JURNAL UPI

Indonesian Journal of Educational Research and Technology

IJERT Indonesian Journal of Educational Research and Technology

Journal homepage: http://ejournal.upi.edu/index.php/IJERT/

Improving Students' Participation and Performance in Building Quantities through Think-Pair-Share Cooperative Learning

Fathin Amirah Ismail[1], Jabaidah Bungsu[2], Masitah Shahrill[2,]*

[1] IBTE Nakhoda Ragam Campus, Ministry of Education, Brunei Darussalam

[2] Sultan Hassanal Bolkiah Institute of Education, Universiti Brunei Darussalam, Brunei Darussalam

*Correspondence: E-mail: masitah.shahrill@ubd.edu.bn

ABSTRACT

The Think-Pair-Share (TPS) cooperative learning is associated with high student participation and performance in various subjects. However, research focusing on this direction in Vocational and Technical Education (VTE) is not widespread. This mixed method with an action research approach investigated the effectiveness of TPS cooperative learning in improving student participation and performance in building quantities. It also explored the perceptions of students about TPS cooperative learning intervention. Convenience sampling was used to select 24 students from one of the VTE institutions in Brunei Darussalam. Data were collected through a pre-test, a post-test, interviews, and observations; and analyzed with a paired sample-test, frequency and percentage counts, and thematic analysis. The results showed that TPS cooperative learning improved student performance and participation. It encouraged creativity, collaboration, active learning, and motivation, which are conduits to high performance and participation. Although the implementation of TPS cooperative learning comes with some challenges, it can be an effective tool to improve student performance and participation in VTE. Its key features, such as teamwork, critical thinking, and problem-solving skills, may contribute to nurturing the soft skills needed in VTE. Also given are the recommendations for the effective implementation of TPS cooperative learning in VTE.

ARTICLE INFO

Article History:

Submitted/Received 08 Jul 2022

First revised 20 Aug 2022

Accepted 31 Aug 2022

First available online 01 Sep 2022

Publication date 01 Dec 2023

Keyword:

Academic performance,

Building quantities,

TPS cooperative learning,

VTE in Brunei Darussalam.

1. INTRODUCTION

An ideal 21st-Century teaching and learning require active student participation. Opportunities should be provided for learners to engage and interact with students and teachers during teaching and learning (Zhu, 2012). The literature suggests that student participation in teaching and learning is a common problem in several educational contexts, requiring much attention (Herrmann, 2013; Nguyen *et al*., 2018). This attention is needed because student participation is required at the lower and higher levels of education, tasking teachers to design teaching and learning to meet the different needs of students (Herrmann, 2013; Roberts & Friedman, 2013). One of the essential features of student participation is teamwork, which encourages students to become competent and socially responsible for lifelong learning, which is arguably needed in Vocational and Technical Education (VTE) (Karge *et al*., 2011; Mulongo, 2013).

Cooperative learning is one of the best teaching methods that encourage active student participation and performance (Listiadi *et al*., 2019; Li *et al*., 2021). Learning is said to be cooperative when students learn concepts or ideas through instructional group work, bringing students together to achieve a shared goal (Johnson & Johnson, 1999; Johnson *et al*., 2014; Tran, 2014). These strategies range from Think-Pair-Share (TPS), Student Teams Achievement Division (STAD), Jigsaw, small group teaching, and group investigations (Kani & Shahrill, 2015; Jainal & Shahrill, 2021; Abd Mokmin *et al*., 2023).

These methods can be considered cooperative because each group member's roles are interdependent, and face-to-face learning involves student interactions, individual accountability, teamwork, social skills, and group processing (Johnson & Johnson, 1999; Schul, 2011).

Not only does cooperative learning encourage social interaction and teamwork skills, but it also promotes emotional intelligence and lifelong learning; and limits emotional problems, stress, victimization, and bullying among students (Van Ryzin & Roseth, 2018). The literature provides ample evidence to support that cooperative learning is also associated with student performance across different fields of learning regardless of learning difficulties and abilities (Kent *et al*., 2015; Yapici, 2016; Manuwar & Chaudhary, 2019; Rivera-Perez *et al*., 2020). Given these characteristics of cooperative learning, many educational sectors worldwide continue to advocate using cooperative learning strategies to train creative, innovative, and skilled students (Li *et al*., 2021; Hamdan *et al*., 2022; Abd Mokmin *et al*., 2023).

