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Effects of the POSSE Strategy on Reading Comprehension of Physics Texts and Physics Anxiety among High School Students

Adam A. Al Sultan*
Imam Abdulrahman Bin Faisal University, Saudi Arabia

Abstract. The current study investigated the effect of the Predict, Organize, Search, Summarize, and Evaluate (POSSE) strategy on developing reading comprehension levels for physics texts and reducing physics anxiety among high school students in Saudi Arabia. The researcher used a quasi-experimental design, which allowed two groups to be compared in this study: an experimental group and a control group. Additionally, inferential statistics were used to estimate differences between the two groups. A convenience sample of 70 male high school students from the city of Dammam was chosen to participate in this study. The instruments used to collect data were developed by the researcher; they included a reading comprehension test on physics texts and a physics anxiety questionnaire. The results indicated that the POSSE strategy had a significant positive impact on the participants' relation to physics. Evidence from this study suggests that the POSSE strategy provided students with multiple opportunities to understand how expository texts are structured and develop deeper comprehension skills. The strategy also helped students feel more in control and less anxious about the physics material.

Keywords: POSSE strategy; reading comprehension; physics texts; physics anxiety; high school students

1. Introduction

Many educational systems worldwide have paid significant attention to disciplinary literacy in the main content areas and require that students acquire the skills necessary to read and understand complex materials (Koyuncu & Fırat, 2021; Tavsancil et al., 2019). Disciplinary literacy refers to the ability to read, comprehend, and evaluate texts using methods specific to particular disciplines, such as science, history, and math (Moje, 2007; Shanahan & Shanahan, 2008). In other words, disciplinary literacy is similar to being able to speak different languages; each one has its own grammar, syntax, and vocabulary that must be

*Corresponding author: Adam A. Al Sultan; *aaalsultan@iau.edu.sa*

learned in order to communicate effectively. In the same way, in different disciplines, there are specific ways to process and understand texts that must be mastered for success—and this relates to reading comprehension.

Reading comprehension is a complex human process. A reader's comprehension of a text involves more than decoding vocabulary words or mindlessly absorbing information from the text. Instead, comprehending written text involves an active ongoing interplay between the reader, the text, and the activity or purpose of reading (Magableh & Abdullah, 2020; Snow, 2002). Overall, to achieve academic success, students must have adequate reading comprehension skills in order to learn and acquire new knowledge and information.

Furthermore, although the subject of science is often conceptualized as an active, hands-on discipline, comprehending science texts is equally important. Science texts (i.e., in science textbooks) are nearly all expository because they are written to explain and describe new and abstract concepts and the ways in which these relate to one another (Gee, 2008; Graesser et al., 2002). Additionally, students often either lack the necessary prior knowledge or have scientific misconceptions that impair their ability to comprehend science texts. Moreover, abstract scientific concepts are often difficult to comprehend with reference to their application to everyday experiences, making them difficult for students to understand. This may result in students focusing on comprehending unfamiliar scientific concepts at a sentence level; while this allows a certain level of understanding, it prevents students from acquiring the knowledge scaffolding provided by a greater overall comprehension of text cohesion despite the scaffolding provided by text cohesion (Ozuru et al., 2009).

In the context of high school science education, a student's comprehension of physics texts requires a clear understanding of the subject's unique lexicon, semantics, syntax, and logic. Additionally, physics texts often use compound sentences and logical connectives to illustrate the causes and effects of two ideas. Indeed, researchers have asserted that physics texts often present readers with cognitive difficulties as they interact with these texts to construct meaning (Handayani et al., 2018; Koch, 2001). Therefore, developing strategies to overcome the unique challenges of comprehension of physics texts is critical for teachers. Thus far, little research has been carried out on high school students' reading comprehension levels for physics texts and the instructional strategies needed to improve student's reading comprehension of physics texts.

