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EFFECT OF THINK-PAIR-SHARE STRATEGY ON JUNIOR SECONDARY TWO STUDENTS' ACHIEVEMENT IN BASIC SCIENCE AND TECHNOLOGY IN JAMA'A, KADUNA STATE, NIGERIA

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ABSTRACT
The study investigated the effect of think- pair-share strategy on Junior secondary two students' Achievement in Basic Science and Technology in Jema'a, Kaduna State, Nigeria. The study had three objectives, three research questions that guided the study and three hypotheses were formulated and tested at 0.05 level of significance. The study anchored on social constructivist theory of human learning by Vygotsky, 1978. A quasi-experimental design pre-test, post-test non-equivalent control group was used. Population of the study was 1153 JS 2 students offering Basic Science and Technology for 2024/2025 academic section. A sample of 158 JS 2 Basic Science and Technology students from two schools were obtained using random sampling techniques. The instrument used for data collection was Basic Science and Technology Achievement Test (BSTAT) . The instrument was validated by three experts, two in the Department of Science Education and Technology and one in the department of Educational Foundations, all from the University of Jos. The reliability was established using Kuder Richardson 20(KR-20) for BSTAT which yielded coefficient of 0.76. The experimental group was taught using think- pair -share strategy while the control group was taught using lecture method. The treatment lasted for six weeks. The students were given pre-test and post-test. The data collected were analysed using mean and standard deviation to answer the research questions while analysis of covariance (ANCOVA) was used to test the null hypotheses. Findings of the study revealed that there were significance differences in the mean academic achievement scores of students taught using think -pair-share strategy than those taught using lecture method, the findings also revealed that the strategy is gender friendly. It was recommended among others that seminars, workshops and conferences should be organized by school heads to orient Basic Science and Technology teachers on how to used think-pair- share strategy in teaching. Think -pair-share strategy, Achievement, Basic Science and Technology.

INTRODUCTION
The advancement of any nation depends to a large extend on the rate of her scientific and technological development especially in developing countries like Nigeria. This is because the future of any nation depends on her ability to provide science and technology products to outside world (Ogunyebi 2018). Science is seen as a body of knowledge a way of investigation and thinking in pursuit of an understanding of nature. science such as Basic Science and Technology plays vital role in the lives of individuals and the development of a nation.

Basic science and technology (BST) are a fundamental component of the Nigeria Junior secondary school curriculum. It is designed to provide students with a broad -based education in science, technology engineering and mathematics (STEM) subjects (federal ministry of Education,2023).Basic science and technology (BST) is a subject taught in junior secondary school as a foundation for a range of subjects in the senior secondary school which include biology, chemistry ,physics, mathematics, and technology (Adejumo,2017). It is designed to equip students with the knowledge and attitude necessary to participate effectively in an increasingly complex and technological world (Oyinloye,2019). This means that Basic science and technology is essential for national development, as it provides the foundation for scientific and technological innovation.

The 21st century world is focusing on student -centred strategies to facilitate the study of Basic Science and Technology in schools. This is because teacher -centred methods of teaching do not

promote the much-required critical thinking and problem-solving skills in students which lead to improved academic achievement. In contrast, student -centred methods according to kingdom -Aaron,Etoken and Okwelle(2019) offer opportunities to students for active involvement in the teaching -learning process, communicating effectively and being proficient in understanding concepts. One of such students -centred methods that have this advantage is the cooperative learning method. Cooperatives learning method involves small groups of students working on a common assignment together so as to achieve specific objectives of that assignment.one of the cooperative learning method by (Josiah 2022) was think-pair-share strategy

Think-Pair-Share is a cooperative learning strategy that encourages individual thinking, peer interaction, and class-wide discussion. It is widely used to foster student engagement, collaboration, and critical thinking in various educational settings, including Basic Science and Technology classrooms. This strategy, developed by Frank Lyman in 1981, has continued to evolve, with recent researches highlighting its effectiveness in enhancing student achievement, especially in complex subjects like Basic Science and Technology .The Think-Pair-Share strategy consists of three key phases .Think: The teacher poses a question or problem, and each student is given time to think and reflect individually before responding. This phase encourages independent thinking and allows students to organize their ideas. Pair: After thinking individually, students pair up with a partner to discuss their thoughts, share their responses, and listen to each other's ideas. This phase promotes peer learning, communication, and collaborative problem-solving. Share: Finally, each pair shares their findings or ideas with the entire class. This phase fosters whole-class interaction, and the teacher can guide the discussion, clarify misconceptions, and facilitate deeper understanding. The Think-Pair-Share strategy has several advantages, especially in promoting engagement, enhancing learning outcomes, and fostering a collaborative classroom environment:

Achievement in the teaching-learning process is a measure of students mastering of content and the outcome of instruction at the end of teaching –learning activities (Achghu and Eke, 2020) it depicts the level to which students have successfully completed academic activities commonly determine by scores and grade. The research work of Nwanko and Okigbo (2021) reveals that students taught Basic Science and Technology concept using think-pair-share strategy achieved higher than those taught using conventional method.

Gender is a socio-culturally ascribed attribute that differentiate feminine from masculine. Studies on gender and student's achievement in Basic Science and Technology has not pointed to a definite conclusion. For instance, in some cases, depending on the teaching method adopted, achievement may favour both male or female students (Jack & Jinadu, 2023). Furthermore, gender play key roles on retention of learned concept. Thus, the need to also determine how gender affect student's achievement and retention using think-pair-share strategy.

In 2019 to 2023, the academic achievement of students in Junior secondary school in Basic Science and technology has raised concerns in educational circles, particularly in Jema'a Local Government areas of Kaduna State. Despite the effort of government, educator and policy makers to improve learning outcome, there persist a noticeable disparity between the desired academic achievement and the actual performance of students in subjects as reveal in Kaduna State BECE results for 2019 to 2023,52.62% of the candidates who sat for the examination failed to pass at credit level (35% in 2019, 39.22% in 2020, 40.13% in 2021, 39.41% in 2022, 53.22% in 2023).This implies that only 47.38% of the candidates passed the examinations at credit level and above.

This discrepancy is indicative of an underlined issue that requires thorough investigation. One potential factor contributing to this academic achievement gap is the teaching methodology in education ,teachers use of lecture method. low achievement in these subjects may also result in diminished student interest in pursuing careers in science, engineering, or technology, ultimately reducing the pipeline of future professionals. Additionally, such failures exacerbate educational inequalities, as students in under-resourced areas often have the most difficult mastering of these foundational subjects. (Olugbenga, 2022). It is against this backdrop that think-pair-share (TPS) strategy emerge as a potential solution. TPS promote active students' participation, interaction, and

cooperative learning, thus holding the promise of positively impacting academic achievement. However, the effectiveness of the TPS strategy as an intervention to enhance student's achievement in Basic Science remain largely unexplored in the context of junior secondary schools within Jema'a Local Government of Kaduna State. Consequently, there is a pressing need to investigate whether the adoption of the think-pair-share strategy can bridge the gap in academic achievement and improve students understanding in Basic Science and Technology.

Purpose of the study

The purpose of the study was to investigate the effect of think-pair-share strategy on the academic achievement of junior secondary two students in Basic Science and Technology in Jema'a, Kaduna state, Nigeria. The specific objectives of the study were to:

1 determine the pre-test and post-test mean achievement scores of junior secondary two students taught Basic Science and Technology using think-pair -share strategy and those taught using lecture method in the experimental and control group.

2 determine the difference in the pre-test and post-test achievement score of junior secondary two male and female students in the experimental group.

3 Investigate the interaction effects of gender and think -pair-share strategy on students' achievement in BST.

RESEARCH QUESTIONS

The following research questions guided the study:

1 What is the difference between the pre-test and post-test achievement mean scores of JS two students taught Basic Science and Technology concept using think-pair-share strategy and lecture method?

2 What is the difference in the pre-test and post -test mean achievement of JS two male and female students in the experimental group based on gender ?

3 What is the interaction effect of treatment and gender on students' achievement in Basic Science and Technology?

HYPOTHESES

The study tested the following hypotheses at 0.05 level of significance

1. There is no significant difference between the pre-test and the post-test mean achievement scores of JS two students taught Basic Science and Technology using think-pair-share strategy and those taught using lecture method.

2. There is no significant difference in the pre-test and post-test achievement scores of students taught Basic Science and Technology using think-pair-share strategy based on gender.

3.There is no significant interaction effects of treatment and gender on students' achievement.