In cooperative learning, TPS is a widely used strategy in the literature and has proven to improve student performance. It allows students to think for themselves, talk to their seatmates to exchange ideas, and show their willingness to participate or share their thinking in class discussions (Mundelsee & Jurkowski, 2021). Students are happy to participate in TPS cooperative teaching and learning. A study by Hetika *et al*. (2017) on TPS cooperative learning in Indonesia reported that students were delighted since their motivation and performance in learning improved. Sampsel's (2013) study on TPS cooperative learning in the United States also said that mathematics students were interested in TPS lessons since they encouraged discussion among them. This is not surprising since TPS cooperative learning provides thinking time for the students and discussion with partners before sharing their ideas with the whole class (Rahmawati, 2017).

The association between TPS cooperative learning and improvement of student performance has also been established in the literature. From a total of 393 ninth-grade geography, mathematics, and biology students in Germany, Mundelsee and Jurkowski (2021) found that although students were shy and anxious, they could raise their hands to share their

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

thoughts after a TPS cooperative learning intervention. In Gaza, found that 68 English students improved in their writing achievement test after TPS cooperative learning intervention. In Nigeria, Bamiro (2015) reported a difference between students' pre-test and post-test chemistry scores. Out of 240 science students, an eight-week TPS cooperative learning intervention showed that the post-test scores were higher than the pre-test scores. Similar findings were reported in Nigeria for mathematics (Akanmu, 2019; Abiodun *et al*., 2022). In other studies, TPS cooperative learning improved student communication skills in Palestine (Raba, 2017), learning achievement and satisfaction in social studies in Thailand (Dorji & Chalermnirundorn, 2021), and student confidence and participation in the United States (Sampsel, 2013).

The effectiveness of TPS cooperative learning in improving student performance and students' general attitudes towards it have been confirmed in various subjects, such as English, mathematics, science, and social studies. However, research focused on this direction, especially in VTE, has not received much attention. Given the features of TPS cooperative learning, this study argues that teamwork, discussion, creativity, and the sharing of ideas that accompany TPS cooperative learning are quintessential in VTE. Therefore, this study is situated in the Bruneian context to investigate how a TPS cooperative learning intervention can improve student performance and participation. The Bruneian context is worth studying because, like other Southeast Asian contexts, education stakeholders in Brunei have firmly acknowledged the relevance of VTE, especially in training students who can apply their skills and knowledge to enter the field of work to create their jobs. Therefore, the Ministry of Education in Brunei has established the Institute of Brunei Technical Education (IBTE) to train students with the knowledge and practical skills to meet the ever-changing needs of the Bruneian job market.

Despite the above effort by the Ministry of Education, the teaching and learning in VTE remain teacher-centered. Based on our observations in classroom teaching and learning, students were found to be passive, failed to discuss or interact among themselves, and did not contribute to classroom discussions, affecting student performance in several courses in VTE, such as building quantities. Amid this challenge, some studies on VTE in Brunei have neglected cooperative learning interventions such as TPS (Ismail & Koay, 2014; Ebil *et al*., 2020; Salleh *et al*., 2021; Hamdan *et al*., 2022). The few studies that used TPS cooperative learning and justified its effectiveness in improving student learning and performance focused on mathematics (Lee *et al*., 2018). Given that the VTE students who majored in building quantities were conveniently available for this study and the ongoing shifts to student-centered learning, this study sought to investigate the effectiveness of TPS cooperative learning intervention in improving student participation and performance in building quantities. It also examined students' perceptions about TPS cooperative learning as an instructional option. The following are the research questions for this study:

(i) What is the effectiveness of TPS cooperative learning intervention in improving VTE student participation and performance in building quantities?
(ii) How do VTE students perceive TPS cooperative learning in the teaching and learning of building quantities?

2. METHOD

2.1. Research Method and Approach

This study used a mixed-method design with an action research approach. The mixed method design is used because quantitative and qualitative approaches involved pre-tests

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

and post-tests, and interviews and observations were sequentially used. The action research approach was also used because a TPS cooperative learning intervention was provided to address a classroom-related problem of students' lack of participation, teamwork, and low performance in building quantities (Laudonia *et al*., 2018).

2.2. Participants and Setting

This study was conducted at one of the IBTE schools in Brunei. A total of 24 students were conveniently selected to participate in this study. They were final-year VTE students specializing in building quantities and expected to graduate with a Higher National Technical Education Certificate (HNTec). The age range of the students was between 17 and 24 years. Most of them had O-Levels qualifications before taking the HNTec program.