Furthermore, anxiety about an academic subject restricts students from accessing prior knowledge or learning new concepts efficiently. Anxiety impacts students' ability to remember, process, retain information, and make connections between new and existing knowledge. Additionally, anxiety produces a physiological response that can interfere with cognitive processes (Palmer, 2007; Sahin et al., 2015; Zeidner & Matthews, 2005). Physics anxiety is a unique construct that affects physics learning (Dou & Zwolak, 2019). However, few researchers have studied physics anxiety, making it less readily defined than the more general concept of science anxiety. Science anxiety is defined as the debilitating combination of fear, negative emotions, and cognitive dysfunction when undertaking or thinking about science-related tasks (Mallow 1978, 1988). Science anxiety is primarily noticed in science lessons, group activities, exams, and performance-based activities. Indeed, researchers have established that science anxiety has an impact on students' future career choices. Students with high levels of science anxiety tend to avoid science, technology, engineering, and mathematics (STEM) courses at university or STEM career interests after high school (Megreya & Al-Emadi, 2023). Physics anxiety can be defined as the feelings of fear, worry, and dread that students may experience when confronted with physics and physics-related tasks; it encompasses feelings of apprehension, lack of confidence, and a sense of helplessness when faced with the prospect of learning physics (Gungor et al., 2007; Sahin et al., 2015). Therefore, there is a need to explore instructional strategies that can help reduce physics anxiety among high school students.

Moreover, the Predict, Organize, Search, Summarize, and Evaluate (POSSE) instructional strategy is a five-stage reading comprehension strategy that can be described as a framework that guides teachers and students in pre-reading, during-reading, and post-reading activities designed to improve comprehension (Englert & Mariage, 1991). The POSSE strategy strongly emphasizes the importance of teacher modeling and thinking aloud. In addition, it emphasizes the importance of instructional dialogue between a teacher and students as well as within a group of students (Westwood, 2008; Westwood, 2016). Furthermore, implementing the POSSE strategy provides students with various activities that allow for classroom interaction, which encourages them to take ownership of their learning and creates a positive learning environment in which to foster students' affective needs (Alyatim et al., 2020; Paul & Norbury, 2012). As such, the POSSE strategy has the potential to empower students to become competent readers of physics texts and reduce their physics anxiety. In Saudi Arabia, very little is known about high school students' performance in terms of reading and comprehending physics texts. However, what is known about this issue comes from a study by Albadi et al. (2017) that reported on how first-year high school students had significant difficulty in reading physics passages.

Researchers have pointed out that educators often avoid trying to address students' poor comprehension of science texts (e.g., physics text), as it can be a challenging task and time-consuming for the teacher (Ali & Razali, 2019; Fisher & Frey, 2014; Amendum Conradi, & Hiebert, 2018). This problem needs to be addressed since studies have revealed that high school students find many science texts complicated and difficult to comprehend, and that students' reading comprehension abilities influence both how students learn scientific concepts and anxiety about the content (León & Escudero, 2015; Patterson et al., 2018; van den Broek, 2010). Therefore, it is necessary to propose an instructional strategy to empower students to become competent readers of physics texts and reduce their physics anxiety. As such, the aim of this study is to fill a gap in the literature by investigating the effect of the POSSE strategy on developing reading comprehension levels for physics texts and reducing physics anxiety among high school students. The study was guided by the following questions:

1. How effective is the POSSE strategy in improving male second-year high school students' reading comprehension of physics texts?
2. How effective is the POSSE in reducing physics anxiety among male second-year high school students?

2. Literature Review and Theoretical Framework

The POSSE Strategy

The process of teaching reading comprehension strategies to students is not an easy task. The challenge increases when students encounter expository text (e.g., physics texts) in which abstract logical causal relationships are presented and a there is a higher level of technical vocabulary than narrative text (Gertsen et al., 2001). However, several approaches have been theorized to help improve students' comprehension of expository text. Among these approaches is the multi-component reading comprehension approach. This approach aims to incorporate several scientifically proven practices into one intervention strategy. These practices include comprehension monitoring, acquiring prior knowledge, and summarizing information throughout the reading process (Baker, Gertsen & Scanlon, 2002; Wong & Butler, 2012). Along the same lines, Sencibaugh (2007) argued that reading comprehension approaches should include these particular abilities: identifying the main idea, self-monitoring for understanding, restating key concepts, self-questioning throughout the reading, and summarizing.

Accordingly, the POSSE reading strategy adheres to the above-mentioned approaches and it is designed to model and teach students the habits of strong readers. There are many reading practices included in this strategy that improve reading comprehension. In addition to graphic organizers and text structures, students are stimulated to become aware of their prior knowledge and monitor their progress (Olbata et al., 2023). Furthermore, earlier studies on POSSE indicated that the strategy was successful in helping students in upper elementary and middle school process expository text, as well as undergraduate students from English education majors (Mertosono et al., 2020; Westwood, 2008). However, hardly any study has investigated the effectiveness of the POSSE strategy on expository subject-specific text, such as physics.