METHODOLOGY

The design of the study was quasi-experimental, specifically the pretest-posttest non-equivalent control group design. The area of the study was junior secondary schools in Jama'a, Kaduna state. The population of the study was 1153(male 636 and female 587) JS 2 students offering Basic Science and Technology in 10 public junior secondary schools in Jama'a.The sample for the study was 158 junior secondary school students obtained from the two sample schools using simple random techniques. The schools were randomly assigned to experimental and control groups. The experimental group has 75 students (40 male and 35 female) while control has 83 (43 male and 40 female). The instrument used for the study was Basic Science and Technology Achievement Test (BSTAT). BSTAT was made of 25 questions drawn from the two topics Human respiratory system and human circulatory system from Js 2 curriculum to ensure adequacy of questions in the content areas taught, a table of specification was used to determine the number of questions in the low and

high order cognitions. Also, lesson plans were prepared on the contents for the treatment group using think-pair-share strategy. The control group lesson plan was on lecture method of teaching. The instrument was validated by lecturers in the Departments of Science Education and Educational Foundations. The reliability of the BSTAT was established using Kuder-Richardson 20(KR-20). BSTAT was administered once to 40 JS2 Basic Science and Technology students in a school outside the area of the study and data generated was used to computer the internal consistency which yielded 0.76. The instruments were administered as pre-test and posttest. The data generated from the tests were organized and analyzed. The analysis was based on the hypotheses. The hypotheses were tested at 0.05 alpha level using Analysis of Covariance (ANCOVA). The decision rule is that when p-value was less than or equal to 0.05, the null hypotheses was rejected and whenever p-value is greater than 0.05, the null hypotheses was not be rejected.

RESULTS

Research Question One

What is the difference between the pre-test and post-test achievement mean scores of JS two students taught Basic Science and Technology concept using think-pair-share strategy and lecture method?

Table 1
Achievement Mean Scores of Students taught Basic Science and Technology Concept using Think-Pair-Share Strategy and Lecture Method

Group		Pre-test		Post-test		Mean	Mean Gain	Post-test
	N	Mean	SD	Mean	SD	Gain	Difference	Mean Difference
Experimental	75	27.08	10.02	63.89	11.36	**36.81**	**10.44**	**17.79**
Control	83	19.73	6.47	46.10	6.73	**26.37**		

The result in Table 1 shows the pre-test and post-test mean scores of JS two students taught Basic Science and Technology concepts using the think-pair-share strategy (experimental group) and the lecture method (control group). The experimental group recorded a pre-test mean of 27.08 (SD = 10.02) and a post-test mean of 63.89 (SD = 11.36), giving a mean gain of 36.81. On the other hand, the control group had a pre-test mean of 19.73 (SD = 6.47) and a post-test mean of 46.10 (SD = 6.73), resulting in a mean gain of 26.37. The difference in post-test means between the two groups was 17.79, favouring the experimental group. This indicates that students exposed to the think-pair-share strategy performed significantly better than those taught with the lecture method. The higher mean gain in the experimental group suggests that the interactive nature of the think-pair-share strategy enhanced understanding and retention of Basic Science and Technology concepts more effectively than the traditional lecture approach.

Hypothesis One

There is no significant difference between the pre-test and the post-test mean achievement scores of JS two students taught Basic Science and Technology using think-pair-share strategy and those taught using lecture method.

Table 2
ANCOVA Result on Achievement Mean Scores of Students taught Basic Science and Technology using Think-Pair-Share Strategy and those taught using Lecture Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	21295.047[a]	2	10647.523	371.190	.000
Intercept	20238.137	1	20238.137	705.535	.000
Covariate	8816.232	1	8816.232	307.349	.000
Group	4117.652	1	4117.652	143.548	.000
Error	4446.143	155	28.685		
Total	495804.000	158			
Corrected Total	25741.190	157			

a. R Squared = .827 (Adjusted R Squared = .825)
b. Table 2 presents the ANCOVA result comparing the achievement mean scores of students taught with the think-pair-share strategy and those taught with the lecture method. The result shows that the calculated F-value was 143.55 with a corresponding p-value of 0.000, which is less than the 0.05 level of significance. This indicates that there was a statistically significant difference between the two groups in the post-test achievement scores when controlling for pre-test scores. With an Adjusted R^2 value of .825, the model explains a substantial portion of the variation in achievement. The results implied that the Think-Pair-Share strategy led to significantly different and likely better achievement outcomes compared to the lecture method.