2.3. Instruments

Three types of instruments were used to collect data. They were video-recorded observations, tests, and interviews. Recorded video observations were used to determine how students participated, interacted, and engaged in teaching and learning (Roberts & Friedman, 2013; Ngyyen *et al*., 2018). The observation was used to monitor student behavior in the final stage of the TPS cooperative learning intervention. This involved a checklist of how the students shared and discussed what they learned with the entire class. The pre-determined criteria for observing students were their ability to explain, answer, or ask questions.

The pre-test and post-test were used to determine student performance in building quantities. The pre-test was conducted before the TPS cooperative learning intervention to judge the entry behavior of students before the intervention, while the post-test was used to determine student performance after the intervention. The pre-test and post-test scores were compared to investigate the effectiveness of the intervention (Suminar & Putri, 2018; Malik & Alam, 2019). The same questions were used for the pre-test and post-test. It involved seven constructed response questions on unit rates. The highest score a student could get on the tests was 30 marks.

A structured interview guide was used to collect data to support and validate the results of the tests and recorded video observations. It sought to explore the perceptions of students of the intervention. Some questions asked are "How did TPS cooperative learning allow you to participate in teaching and learning of building quantities compared to normal teaching and learning?" and "How did the TPS improve your performance in building quantities?" A total of six participants were conveniently selected for the interview. This was because there was an information redundancy from the seventh participant, suggesting that the information gathered from the six participants was enough for our analysis. The selection was made for two students from higher, medium, and low-performing groups. This was done to have a holistic view of how the intervention improved student participation and performance.

To improve the reliability and validity of the instruments, three VTE experts in building and construction with more than 15 years of teaching experience checked all the instruments. They assessed the questions/statements in each instrument in the context of clarity, ambiguity, and relevance. Before data collection, all expert suggestions and comments were considered in the final instruments. In addition, a table of test specifications was designed based on the objectives and cognitive abilities of the students. This was to ensure that the content of the test adequately represented what was taught (Asamoah *et al*., 2019).

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

2.4. Ethics

Ethical approvals were obtained from the Ethics Committee of the Sultan Hassanal Bolkiah Institute of Education, the selected IBTE school, and the Department of Planning, Development, and Research of the Ministry of Education in Brunei. Informed consent forms to seek the voluntary participation of respondents and a comprehensive information sheet were provided to participants. They were also assured anonymity and confidentiality. Therefore, all the information and identity of the participants were treated as confidential and anonymous in this report.

2.5. Intervention Processes

A 60-minute lesson on unit rates under building quantities was planned and delivered to students. Before starting the lesson, students were briefed on the lesson's objectives, discussing the general purpose of the TPS cooperative learning intervention, strategies, and guidelines, which were integrated into the 60-minute lesson. A checklist containing some set of questions and reading texts on unit rates was also provided to participants. The participants were then placed into a group of four members, with six groups comprising participants of high and lower ability. They were guided to review the texts and the checklist containing the questions for 15 minutes. After this stage, we applied the 'think' strategy, where participants were asked specific questions about the texts and the questions on the checklist. They were allowed up to 10 minutes to think about what they had learned about the topic. Then 'pair' strategy was applied. Each of the students paired with another student to discuss further what they learned about the questions and the texts for up to five minutes. Lastly, the 'share' strategy was implemented, where students raised their hands and shared their thoughts on what they had learned with their peers. At the sharing session, we ensured that there was a whole class discussion to monitor the extent of student participation. The 'think' and 'pair' formed the first cycle of the intervention, while the 'share' session formed the second intervention cycle.

Throughout the intervention, we ensured students understood how to use the TPS cooperative learning strategy. They were also monitored and supported to engage in fruitful discussions. For example, aside from the documented options in the checklist, we asked open-ended questions which required students to think about for two minutes and then share their responses. The goal of open-ended questions was to engage students in effective dialogues between themselves and us and develop knowledge for themselves. The students were also reminded not to be shy and not to interrupt their peers. For the students who were shy to share their views, we supported them with psychosocial feedback to overcome any behaviors such as anxiety that impeded their engagement and active learning (Mjelve *et al*., 2019).

2.6. Data Collection

Data collection lasted six weeks on a scheduled date convenient for all students in a laboratory facility in the selected IBTE school. The pre-test was conducted before the post-test and the post-test after the intervention. The interviews were conducted after the post-test, and the entire lesson was video-recorded. Appropriate environments and conditions were prepared for the test and interviews. The test and interviews lasted 45 and 30 minutes, respectively.