More specifically, POSSE is a five-stage reading comprehension strategy used to teach expository text structure to students (Englert & Mariage, 1991). Additionally, each stage must include one main activity. In particular, two activities are carried out before reading (i.e., predict and organize), and three are undertaken during and after reading (i.e., search, summarize, and evaluate). In the following paragraphs, the five stages of the POSSE strategy are presented.

In the *predict* stage, students focus on brainstorming. As a group, students try to predict the content of the text based on the title, picture, or keywords. Students activate their prior knowledge. This is important because it helps the students engage with the text and form an initial understanding before reading it. This helps them to make informed predictions about what will be in the text and better comprehend the information. For the *organize* stage, student groups use concept maps or graphic organizers to arrange ideas from the previous stage. These visual representations of the relationships between ideas help students to identify patterns and make connections more quickly, which helps them to better understand the material and identify key points.

Furthermore, in the *search* stage, student groups examine their predictions and search for the main ideas in the text. They look for patterns and discrepancies in their predictions, compare them to those identified by their peers, and develop an understanding of the main topics of the text. The comparison between their predictions and the actual content of the text helps students to identify any misconceptions they may have and adjust their understanding accordingly. For the *summarize* stage, student groups write an analysis of each paragraph and combine the main ideas into a summary. This analysis and synthesis process helps students to gain a deeper understanding of the content, helps them to identify any gaps in their understanding of the material, and allows them to clarify any questions they may have.

The final stage is *evaluation*. Here, students assess whether their predictions match the actual text content. Students must record how well their predictions match the content of the actual text in order to recognize this process as a strategy that helps them understand the text. This can help them identify areas of understanding that need improvement and which strategies are effective. Overall, the POSSE strategy supports students in understanding how expository texts are structured, enabling them to better comprehend the material. Additionally, the strategy allows students to break down the structure of expository text into manageable pieces, ensuring that the overall understanding of the material is more achievable.

Reading Comprehension of Physics Texts

Reading comprehension is a dynamic process and an evolving interaction between the reader's background knowledge and the text (Lems et al., 2010). Specifically, reading comprehension is the ability to understand what is being described in a text rather than interpreting isolated words or sentences for meaning (Woolley, 2011). Overall, comprehension occurs when a mental representation of the situation in the text is created as a result of many processes during reading (León & Escudero, 2017). Moreover, physics texts are challenging for students to comprehend because they have a high level of lexical density and because of the use of diagrams, charts, and multimodal sources (Buehl, 2017; Yore, 2012). Although researchers have concluded that physics texts are challenging to comprehend, studies that measure and improve students' comprehension of physics text are rare (e.g., (Abu Shama, 2011; Tolba, 2007).

Tolba (2007) investigated the effectiveness of the semantic map strategy on the development of first-year high school students' levels of comprehension of physics texts. The researcher employed a quasi-experimental design and divided the students into two groups: experimental and control. Tolba used a test measuring comprehension of physics texts to collect data from the participants. The test included 40 questions with a total possible score of 57 points. According to the results, the experimental group achieved significantly higher mean scores than the control group. The mean scores for the experimental and control groups were 47.3 and 34.16 points out of 57, respectively. Because of the control group's low score, the researcher recommended that more research be conducted to investigate other instructional strategies to foster students' comprehension of physics texts. To that end, this current study aims to investigate an instructional strategy that has the potential to address students' physics learning needs (i.e., comprehension of physics texts).

Physics Anxiety

Anxiety is defined as a feeling of tension, worried thoughts, and bodily changes such as sweating, dizziness, and increased heart rate (Slavin, 2009; Woolfolk, 2016). Additionally, anxiety is generally considered a long-acting, future-oriented response that affects one's state of mind. In education, it is common for students to feel anxious or worried when faced with academic challenges, such as a test, or when they have to perform well in class. Many successful students have moderate anxiety levels that contribute to their success. However, excessive anxiety levels can restrict a student's ability to access prior knowledge, solve problems, engage in group activities, and reach their full academic potential (Egger et al., 2003; von der Embse et al., 2018). Additionally, anxiety shapes how and to what extent students participate in classroom activities. Students with high anxiety levels tend to hesitate to participate in group discussions, debates, and other interactive activities. They may feel like they are not prepared to answer questions or provide meaningful contributions, which can limit their participation in the classroom.