Research Question Two
What is the difference in the pre-test and post -test mean achievement of JS two male and female students in the experimental group?

Table 3
Pre-test and Post-test Achievement Mean Scores of Male and Female Students in the Experimental Group

Group	**N**	**Pre-test Mean**	**SD**	**Post-test Mean**	**SD**	**Mean Gain**	**Mean Gain Difference**	**Post-test Mean Difference**
Male	40	27.53	9.36	64.40	9.57	36.87	0.13	1.09
Female	35	26.57	10.84	63.31	13.24	36.74		

Table 3, both male and female students in the experimental group showed substantial improvement after being taught using the think-pair-share strategy. Male students had a pre-test mean score of 27.53 (SD = 9.36) and a post-test mean score of 64.40 (SD = 9.57), representing a mean gain of 36.87. Female students recorded a pre-test mean of 26.57 (SD = 10.84) and a post-test mean of 63.31 (SD = 13.24), yielding a mean gain of 36.74. The post-test mean difference between male and female students was only 1.09, showing that male students performed slightly better. However, this difference is minimal and indicates that both genders benefited almost equally from the think-pair-share strategy. Therefore, the teaching approach was effective in improving students' performance irrespective of gender differences.

Hypothesis Two
There is no significant difference in the pre-test and post-test achievement scores of students taught Basic Science and Technology using think-pair-share strategy based on gender

Table 4
ANCOVA Result on Achievement Mean Scores of Male and Female Students in the Experimental Group

Source	Type III Sum of Squares	Df	Mean Square	F	P-value
Corrected Model	6555.798[a]	2	3277.899	78.792	.000
Intercept	13198.042	1	13198.042	317.245	.000
Covariate	6533.795	1	6533.795	157.055	.000
Gender	.676	1	.676	.016	.899
Error	2995.348	72	41.602		
Total	315728.000	75			
Corrected Total	9551.147	74			

a. R Squared = .686 (Adjusted R Squared = .678)

The ANCOVA result on Table 4 yielded an F-value of 0.016 with a p-value of 0.899, which is greater than 0.05. Since the value of .899 is greater than 0.05 level of significance, the null hypothesis was therefore retained. The adjusted R^2 value of 0.678 indicates that about 67.8% of the variation in students' achievement can be explained by factors included in the model (such as the teaching method), while the remaining percentage is attributed to other external factors. Since gender was not a significant predictor, it can be inferred that both male and female students benefited equally from the think-pair-share strategy, demonstrating that the teaching method was effective across genders. This means that there was no significant difference in the achievement mean scores of male and female students taught Basic Science and Technology using the think-pair-share strategy.

Research Question Three
What is the interaction effect of treatment and gender on students' achievement in Basic Science and Technology?

