both groups showed improvement in specific writing sub-skills, the constructivist approach has been more effective in promoting overall writing proficiency, as evidenced by the significant difference observed. Regarding the effect sizes, there are large difference across all-subskills, highlighting substantial improvements in various aspects of writing skills. These effect sizes underscore the considerable impact of the constructivist approach in fostering improvements across sub-skill of writing, further supporting its efficacy in promoting comprehensive writing proficiency.

As supported by Ardiasih (2018), both found that implementing the constructivist approach significantly increased students' motivation and ability to write academic papers. This approach, which focuses on the process of writing, was also found to be more effective than the product approach in teaching academic writing. Furthermore, Zhao (2015) suggests that the constructivist approach can be used to develop effective teaching strategies and enhance students' writing skills.

Recommendations

Based on the study's findings and conclusion, the following recommendations are offered:

1. For Classroom Practice

1.1 For English Teachers that they may:

1.1.1 expose students to strategies using a constructivist approach, such as active participation, peer review, and reflection practices, to enhance their writing skills, specifically in the sub-skill sentence structure; and

1.1.2 utilize this study as a reference to address the low writing performance of the students' writing skills, especially in argumentative essays.

1.2 For Research Writing Teachers that they may:

1.2.1 integrate these approaches into teaching research writing to enhance the writing skills of the research students; and

1.2.2 employ the approaches in teaching the students to construct the foundation, such as the background of the study and theoretical framework of their research, to aid the clear establishment of the needed details

1.3 For School Administrators to:

1.3.1 encourage teachers to utilize constructivist and behaviorist approaches in the teaching-learning process.

1.3.2 include the classroom implementation of constructivist and behaviorist approaches in In-service Training as part of the professional development training.

2. For Future Research

2.1 For Future Researchers that they may:

2.1.1 further explore and conduct additional studies across various educational settings. Comparative research across different regions and educational levels could provide a more comprehensive understanding of how the approaches performs in diverse contexts.

2.1.2 expand more writing activities such as journaling and copywriting for both interventions to better investigate the effectiveness of constructivist and behavioristic approaches.

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