Despite this, science anxiety has been the subject of only a few research studies, and physics anxiety has been the subject of even fewer studies (Agra et al., 2017; Reddy, 2019). Physics anxiety can arise from various sources, such as a fear of failure, a lack of confidence, a lack of understanding of the material, or negative experiences in past physics classes. Additionally, it can create a mental block that makes it more difficult for the student to focus on the task at hand and thus impedes their progress in learning physics; it can be triggered by anything from a challenging concept to a difficult problem or a high-stakes test (Mahdy, 2020). In sum, research on physics anxiety is necessary to provide teachers with effective instructional strategies that can help to minimize students' anxiety.

3. Methodology

The research in the current study is a quasi-experimental design with an experimental and a control group. The study was conducted in a classroom setting. Both groups undertook a pre-test and post-test, but only the experimental group received the POSSE strategy treatment (see Table 1).

Table 1: Study's research design (quasi-experimental design)

Group	Pre-test	Intervention	Post-test
Experimental	Reading comprehension of physics texts test & Physics anxiety questionnaire	POSSE strategy	Reading comprehension of physics texts test & Physics anxiety questionnaire
Control		None	

In Saudi Arabia, general education lasts for 12 years, and includes six years of elementary education, three years of intermediate education, and three years of high school education. This current study specifically focused on all male second-year male high school students enrolled in public high schools in the city of Dammam. This city was chosen because of its accessibility to the researcher for collecting data. It is important to note that Saudi high schools are gender segregated. Unfortunately, no female researcher was available to participate in data collection for the study, so no female participants were included.

Moreover, a convenience sample of two schools was chosen because of their ready willingness to participate in this study. Choosing two different schools helped reduce the diffusion of treatment threat to the study's external and internal validity; specifically, this is where participants in both groups communicate with one another and influence the outcome of the study (Creswell, 2013). Each school involved had three second-year classes, and one class from each school was randomly selected. Both the experimental and control groups had 35 students in their selected classes. As such, a total of 70 male second-year high school students participated in this study.

Based on the City's Department of Planning and Development, student populations in both schools were predominantly from middle-class families. Additionally, none of the students in either group were gifted or special education students, and the achievements of both groups on their previous semester's physics exam followed a normal distribution. The limitation of these abovementioned extraneous variables allowed for a more accurate assessment of the effectiveness of the intervention (i.e., the POSSE strategy). Furthermore, physics is generally taught five times per week, and the following unit from the physics textbook was used in this study: "Energy, Work, and Simple Machines", which took four weeks to complete. Ethical approval to conduct the study was received from the Ministry of Education (Number: 4400532453; Date: Nov. 2022).

Furthermore, the current study developed two instruments for collecting data from the participants: the Reading Comprehension of Physics Texts Test and the Physics Anxiety Questionnaire. The Arabic language is the local medium of instruction. As such, both instruments were written in Arabic. The Reading Comprehension of Physics Texts Test was developed to measure students' reading comprehension levels for physics texts related to the "Energy, Work, and Simple Machines" unit. Little research has been carried out on reading comprehension of physics texts. However, by reviewing the literature on reading comprehension for physics texts (Abu Shama, 2011; Koch, 2001; Tolba, 2007), four levels of reading comprehension were identified: direct, deductive, critical, and creative. Each comprehension level consists of three skills.

First, the *direct* comprehension level requires the following skills: (a) ability to determine the main idea of the text, which refers to the student's ability to identify the general idea of the text; (b) ability to determine scientific details, which refers to the student's ability to identify scientific facts in the text that support the main idea and represent the basic budling blocks from which the student builds a deeper conceptual understanding of the physics text; and (c) ability to determine physics symbols and units, which refers to the student's ability to link the concept's name and the symbol denoting it and to identify the symbols that make up the units of measurement.

Second, the *deductive* comprehension level includes the following skills: (a) inferring cause–effect relationships, which refers the student's ability to uncover the cause (why an event happened) and effect (description of what happened) relationships from the physics text; (b) inferring the relationship between physics quantities, which refers to the student's ability to perceive the relationships between physics concepts and connect them in a quantitative form; and (c) drawing similarities and differences, which refers to the student's ability to distinguish between physics concepts and their relationships with other concepts to reach a general layout that defines the characteristics of the concepts included in the text.