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

2.7. Data Analysis

The pre-test and post-test scores were entered into SPSS for further analysis. Data cleaning was performed to address all outliers and missing values. To investigate the effectiveness of the intervention on student performance, a paired-sample t-test was performed to compare the means of the pre-test and post-test scores (Coman *et al*., 2013). Before performing the paired sample-test analysis, the normality assumption was checked and fulfilled, with p-values of 0.09 and 0.72, which were all greater than 0.05 for both pre-test and post-test, respectively (Fisher & Marshall, 2009). Frequency and percentage counts were used to analyze the recorded video observations. The number of times each student participated by answering and responding to questions and sharing their views was checked from the video recordings, on which the frequencies and percentages were calculated. Six phases of thematic analysis. In addition, excerpts from the transcriptions have been used to validate the findings of the interviews.

3. RESULTS AND DISCUSSION

3.1. Effectiveness of TPS Cooperative Learning Intervention in Improving VTE Student Participation and Performance in Building Quantities

This section is divided into parts. First, it presents results on the effectiveness of the TPS cooperative learning intervention in improving student performance and participation, and second, students' perceptions about the intervention.

3.2. TPS Cooperative Learning Intervention and Student Participation in Building Quantities

The summary of the overall results of student participation in the intervention is presented in **Table 1**.

Results in **Table 1** show that the participants participated during the whole-class discussions, especially at the sharing stage (second cycle) of the intervention. About 16.7% (4 out of 24) participants were active, participating more than five times. More than half of the participants (54.2% or 13 out of 24) participated one to five times, while 29.2% (7 out of 24) were non-active participants. The results support that the TPS cooperative learning improved student participation.

3.3. TPS Cooperative Learning Intervention and Student Performance in Building Quantities

Table 2 shows the overall results of the effectiveness of the intervention in improving student performance in building quantities. It summarises the mean difference between the pre-test and post-test scores before and after the intervention.

The results in **Table 2** support that student performance in the post-test (mean=22.58, SD=3.81) is significantly higher than in the pre-test (mean=0.58, SD=0.88), suggesting that their performance improved after the intervention. From Cohen's d value of 0.97, it can be observed that the intervention accounted for 97% of the student performance in building quantities. Further analysis showed that 18 of 24 (75%) students attained more than 15 but less or equal to 25 marks. Four students (17%) improved by more than 25 marks. Two students (8%) improved less than or equal to 15 marks. These results indicate that the students could be categorized into high performers (those who scored above 25 marks), middle performers (those who scored above 15 but below/equal to 25 marks), and low performers (those who scored 15 marks or less). Since we were also interested in how student performance was associated with their participation, we equated their performance to their involvement. A summary of the results is presented in **Table 3**.

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

The results revealed that the four students in the very active category achieved more than 15 marks, and two reached more than 25. In addition, most active students attained more than 15 but less than 25 marks, including two students who acquired more than 25 marks. For the non-active category, the two students improved by 15 marks or less, which corresponds well to their lack of participation in the discussions. Meanwhile, five of the seven non-active students attained more than 15 marks but less than 25, while two attained less than or equal to 15. This supports that the students who actively participated in the intervention performed better than their non-active counterparts.

3.4. Student Perceptions of TPS Cooperative Learning in Building Quantities

When students were asked to reflect on their perceptions of the intervention, our analysis of the interview data revealed three main themes: improvement in student performance and participation, increased group work, and challenges of TPS cooperative learning implementation. Generally, the students reported positive perceptions of the intervention.

3.4.1. Improvement in Student Performance and Participation

The students confirmed that they were able to participate and improve their performance after the intervention. Most students (n=5) believed that the intervention improved their performance and participation. They believed that this approach to teaching and learning allows the teacher to guide them to think and share ideas, training them as active learners. In addition, mixing students with different abilities in a group helped them to tap ideas from other sources. When the teacher validates these ideas, it helps improve their learning. The following excerpt confirms this finding:

> *I rarely speak in a normal class, but with the TPS cooperative learning, I was able to think critically and work collaboratively with my peers. I was able to share my thoughts during the sharing session with the whole class. I think this improved my performance and participation, which is something I want to do every day* (Student 4).

It can be inferred that the TPS intervention improved students critical thinking skills since they worked, discussed, and shared ideas in groups, suggesting that TPS cooperating learning is associated with active learning and high performance (Sampsel, 2013; Hetika *et al*., 2017; Paksi, 2017). These are important determinants of performance and participation in class activities.

3.4.2. Increased Group Work

Most students (n=5) believed that the intervention encouraged group work and collaborative skills, which improved their participation. Most of the students thought and discussed concepts together during the intervention. This motivated them to share what they had learned and improved their performance and participation. Reflecting on her experience, one of the participants shared:

> *Since there is group work, I feel motivated and confident to study and share with the whole class. This helps us to know whether our answers are correct or not* (Student 22).

