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EFFECTIVENESS OF TPS (THINKING, PAIRING AND SHARING) LEARNING MODEL ASSISTED BY QUIZIZZ TO TRAIN CRITICAL THINKING AND COLLABORATION SKILLS

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Abstract

The purpose of this study was to train critical thinking and collaboration skills through the TPS (Thinking, Pairing and Sharing) learning model assisted by Quizizz. The results of pre-research interviewswith science subject teachers revealed that learning had not optimally practiced critical thinking skills and collaboration. This study used a quantitative experimental method with a quasi-experimental groupdesign, where data were collected through tests and questionnaires distributed to 64 VIII grade students asresearch samples. The instruments used in this study were critical thinking skills test using Quizizz, collaboration skills questionnaire instrument, and TPS cooperative syntax implementation observation sheet instrument. The results of the study showed that the implementation of TPS (Thinking, Pairing and Sharing) cooperative learning model assisted by Quizizz had a significant increase in critical thinking skills and collaboration. The data that has been obtained shows 0.000 <0.05, which means that there is a significant change between the control and experimental classes. HOTS questions can hone criticalthinking in the evaluation phase while the study group stage fosters students' collaboration skills. The average value of critical thinking skills between control and experimental classes shows a difference of 83.6%, while the value of collaboration skills has a difference of 11.6%.

Keywords: Learning Model, Critical Thinking, Collaboration

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INTRODUCTION

The development of the times has brought about changes in lifestyles, especially in the field of education. Advances in technology can encourage improvements in the teaching and learning process so that it can keep up with more effective methods. Education is important in life because it is related to the character of a nation. The objectives of Indonesian education and the curriculum outlined in the Constitution of the Republic of Indonesia state that the goal is to educate the nation in order to create a golden generation in the future. Education serves as a means to create a smart young generation and shape the character of the nation (Habe & Ahiruddin, 2017; Amany, 2020). Educators have the full responsibility to instill in students a way of thinking that is more character-oriented so that they can thrive in the era of globalization.

21st century skills have emerged to address developments as a necessity that learners must possess in an increasingly complex world of work. This can encourage individuals to compete in various fields that are increasingly connected to each other and respond quickly to problems. Critical thinking skills are one of the skills that can provide ideas and arguments to solve problems in global phenomena and even all aspects of life. Screven and Paul, as well as Angelo (Filsaime, 2008), state that critical thinking serves as a guide for beliefs and actions, involving a smart and systematic process that includes conceptualization, application, analysis, synthesis, and evaluation in an active and skilled manner. This process is acquired through observation, experience, reflection, reasoning, or interaction. Science education is closely related to higher-order thinking skills because it involves exploration and thinking processes that require analysis, assessment, and integration of information. On the other hand, this can encourage students to identify problems, design experiments, and evaluate results.

Solving a problem can be easily resolved through cooperation with each team's unique ideas and perspectives to find a more effective solution. Collaboration can create openness among individuals to be flexible in achieving common goals. Collaboration is a form of interaction between individuals or organizations aimed at sharing information, resources, benefits, and responsibilities in the decision-making process to achieve common goals or solve problems. This approach aligns with Roschelle and Teasley's definition of collaboration, which describes it as the joint involvement of participants in coordinated efforts to solve common problems. They also highlight that collaborative interaction is characterized by shared goals, equal structure, and high levels of negotiation, interaction, and interdependence. Similarly, Camarihna-Matos and Afsarmanesh state that collaboration involves sharing information, resources, and responsibilities to achieve mutually agreed-upon goals. (Saleh, 2020)

According to etymology, "collaboration" or collaborative also refers to the unification of strengths or increased capacity to achieve mutually agreed goals. In addition, efforts to complete work involving cross-border, cross-sector, cross-relationship, cross-organizational, and even cross-national boundaries are often referred to as "collaboration" (O'Leary, 2010). Collaboration skills refer to a broad and general meaning that describes a situation where two or more individuals or organizations work together to understand each other and solve the problems they face. This process of working together is a dynamic that develops as the group grows and achieves results together (Gray, 1989), leading to a synthesis of various perspectives. The idea of collaboration is developed from the integration of results-oriented perspectives, which state that problem identification, direction setting, and structuring lead to solid partnerships within a team.