Third, the *critical* comprehension level includes the following skills: (a) judging the physics text, which refers to the student's ability to infer new information in light of their understanding of the physics text; (b) reading graphs related to physics, which refers to the student's ability to visually perceive graphic forms, extract information from them, and convert them into a verbal form that expresses the idea or relationship expressed graphically; and (c) reading physics-related data tables, which refers to the student's ability to read the data contained in the table, express them in writing, and realize the extent of their rationality as well as the ability to clarify the relationship between the variables mentioned in the table.

The final reading comprehension level is the creative comprehension level and includes the following skills: (a) paraphrasing the physics text, which refers to the student's ability to restate the meaning of the text using another form (e.g., quantitative or written); (b) predicting the physics phenomenon, which refers to the student's ability to indicate in advance what may happen to a physics phenomenon if changes were to occur to it and under certain conditions; and (c) applying knowledge that is extracted from the physics text, which refers to the student's ability to employ the ideas contained in the text in other situations, whether related to the scientific material or everyday life activities.

Together with an experienced high school physics teacher, several resources were examined when drafting the Reading Comprehension of Physics Texts Test. The resources included the scientific concepts in each lesson, the learning objectives of each lesson, and samples of both the Academic Achievement Test for Scientific Specializations (i.e., physics section) and the Saudi General Aptitude Test (i.e., reading comprehension ability). The Reading Comprehension of Physics Texts Test included multiple-choice questions (MCQs), short-answer items, and fill-in-the-blanks items, which were used to adequately measure student achievement for each reading comprehension level (i.e., direct, deductive, critical, creative). The table below displays the specifications for the Reading Comprehension of Physics Texts Test.

Table 2: Table of specifications for the Reading Comprehension of Physics Texts Test

Reading comprehension level	Reading skill	Total number of questions	Item number
Direct comprehension	Determining the main idea	3	2/16/25
	Determining scientific details	3	3/19/28
	Determining physics symbols and units	4	4/7/24/11
Deductive comprehension	Inferring cause–effect relationships	3	18/32/30/14
	Inferring the relationship between physics quantities	3	1/20/23
	Drawing similarities and differences	4	33/21/17
Critical comprehension	Judging the physics text	2	15/29
	Reading physics-related graphs	2	13/5
	Reading physics-related data tables	2	6/12
Creative comprehension	Paraphrasing the physics text	2	27/8
	Predicting the physics phenomenon	2	10/31
	Applying the knowledge that is extracted from the physics text	3	9/22/26

To ensure that the content validity of the test was sound, two science professors were asked to review the suitability of the questions for each reading comprehension level, review each MCQ question for clarity, and provide any other suggestions. Accordingly, minor changes were made to the wording and alternative options for the MCQ questions. The test was then pilot tested on 35 male third-year high school students who were not part of the study.

The internal consistency of the test was calculated using Pearson correlation coefficients between each item and the total score for the cognitive level associated with it. Table 3 shows that all correlation coefficients between each question and the total mark for the reading comprehension level under which the question fell are statistically significant at 0.01. Therefore, there is internal consistency in the Reading Comprehension of Physics Texts Test.

Table 3: Pearson correlation coefficients (PCC) for the Reading Comprehension of Physics Texts Test

Direct comprehension		Deductive comprehension		Critical comprehension		Creative comprehension	
PCC	Question number	PCC	Question number	PCC	Question number	PCC	Question number
0.635*	2	0.583*	1	0.591*	5	0.725*	8
0.753*	3	0.692*	14	0.851*	6	0.755*	9
0.639*	4	0.588*	17	0.641*	12	0.737*	10

0.782*	7	0.829*	18	0.832*	13	0.626*	22
0.614*	11	0.751*	20	0.911*	15	0.766*	26
0.727*	16	0.657*	21	0.832*	29	0.645*	27
0.835*	19	0.824*	23			0.623*	31
0.853*	24	0.693*	30				
0.749*	25	0.621*	32				
0.683*	28	0.822*	33				

* Correlation is significant at the 0.01 level.

The internal consistency was also calculated for each reading comprehension level independently of total test scores. The coefficient values for direct, deductive, critical, and creative comprehension were as follow: 0.632, 0.756, 0.615, and 0.757, respectively. Statistically significant correlations were found for all coefficients at a 0.01 level, indicating strong internal consistency. Furthermore, the reliability of the test was estimated using Cronbach's alpha, which was calculated as 0.876. Additionally, split-half reliability (i.e., Spearman–Brown) was estimated, which was calculated as 0.856. Both reliability results imply a good reliability score (Tuckman & Harper, 2012).