Another participant corroborated:

> *… let's say that in a group of four people, there are four brains. Thus, each of us has like different opinions. So, it means everyone has their answers. This then improves our understanding of the topic and helps us share the answers with the entire class without difficulty* (Student 9).

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

It can be inferred that group work leads to collaboration, confidence, and motivation, which are associated with performance and participation. The students believed they were more comfortable participating in class discussions because they experienced different answers from their peers, which motivated them to share their views with the class, creating an atmosphere of successful learning. Consistent with the literature, Nandi *et al*. (2011) highlighted that student-to-student interactions and teacher interactions promote student learning. The teacher's role of providing constant guidance to students and allowing them to engage in peer dialogues encourages student-centered learning, which is vital for successful learning (Hetika *et al*., 2017; Tesema *et al*., 2020). This suggests that teacher-centered teaching and learning may not be an excellent way to teach and learn VTE concepts. This is because teacher-centered instruction, such as formal lectures, may limit student collaboration and interactions, making them lack the motivation and interest to participate in teaching and learning (Mijatovic & Jednak, 2011; Drakeford, 2012). Therefore, it is unsurprising that most students reported a positive perception of the intervention and voiced that it should be used in place of the lecture method, especially on complex topics. For example, one of the participants commented:

> *…I prefer TPS as there is great teamwork… I think it can be used to introduce new and difficult topics. Since TPS allows great teamwork, no matter the difficulty of the topic, some students may have some knowledge to share. It is always best to learn from our peers because we understand learning better* (Student 18).

3.5. Challenges of TPS Cooperative Learning Implementation

Most students (n=4) reported challenges that affected their participation and performance. They could not perform well because the questions and text content were unclear. The limited time to prepare to answer questions and language barriers also hindered their participation in class activities and performance. For example, one of them shared:

> *I need more time to prepare and answer the questions, as I must highlight key points and translate some English words into Malay. This is because I have a problem with my English* (Student 3).

Similarly, another participant had this to say:

> *The teacher should explain more details so that the questions and text content won't be complicated. This can include giving detailed information, more examples, and explanations to improve our understanding* (Student 9).

The views expressed by the student suggest that several factors should be considered when implementing TPS cooperative learning, and most of these factors emphasize the teacher's role. The student must explain text content, define the strategies for group work, and provide clear questions to measure student learning (Azizinezhad *et al*., 2013; Mjiatovic & Jednak, 2021; Asamoah *et al*., 2022). The teacher should provide adequate time for students to answer and share their knowledge and respond to questions for satisfactory learning.

Additionally, half of the students (n=3) reported not being confident enough to participate in the lesson activities. They attributed this to the fact that they were not encouraged enough. Some believed that their names were mentioned randomly to respond to questions, which affected their readiness and confidence to answer questions and share their knowledge with their peers. To validate these findings, one of the participants shared:

> *I'm not confident, and I'm not sure if my answer is correct or not. This is because, during the normal question and answer time, I work alone… at times, my name is*

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

called at random by the teacher. This makes me unprepared and not confident to answer the questions or share with my peers (Student 13).

The challenges reported by the students highlight that identifying the way to boost student confidence is essential to improve their performance and participation. The literature suggests that the lack of student participation in class can be attributed to low confidence, including the failure to answer questions and the stigmatization or bullying they may get from their peers when they make mistakes (Drakeford, 2012; Straker, 2016). One way to boost student confidence in teaching and learning is encouragement from teachers and their peers (Karge *et al*., 2011; Roberts & Friedman, 2013). Teachers have the critical role of designing lesson activities that elicit student participation and draw students' attention to their involvement in contributing to a shared experience. Providing positive reinforcement is another way to encourage student participation.

Table 1. Summary of the frequency of student participation.

Frequency of participation	Level of participation	No. of participants	% out of 24 participants
≤ 1	Low (non-active)	7	29.2
>1 and ≤ 5	Moderate (active)	13	54.2
>5	High (very active)	4	16.7

Table 2. Paired sampled t-test between pre-test and post-test scores.

	Mean	SD	Mean difference (95% CI)	t	df	Sig (2-tailed)	Cohen d
Pre-test	0.58	0.88	22	28.81	23	0.000	0.97
Post-test	22.58	3.81					

SD=standard deviation, mean difference is significant if sig<0.05

Table 3. Equating student performance and their participation.