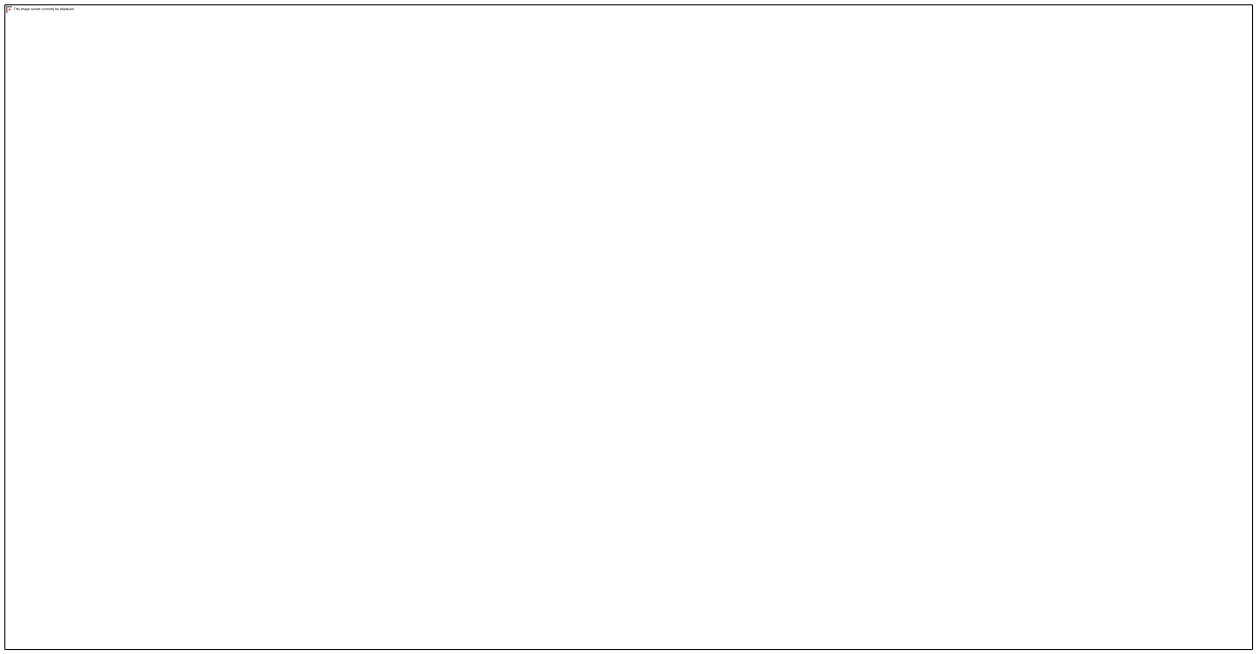

Figure 1: Showing Interaction Effect of Treatment, no Treatment and Gender on Achievement of Students in BSAT

The result presented in Figure 1 shows the interaction effect of treatment and gender on students' achievement in Basic Science and Technology. The profile plot reveals that the lines representing male and female students in both the treatment (think-pair-share) and non-treatment (lecture) groups did not intersect. This pattern indicates no significant interaction effect between treatment and gender on students' achievement. In other words, while the think-pair-share strategy improved students' overall performance, it did so consistently across both genders, meaning that the improvement was not influenced by whether the students were male or female

Hypothesis Three

There is no significant interaction effects of treatment and gender on students' achievement in BSAT.

Table 5
Interaction Effects of Treatment and Gender on Students' Achievement in BSAT

Source	Type III Sum of Squares	Df	Mean Square	F	P-value
Corrected Model	21486.603[a]	4	5371.651	193.171	.000
Intercept	20038.616	1	20038.616	720.612	.000
Covariate	8875.273	1	8875.273	319.165	.000
Group	4125.851	1	4125.851	148.370	.000
Gender	104.177	1	104.177	3.746	.055
Group * Gender	77.446	1	77.446	2.785	.097
Error	4254.587	153	27.808		
Total	495804.000	158			
Corrected Total	25741.190	157			

a. R Squared = .835 (Adjusted R Squared = .830)

The hypothesis that there is no significant interaction effect of treatment and gender on students' achievement in Basic Science and Technology (BSAT) is supported by the results in Table 5. The interaction term, Group × Gender, produced an F-value of 2.785 with a p-value of .097, which is greater than the significance level of .05. This indicates that the effect of the teaching treatment on students' achievement does not depend on gender; in other words, both male and female students benefited similarly from the treatment. The main effect of Group was significant ($F = 148.370$, $p < .05$), showing that the treatment itself had a substantial impact on achievement, while the main effect of Gender was not significant ($F = 3.746$, $p = .055$), suggesting that male and female students performed comparably overall. With an Adjusted R^2 of .830, the model explains 83% of the variance in students' achievement scores, indicating a strong model fit. Overall, the findings confirm that there is no significant interaction between treatment and gender**,** meaning that the teaching method was equally effective for both male and female students.

DISCUSSION

The results of the study clearly indicate that the think-pair-share (TPS) strategy was more effective than the lecture method in enhancing students' achievement in Basic Science and Technology. Although both the experimental and control groups showed improvement from pre-test to post-test, the experimental group demonstrated a much larger gain. This substantial increase suggests that the interactive nature of the TPS approach where students think individually, collaborate with peers, and share their ideas promotes deeper understanding and better application of concepts. The lecture method, though still beneficial to some degree, did not produce the same level of improvement, indicating its relative limitation in fostering active engagement and conceptual development (Gillies, 2016; Kagan, 2014). The ANCOVA results further strengthen this conclusion, as they revealed a significant difference in post-test achievement between the two groups even after controlling for pre-test differences. The high Adjusted R^2 value also shows that the model effectively explains the variance in students' achievement scores, underscoring the reliability of the findings. This supports the assertion that TPS contributes meaningfully to students' academic performance, beyond what traditional lecturing can achieve (Slavin, 2014). The findings align with previous studies showing that cooperative and interactive learning strategies positively impact students' academic achievement. For instance, Gillies (2016) and Kagan (2014) report that cooperative learning structures like TPS increase student participation, deepen understanding, and enhance performance across subject areas.