Furthermore, the difficulty and discrimination coefficients for each question were estimated. The difficulty coefficients ranged from 0.37 to 0.75, and the discrimination coefficients ranged from 0.33 to 0.66. The averages for the difficulty and discrimination coefficients were 0.56 and 0.66, respectively. Therefore, the Reading Comprehension of Physics Texts Test questions have appropriate and suitable difficulty and discrimination coefficients. The Reading Comprehension of Physics Texts Test took approximately 45 minutes to complete. Collectively, the validity and reliability results confirm the appropriateness of the test for the proposed application.

Guided by the limited literature on physics anxiety, the Physics Anxiety Questionnaire focused on the following three components: physics course anxiety, physics exam anxiety, and anxiety about lack of physics knowledge. These specific anxieties were chosen because of their documented role in the literature on physics anxiety within the context of high school education (i.e., Abou-Ghaneima, 2017; Alsaeed, 2015; Duvall & Roddy, 2020; Syvertsen et al., 2020). The questionnaire consisted of 18 statements, with six statements focusing on each component. To avoid confusion and misinterpretation of the statements, negative phrases were not used. A Likert scale was used to assess the participants' responses: rarely (score 1), sometimes (score 2), and always (score 3).

Furthermore, content validity was verified by two educational psychology experts. They evaluated each item for clarity, readability, and relevance. All changes deemed necessary by the reviewers were implemented; these mostly related to wording and minor grammatical changes. The questionnaire was then pilot tested on a total of 56 students from high schools which did not take part in the study. Table 4 shows the internal consistency of the questionnaire, which was calculated using Pearson correlation coefficients.

Table 4: Pearson correlation coefficients (PCC) for the Physics Anxiety Questionnaire

Physics course anxiety		Physics exam anxiety		Anxiety about lack of physics knowledge	
No.	Pearson Correlation	No.	Pearson Correlation	No.	Pearson Correlation
1	0.813*	7	0.738*	13	0.837*
2	0.779*	8	0.827*	14	0.733*
3	0.772*	9	0.858*	15	0.827*
4	0.759*	10	0.748*	16	0.775*
5	0.783*	11	0.827*	17	0.758*
6	0.843*	12	0.775*	18	0.785*

* Correlation is significant at the 0.01 level.

Table 4 demonstrates that all the correlation coefficients for each statement and the total mark for the habit of mind under which the statements fell are statistically significant at the 0.01 level. This significance indicates that the questionnaire is internally consistent. Additionally, the internal consistency was calculated for each skill with overall questionnaire scores. The values for the coefficients were statistically significant at the 0.01 level: physics course anxiety (0.677), physics exam anxiety (0.651), and anxiety about lack of physics knowledge (0.758). Furthermore, the reliability of the questionnaire was estimated using Cronbach's alpha, and was calculated as 0.914. Additionally, split-half reliability (i.e., Spearman–Brown) was estimated, which was calculated as 0.861. Both reliability results imply a good reliability score (Tuckman & Harper, 2012). Finally, on average, it took about 30 minutes to complete the questionnaire.

A teacher's guide to the POSSE strategy for the "Energy, Work, and Simple Machines" Unit was developed by the researcher. The purpose of the guide was to help the teachers implement the POSSE strategy with the experimental group and to ensure that they had a coherent understanding of the POSSE strategy. The teacher's guide included the following sections: introduction to the POSSE strategy, instructions about the role of the teacher and the role of the student in the POSSE strategy, lesson plans according to the POSSE strategy, a timetable for the POSSE strategy lessons, worksheets, and a list of resources about the POSSE strategy for further reading. A science education professor and an experienced high school physics teacher reviewed the guide. Necessary changes were made based on their feedback and written suggestions.

Concerning the control group, the teacher employed their usual teaching method. This entailed lecturing and having students answer questions individually and in groups about the material. Students were also encouraged to ask questions and discuss their ideas. The teacher also gave classwork assignments and provided feedback on students' work. Additionally, quizzes were regularly administered to evaluate students' comprehension of the material.

Turning now to the data analysis for the study, initially, the normality distribution of the data was calculated using the Shapiro–Wilk test for each group. The results indicated that the experimental and control groups had nonsignificant readings signaling a normal data distribution. Therefore, inferential statistics were used to estimate differences between the two groups. Accordingly, the researcher administered the pre-test (i.e., test and questionnaire) with both groups to verify their equivalence, which was calculated using an independent sample t-test (Tuckman & Harper, 2012). Tables 5 and 6 present the results.