Learning using technology can encourage students to participate actively and interactively. One medium that can attract students by combining learning and playing is Quizizz. Quizizz is an online platform that offers various tools to help students learn independently and improve their learning outcomes. With innovative assignments that actively engage students in the learning process, this online platform serves as a tool that motivates educators to continue learning (Sarah, 2023). Quizizz consists of a quiz provided by educators to sharpen students' skills in line with the material that has been taught. The Quizizz platform can be accessed through various devices with internet connectivity, including smartphones, laptops, computers, and tablets.

The current independent curriculum gives each individual the freedom to learn according to their own learning style, opening up opportunities for them to be creative in line with their interests. Schools have three ways to implement the independent curriculum: implementing part of the independent curriculum without changing the existing curriculum, combining the independent curriculum with existing learning resources, or creating their own learning materials. The advantage of the independent curriculum is its focus on important material and the development of students' competencies (Fauzi, 2022).

Interviews with science teachers revealed that the learning process of critical thinking and collaboration skills has not been fully optimized,

especially in the use of online Quizizz and cooperative learning models. The use of technology in learning is still limited and there is a lack of supporting facilities in schools. This hinders the integration of technology-based media that can enhance student interaction and engagement. There are differences in students' abilities to complete tasks, which requires more strategic grouping so that students with similar abilities can work together and support each other in the learning process. Although there are efforts to implement collaborative activities, there are still challenges in preparing students to collaborate effectively and think critically. This indicates the need for further training and guidance for students. The appropriate evaluation method to assess the development of students' critical thinking skills still needs to be developed. This is important to ensure that students truly master the expected skills. Overall, these issues highlight the need for a more innovative approach and better support in the learning process to enhance students' critical thinking and collaboration skills at UPT SMPN 10 Gresik.

Natural disasters are a complex topic involving many concepts such as causes, impacts, and mitigation measures. Through cooperative learning, students can discuss and share their understanding to deepen their knowledge and better connect these concepts. Issues related to natural disasters can encourage students to work in teams, discuss, and make decisions together when facing such situations. Additionally, it can encourage students to consider various perspectives and understand the emotional and social impacts of a disaster. Cooperative learning develops students' cognitive and social skills, which are essential for dealing with natural disasters. Students must be able to think critically, communicate effectively, and collaborate to take appropriate actions in emergency situations (Baehaqi, 2020). Cooperative learning models, such as those developed by Spencer Kagan and Miguel Kagan, have clear objectives, one of which is to develop social skills such as cooperation and collaboration. This is highly relevant in the context of natural disaster education, which requires cooperation and effective communication (Kagan & Kagan, 2009).

One cooperative learning model that aims to change student interaction behavior is the Think Pair Share (TPS) paradigm. Frank Lyman created a teaching and learning strategy involving paired (or group) thinking as a framework for cooperative learning exercises (Sulistio & Haryanti, 2022). Using this method, students can collaborate with others. According to the TPS approach, students must be given sufficient time to exchange ideas about solutions to any problems or difficulties that may be posed by the instructor. Students work together to utilize their abilities to solve existing challenges. This is then explained further in class. The TPS learning model is one of the models that allows students to think independently or in pairs, as explained earlier. The syntax of the TPS cooperative learning model consists of six phases. Phase 1, conveying objectives and motivating students; phase 2, presenting information; phase 3 organizing students into learning groups (pairs); phase 4 guiding groups to work and learn; phase 5 evaluation; phase 6 giving rewards. Kurniasih and Sani (2016) propose that a learning model can be defined as "a consciously designed process to organize educational opportunities to achieve learning objectives." A learning model can also refer to the strategies applied in educational activities.

With the background information above, the researcher wants to test and develop critical thinking and collaboration skills through the TPS (Thinking, Pairing, and Sharing) learning model assisted by Quizizz to prepare for the future of increasing globalization. The use of this model can encourage students to be more skilled and work together to solve problems.

METHOD

This study applied a quantitative experimental method with a quasi-experimental group design. The purpose of the design and method used was to examine the difference in the impact of a treatment on experimental and non-experimental groups (Sugiyono, 2020). Samples were taken using the simple random sampling method, which provides equal opportunities for each member of the population. Where this study involved students from class VIII A and VIII D at UPT SMPN 10 Gresik. Class VIII A as an experimental group by applying the Think Pair Share (TPS) learning model assisted by Quizizz, while Class VIII D acts as a control group with the application of the discovery learning model. The sample involved was 64 students. This research design model uses HOTS-based instruments to improve critical thinking and collaboration skills. Data were collected using a critical thinking skills test instrument using a Quizziz, a collaboration skills questionnaire instrument, and an observation sheet instrument for the implementation of TPS cooperative syntax. Observation was carried out by direct observation of the research conditions before and after the treatment was given. Pre-research observation aims to identify existing problems in the field, while post-research observation can identify changes or impacts after treatment has been carried out. Observations were made starting at the preliminary study stage and during

the learning process. We describe the research process through the procedure in Figure 1.