Performance	Participation		
	Non-Active (Frequency ≤1)	Active (Frequency > 1 ≤ 5)	Very Active (Frequency >5)
≤ 15 Marks	2	0	0
> 15 Marks ≤ 25 Marks	5	11	2
> 25 Marks	0	2	2

Generally, the pre-test, post-test, interviews, and recorded video observation results highlight that TPS cooperative learning can improve student performance and participation in VTE, especially in building quantities. This confirms existing studies that found that the TPS cooperative strategy is associated with student performance and participation in different subjects (Kent *et al*., 2015; Yapici, 2016; Manuwar & Chaudhary, 2019; Rivera-Perez *et al*., 2020), and this study has confirmed this association in VTE.

We observed that students were active learners, were able to collaborate with their peers, and developed teamwork skills when the intervention was provided, confirming the literature that cooperative learning encourages active student participation (Bamiro, 2015; Listiadi *et al*., 2019; Li *et al*., 2021; Lukas & Jurkowski, 2021; Abiodun *et al*., 2022). Therefore, it is not surprising that most students suggested that TPS cooperative learning should be used to introduce new topics and teach complex topics in VTE.

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

The results of this study give essential insights into VTE. Since VTE prioritizes practical skills, we believe that the teamwork, motivation, idea sharing, and confidence associated with TPS cooperative learning are essential to training VTE students. The contemporary field of work and the ability to create job demand for students and individuals with critical thinking, problem-solving, and collaborative skills, as well as other soft skills (Hamdan *et al*., 2022). Since the TPS cooperative learning emphasizes these skills, it may be one of the crucial ways to train students toward these skills.

Like how we implemented the TPS cooperative learning intervention, certain vital factors should be considered to encourage student participation and performance. VTE teachers are responsible for explaining text content, facilitating group work, providing clear explanations, giving open-ended questions, and providing adequate time and directions when implementing TPS cooperative learning. We have found that this will help build students' confidence, participation, and performance in VTE concepts (Lemos, 2012; Sampsel, 2013; O'Connor *et al*., 2017). It is not enough to put students into groups. However, the groups should consist of students with different learning abilities. Students should also have a good understanding of the TPS cooperative learning, monitored, and supported to engage in fruitful discussions.

4. CONCLUSION

This study investigated the effectiveness of TPS cooperative learning in improving student participation and performance in building quantities. It also examined student perceptions of TPS cooperative learning as an instructional tool. This study showed that TPS cooperative learning improved student participation and performance, making students express positive perceptions about it. TPS cooperative learning encouraged creativity, collaboration, active learning, and motivation, which are conduits of high performance and participation. It improved student learning as they understood the learning content and engaged in group and whole-class discussions. Regardless of students' positive perception of TPS cooperative learning, they reported challenges such as unclear questions and text content, limited time to prepare and answer questions, language barriers, and low confidence. The results in this study imply that TPS cooperative learning can be an effective tool to improve student learning and participation in VTE concepts such as building quantities.

Given that VTE emphasizes practical, creative, problem-solving, and entrepreneurial skills, the student-centered nature of TPS cooperative learning may supplement the training of VTE students to acquire these soft skills needed for VTE. This study recommends that VTE teachers consider using TPS cooperative learning as an instructional option in building quantities and other VTE courses. While implementing TPS cooperative learning, the appropriate strategies and best practices should be considered, as outlined in the intervention part of this study. Future researchers should assess the effectiveness and perceptions of TPS cooperative learning in improving student participation and performance in other VTE courses and other educational contexts.

5. ACKNOWLEDGMENT

We are thankful for the contributions, commitment, dedication, and patience of the school leaders, staff, and students at the school where this study was conducted.

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

7. REFERENCES

Abd Mokmin, A. U. P., Bungsu, J., and Shahrill, M. (2023). Improving the performance and knowledge retention of aircraft maintenance engineering students in the theory of flight through STAD cooperative learning . *ASEAN Journal of ScienceDorjind Engineering Education, 3*(2), 149-162.

Abiodun, T. O., Asanre, A. A., Ogundeji, M. A., Odupe, T. A., and Rasaki, M. G. (2022). Effect of think-pair-share strategy on student achievement in senior secondary school mathematics. *FNAS Journal of Mathematics and Science Education, 3*(2), 20-25.

Akanmu, M. A. (2019). Effects of think-pair-share on senior school students' performance in mathematics in Ilorin, Nigeria. *African Journal of Educational Studies in Mathematics and Sciences, 15*(2), 107–116.

Asamoah , D., Shahrill , M., and Abdul Latif , S. (2022). A review of formative Assessment techniques in higher education during COVID-19. *The Qualitative Report, 27*(2), 475-48.