Table 5: T-test results for the pre-test Reading Comprehension of Physics Texts Test

Group	N	Mean	SD	df	T value	Significance level
Experimental	35	8.97	1.56	68	−0.611	0.543
Control	35	9.20	1.56			

Table 6: T-test results for the pre-test Physics Anxiety Questionnaire

Group	N	Mean	SD	df	*T*-value	Significance level
Experimental	35	47.14	3.00	68	1.90	0.061
Control	35	45.82	2.75			

Based on the results presented in Tables 5 and 6, no statistically significant differences existed between the experimental and control groups. This is indicated by the fact that the test significance level is above 0.05, demonstrating that the groups are equivalent. The post-test, which included a test and questionnaire, was conducted by the researcher after the four-week treatment for both groups.

4. Results

Effectiveness of POSSE Strategy in the Development of Reading Comprehension Levels for Physics Texts among Students

To test the effectiveness of the POSSE strategy for the development of students' reading comprehension for physics texts, the difference between the post-test mean scores for the experimental and control groups was tested at ($\alpha \leq 0.05$). Table 7 shows the summary statistics for the results.

Table 7: Post-test summary statistics for the Reading Comprehension of Physics Texts Test

Group	N	Mean	SD	df	*T*-test	η^2	Significance level
Experimental	35	29.25	1.35	68	8.83	0.731	0.001
Control	35	24.31	3.01				

According to the results given in Table 7, the null hypothesis is rejected since the significance level is less than 0.05. As such, using the POSSE strategy with the experimental group made a difference in the post-test. Additionally, eta squared ($\eta 2$) was estimated to assess the intervention's effect size and was calculated as 0.73, which is a large effect size (Suter, 2011). This result implies that the POSSE strategy had a major effect on students' performance in the physics reading comprehension test.

Effectiveness of POSSE Strategy in Reducing Physics Anxiety among Students
The post-test mean scores for the experimental and control groups in the Physics Anxiety Questionnaire were compared and tested at ($\alpha \leq 0.05$). Table 8 gives the summary statistics for this hypothesis.

Table 8: Post-test summary statistics for the Physics Anxiety Questionnaire

Group	N	Mean	SD	df	*T*-test	η^2	Significance level
Experimental	35	37.91	2.30	68	−19.77	0.92	0.001
Control	35	46.48	1.12				

According to the results presented in Table 8, the null hypothesis is rejected since the significance level is less than 0.05. As such, using the POSSE strategy with the experimental group made a difference in the post-test (i.e., lower physics anxiety levels). Additionally, eta squared (η2) was estimated to assess the intervention's effect size and was calculated as 0.92, which is a large effect size. Thus, the POSSE strategy had a significant and effective impact on reducing students' physics anxiety.

5. Discussion

In this context, whereby the POSSE strategy made a difference in the post-test Reading Comprehension of Physics Texts Test in favor of the experimental group, a possible explanation for these results is that the POSSE strategy allowed students to lead the comprehension dialogue by asking questions and summarizing and clarifying the text. The teacher’s role was simply to guide students through various reading strategies. Students began by predicting ideas based on their background knowledge. Then they organized their predicted textual ideas and background knowledge according to the text structure. Next, the students searched for the text structure and summarized the main ideas in the expository passage. The POSSE strategy allowed the students to become more actively engaged in the reading process, which enabled them to improve their understanding of the physics text. The POSSE strategy gave students the practice they needed to develop deeper comprehension skills, which allowed them to process information more effectively and recall it more accurately.

Another possible explanation for the significant achievement of the experimental group on the test is the effect of each of the POSSE strategy stages on students’ performance in the comprehension of physics texts. Specifically, during the predict stage, students were given the opportunity to activate their background knowledge and generate prereading questions. Students were engaged in developing prediction strategies by asking prereading questions and focusing on the key points of the physics text. Asking prereading questions helps students to concentrate on the content of the text and identify the main ideas. Subsequently, the organize stage allowed the students to create a concept map based on the background information they had acquired. As a result, students could easily identify connections and relationships between ideas, enabling them to develop a deeper understanding of the physics text.

Furthermore, the search stage enforced the two previous stages by allowing the students to engage with the physics text by reading it carefully to confirm or discredit their predictions—keeping in mind their prereading questions and organizer. Here, the search stage worked as a transitional stage between the pre-reading stages (i.e., predict and organize) and the post-reading stages (i.e., summarize and evaluate). Hence, the students were more likely to form better predictions in upcoming lessons, organize their visual maps more effectively, and subsequently improve their skills in the next stages.