The findings of this study revealed that the post-test mean difference between male and female students was minimal (1.09 points), indicating that male students performed only slightly better than females. This small gap suggests that both genders benefited almost equally from the think-pair-share (TPS) strategy**.** The result aligns with prior research indicating that TPS promotes equitable learning outcomes, minimizing gender disparities in student achievement. For instance, Mbanefo, Ozoji, and John (2023) found no significant difference between male and female students' achievement in genetics when taught using TPS. Similarly, Abiodun, Asanre, Ogundeji, Odupe, and Rasaki (2022) reported that TPS significantly improved mathematics achievement for all students, with gender exerting no significant effect. These findings collectively reinforce the conclusion that TPS is an effective instructional strategy across genders. Although the current study found no significant gender differences, some research presents contrasting evidence. Ogbeta, Awwalu, Shehu, and Hadejia (2023) reported a male advantage in probability when students were taught using TPS. This suggests that the gender effect may be subject- or context-specific, potentially influenced by content complexity, prior knowledge, or how TPS is implemented. However, in Basic Science and Technology, the present findings indicate that TPS fosters equitable performance regardless of gender, highlighting the strategy's inclusive potent

The analysis of the interaction between treatment and gender revealed that the think-pair-share (TPS) strategy improved students' achievement consistently across both male and female learners. The profile plot indicated that the lines representing males and females in both the

experimental (TPS) and control (lecture) groups did not intersect, suggesting that there was no significant interaction effect between treatment and gender. In other words, while TPS significantly enhanced overall performance, this improvement was not influenced by gender; both male and female students benefited equally from the strategy. These findings align with prior research demonstrating that TPS is an inclusive teaching approach that promotes equitable learning outcomes. For instance, Mbanefo, Ozoji, and John (2023) and Abiodun, Asanre, Ogundeji, Odupe, Rasaki(2022) that TPS improved students' achievement in science and mathematics without any significant gender difference.

CONCLUSION

The findings of this study demonstrate that the think-pair-share (TPS) instructional strategy is more effective than the traditional lecture method in enhancing students' achievement in Basic Science and Technology. While both the experimental and control groups showed improvement, students in the TPS group exhibited significantly higher gains, highlighting the benefits of active, collaborative learning. The strategy facilitated deeper understanding, better application of concepts, confirming the value of interactive instructional methods over teacher-cantered approaches. Additionally, the results indicate that TPS promotes equitable learning outcomes across genders. The study confirms that TPS is an inclusive, student-cantered teaching strategy that enhances academic performance and fosters equitable learning experiences, making it a valuable approach for science education.

RECOMMENDATIONS

Based on the findings of the study, it was recommended that:

1. Teachers of Basic Science and Technology should incorporate the think-pair-share (TPS) strategy into their instructional practices, as it has been shown to significantly improve students' achievement, compared to traditional lecture methods.
2. Schools and educational authorities should provide professional development programs to train teachers on the effective implementation of TPS and other cooperative learning strategies. This will help educators facilitate meaningful student interactions and maximize learning outcomes.
3. Since TPS promotes equitable learning outcomes across genders, teachers should use this strategy to minimize gender disparities in academic performance. Attention should be given to ensuring equal participation and encouraging all students to actively contribute during collaborative activities.
4. Curriculum developers should consider integrating TPS and other active learning strategies into lesson plans and teaching guides, particularly in subjects like science and mathematics, where conceptual understanding is critical.
5. Future research should explore the application of TPS across different subjects, age groups, and educational contexts. Studies could also examine additional factors such as students' self-efficacy, engagement, and attitudes to provide a more holistic understanding of TPS's impact.
6. Schools should foster an environment that encourages collaborative learning by providing adequate resources, classroom space, and opportunities for peer interaction, ensuring TPS activities are effectively implemented.

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