Asamoah , D., Sundeme , B., Adusei , A., OEbil cansey , M. K. K., and Ntim , W. N. (2019). Ensuring content representativeness : Perceptions of senior high school teachers in Ghana . *International Journal of Educational Technology and Learning, 6*(1), 2523 -0581.

Azizinezhad, M., Hashemi, M., and Darvishi, S. (2013). Application of cooperative learning in EFL classes enhance the students' language learning. *Procedia - Social and Behavioral Sciences, 93*, 138–141.

Bamiro, A. O. (2015). Effects of guided discovery and think-pair-share strategies on secondary school students' achievement in chemistry. *SAGE Open, 5*(1), 2158244014564754.

Coman, E. N., Picho, K., McArdle, J. J., Villagra, V., Dierker, L., and Iordache, E. (2013). The paired t-test as a simple latent change score model. *Frontiers in Psychology, 4*, 738.

Dorji, T., and Chalermnirundorn, N. (2021). The application of think-pair-share to enhance learning achievement and learning satisfaction in social studies of grade six Bhutanese students. *Walailak Journal of Social Science, 14*(5), 1-19.

Drakeford, W. (2012). The effects of cooperative learning on the classroom participation of students placed at risk for societal failure. *Journal of Psychology Research, 2*(4), 239-246.

Ebil, S., Salleh, S. M., and Shahrill, M. (2020). The use of e-portfolio for self-reflection to promote learning: A case of TVET students. *Education and Information Technologies, 25*(6), 5797-5814.

Fisher, M. J., and Marshall, A. P. (2009). Understanding descriptive statistics. *Australian Critical Care, 22*(2), 93-97.

Hamdan, M. K. K. H., Salleh, S. M., Shahrill, M., and Asamoah, D. (2022). Improving conceptual knowledge and soft skills among vocational students through inquiry-based learning in a flipped classroom. *International Journal of Social Learning, 2*(2), 235-249.

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

Herrmann, K. (2013). The impact of cooperative learning on student engagement: Results from an intervention. *Active Learning in Higher Education, 14*(3), 175-187.

Hetika, H., Farida, I., and Sari, Y. (2017). Think pair share (TPS) as method to improve student's learning motivation and learning achievement. *Dinamika Pendidikan, 12*(2), 125-135.

Ismail, L. M., and Koay, T. L. (2014). Selected pre-vocational students' experiences of school in Brunei Darussalam. *International Journal of Special Education, 29*(1), 98-110.

Jainal, N. H., and Shahrill, M. (2021). Incorporating jigsaw strategy to support students' learning through action research. *International Journal on Social and Education Sciences, 3*(2), 252-266.

Johnson, D. W., and Johnson, R. T. (1999). Making cooperative learning work. *Theory into Practice, 38*(2), 67-73.

Johnson, D., Johnson, R., and Smith, K. (2014). Cooperative learning: Improving university instruction by basing practice on validated theory. *Journal of Excellence in College Teaching, 25*, 85-118.

Kani, N. H. A., and Shahrill, M. (2015). Applying the thinking aloud pair problem solving strategy in mathematics lessons. *Asian Journal of Management Sciences and Education, 4*(2), 20-28.

Karge, B., Phillips, K., Jessee, T., and McCabe, M. (2011). Effective strategies for engaging adult learners. *Journal of College Teaching and Learning (TLC), 8*(12), 53.

Kent, S., Wanzek, J., Swanson, E. A., and Vaughn, S. (2015). Team-based learning for students with high-incidence disabilities in high school social studies classrooms. *Learning Disabilities Research and Practice, 30*(1), 3–14.

Laudonia, I., Mamlok-Naaman, R., Abels, S., and Eilks, I. (2018). Action research in science education – an analytical review of the literature. *Educational Action Research, 26*(3), 480-495.

Lee, C., Li, H. C., and Shahrill, M. (2018). Utilising the think-pair-share technique in the learning of probability. *International Journal on Emerging Mathematics Education, 2*(1), 49-64.

Lemos, N. (2012). "On air": Participation in an online radio show to foster speaking confidence. A cooperative learning-based strategies study. *Profile Issues in Teachers' Professional Development, 14*(1), 91-112.

Li, M., Yin, D., Qiu, H., and Bai, B. (2021). A systematic review of AI technology-based service encounters: Implications for hospitality and tourism operations. *International Journal of Hospitality Management, 95*, 1-10.

Listiadi, A., Sulistyowati, R., and Canda Sakti, N. (2019). Improving learning quality through NHT cooperation model in Indonesian vocational schools. *KnE Social Sciences, 3*(11), 884-902.