Moreover, in the summarize stage, the students were required to summarize the main ideas of the text, which they achieved through group discussion and consensus. Through the group discussions, students listened to different perspectives and drew connections between the main ideas. This helped them form a comprehensive understanding of the physics text, and by coming to a consensus, they were able to create a summary that accurately reflected their comprehension of the material. Finally, the overall purpose of the evaluate stage was for students to assess the extent to which their predictions matched the actual text content. Here, the students could identify gaps in understanding and adjust their approach accordingly. Collectively, the sequence of steps in the POSSE strategy maximized students' acquisition and retention of the material and allowed them to improve their reading comprehension strategies and skills in every lesson.

Although limited research is available on high school students' reading comprehension levels for physics texts, the findings of the current study are consistent with those of Tolba (2007) who also found that adopting instructional strategies that support students in understanding how expository texts are structured can significantly help them improve their comprehension levels for physics texts. Additionally, the study's results further support the idea that instructional strategies (e.g., the POSSE strategy) that ask students to explain their thoughts, visualize cognitive processes, and evaluate their ideas have the potential to inform assessments of students' reading comprehension levels for expository text (Kilpatrick, 2015; Westwood, 2008).

With respect to the POSSE strategy making a difference in the post-test Physics Anxiety Questionnaire in favor of the experimental group, a possible explanation is the supportive nature of the POSSE strategy. Educational psychology has asserted that designing instructional strategies and activities that allow students to correct errors and collaborate with their peers can reduce subject-specific anxiety (Ormrod & Jones, 2012; Slavin, 2009). Indeed, the POSSE strategy provides students with the opportunity to identify and address their errors before being evaluated through a process of self-assessment by comparing their prior knowledge before and after obtaining information from reading the text and through sharing their predictions, visual representations, and summaries in collaborative groups (Englert & Mariage, 1991; Mertosono et al., 2020).

Another possible explanation for the significant decrease in physics anxiety in the experimental group based on the results of the Physics Anxiety Questionnaire is that the POSSE strategy equipped students with a reading comprehension strategy to address challenging physics texts. The POSSE strategy gives students multiple opportunities to understand the learning process, identify gaps in their knowledge, and adjust their learning approaches accordingly, which builds their confidence and decreases their anxiety.

6. Conclusion

The aim of this study was to examine the effect of the POSSE strategy on reading comprehension levels for physics texts and reducing physics anxiety among high school students. Two research questions were addressed. The results of the study suggest that teachers can adopt the POSSE strategy to improve high school students' reading comprehension of physics texts. A possible explanation for the positive impact of the POSSE strategy on the experimental group based on the results of the Reading Comprehension of Physics Texts Test could be could be that it allowed students multiple opportunities to understand how expository texts are structured and develop deeper comprehension skills. Additionally, the results of the study suggest that the POSSE strategy helps reduce students' subject-specific anxiety (i.e., physics anxiety). This could be due to the variety of opportunities the strategy provided students with to work collaboratively and actively engage in the learning process while reflecting on their progress and identifying areas of improvement.

Furthermore, A practical implication of the study's results is for science education providers. Implementing the POSSE strategy in the classroom can help improve students' overall science literacy skills. Teaching students how to approach a complex scientific text can help them to develop skills that will serve them well when faced with all kinds of scientific material. This approach can also help students feel more in control and less anxious about the material they encounter. Furthermore, the POSSE strategy can benefit students who struggle with the technical language and dense information often found in science textbooks. Overall, the contribution of this study has been to confirm that the POSSE strategy provides a step-by-step approach to understanding an expository text, which, in turn, helps students build their comprehension of physics and build the confidence they need to approach physics with less anxiety.

7. Limitations and Recommendations

A potential limitation may have arisen from our purposeful sampling. Nevertheless, because the Saudi educational system is centralized, alternative research in the region will likely yield similar results with little variation. Another limitation may have been the lack of female participants due to the absence of a female researcher at the time of the study. Therefore, conducting a similar study among female high school students in Saudi Arabia or other countries – where education is gender segregated – is recommended for future research. Additionally, future researchers may investigate other instructional strategies to develop high school students' reading comprehension levels for physics texts and reduce their physics anxiety.

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