Malik, G. T., and Alam, T. (2019). Comparative analysis between pre-test/post-test model and post-test-only model in achieving the learning outcomes. *Pakistan Journal of Ophthalmology, 35*(1), 1-6.

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

Mijatovic, I., and Jednak, S. (2011). Attitudes toward active participation as predictors of student achievement-exploratory research from Serbia. *New Educational Review, 24*(2), 258-271.

Mjelve, L. H., Nyborg, G., Edwards, A., and Crozier, W. R. (2019). Teachers' understandings of shyness: Psychosocial differentiation for student inclusion. *British Educational Research Journal, 46*(6), 1295-1311.

Mulongo, G. (2013). Effect of active learning teaching methodology on learner participation. *Journal of Education and Practice, 4*(4), 157-168.

Mundelsee, L., and Jurkowski, S. (2021). Think and pair before share: Effects of collaboration on students' in-class participation. *Learning and Individual Difference, 88*(102015), 1-11.

Nandi, D., Hamilton, M., Harland, J., and Warburton, G. (2011). How active are students in online discussion forums? *Conferences in Research and Practice in Information Technology Series, 114*, 125-133.

Nguyen, T., Cannata, M., and Miller, J. (2018). Understanding student behavioral engagement: Importance of student interaction with peers and teachers. *Journal of Educational Research, 111*(2), 163-174.

O'Connor, C., Michaels, S., Chapin, S., and Harbaugh, A. G. (2017). The silent and the vocal: Participation and learning in whole-class discussion. *Learning and Instruction, 48*, 5-13.

Paksi, H. (2017). Improving students' participation in lecturing through cooperative learning model in Jigsaw type. *Pancaran Pendidikan FKIP, 6*(3), 183-188.

Raba, A. A. A. (2017). The influence of think-pair-share (TPS) on improving students' oral communication skills in EFL classrooms. *Creative Education, 8*, 12-23.

Rahmawati, O. (2017). Think-Pair-Share: A technique to enhance students' writing skill. *Jurnal Pendidikan Edutama, 4*(1), 49-57.

Rivera-Pérez S, Fernandez-Rio, J., and Iglesias, G. D. (2020). Effects of an 8-week cooperative learning intervention on physical education students' task and self-approach goals, and emotional intelligence. *International Journal of Environmental Research and Public Health, 18*(1), 1-11.

Roberts, A., and Friedman, D. (2013). The impact of teacher immediacy on student participation: An objective cross-disciplinary examination. *International Journal of Teaching and Learning in Higher Education, 25*(1), 38-46.

Salleh, S. M., Musa, J., Jaidin, J. H., and Shahrill, M. (2021). Development of TVET teachers' beliefs about technology enriched instruction through professional development workshops: Application of the technology acceptance model. *Journal of Technical Education and Training, 13*(2), 25-33.

Sampsel, A. (2013). Finding the effects of think-pair-share on student confidence and participation. *Honor Project, 28*, 1–19.

Schul, J. (2011). Revisiting an old friend: The practice and promise of cooperative learning for the twenty-first century. *The Social Studies, 102*(2), 88-93.

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427

Straker, J. (2016). International student participation in higher education: Changing the focus from "international students" to "participation." *Journal of Studies in International Education, 20*(4), 299-318.

Suminar, R., and Putri, G. (2018). The effectiveness of TTW (Think-Talk-Write) strategy in teaching writing descriptive text. *Journal of English Language and Learning, 2*(2), 300-305.

Tesema, A., Reta, E., and Seid, S. (2020). Knowledge on active participation in classroom among nursing and midwifery Students. *Journal of Education and Learning (EduLearn), 14*(3), 352-361.

Tran, V. D. (2014). The effects of cooperative learning on the academic achievement and knowledge retention. *International Journal of Higher Education, 3*(2), 131-140.

Van Ryzin, M. J., and Roseth, C. J. (2018). Cooperative learning in middle school: A means to improve peer relations and reduce victimisation, bullying, and related outcomes. *Journal of Educational Psychology, 110*(8), 1192-1201.

Yapici, H. (2016). Use of jigsaw technique to teach the unit "science within time" in secondary 7th grade social sciences course and students' views on this technique. *Educational Research and Reviews, 11*(8), 773-780.

Zhu, C. (2012). Student satisfaction, performance, and knowledge construction in online collaborative learning. *Educational Technology and Society, 15*(1), 127-136.

DOI:https://doi.org/10.17509/ijert.v3i3.50348
p- ISSN 2775-8419 e- ISSN 2775-8427