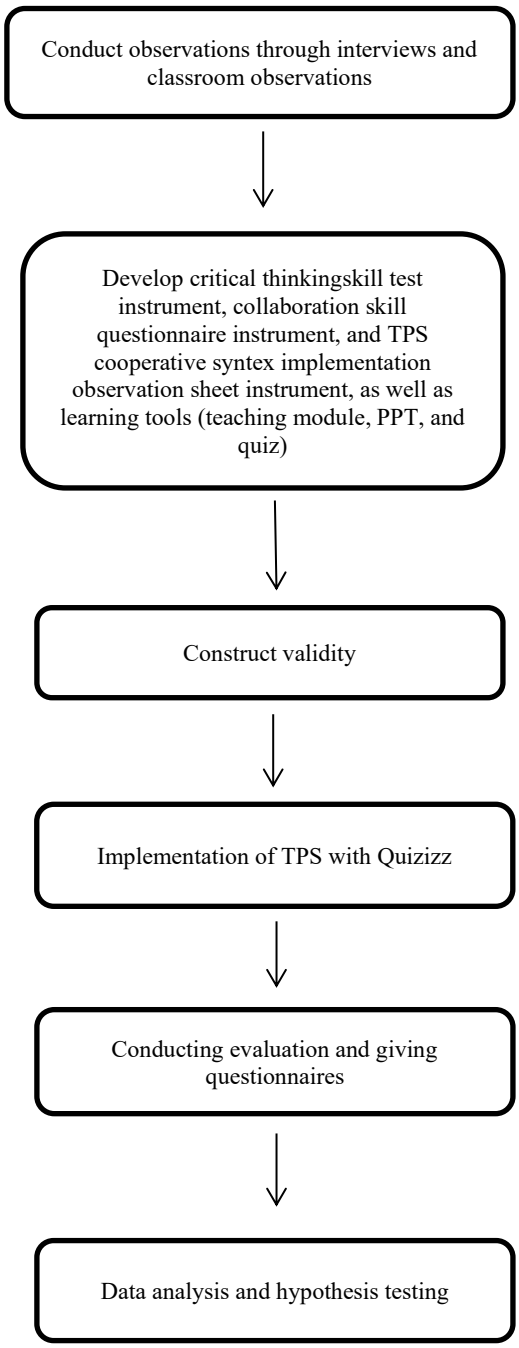

Figure 1. Research procedure

RESULTS AND DISCUSSION

Data on the value of critical thinking skills and collaboration skills are obtained from research that has been carried out. Critical thinking skills were measured using a posttest question of 20 multiple choice questions (complex multiple choice) tested at the end of learning as an evaluation using the TPS (Thinking, Pairing and Sharing) learning model in the experimental class and the control class using the Discovery Learning model.

Making critical thinking questions refers to indicators according to Ennis (1985), namely (1) Analyzing arguments, (2)Asking and answering questions, (3) Considering sources trusted or not, (4) Deducing and considering the results of deduction, (5) Identifying assumptions (Ennis, 1985). In these indicators there are sub-indicators which will be adjusted to the question indicators on natural disaster material. The prepared questions were used in control and experimental classes to determine the effect of the TPS (Thinking, Pairing and Sharing) learning model. The results of the achievement of Critical Thinking and Collaboration Skills abilities are provided in the Table 1.

Table 1. Critical thinking skill achievement results

Variance	Class VIII D	Class VIII A
Number of students	32	32
Average value	29	70,7
Maximum value	62	85
Minimum value	12	40

Based on Table 1. Comparative data between the control class (VIII D) and the experimental class (VIII A)have been collected through critical thinking tests. The experimental class applied the TPS learning model, while the control class used the discovery learning model. The average score achieved by students in class VIII D is 29. While forclass VIII A get an average of 70 (Table 2).

Table 2. Collaboration skill achievement results

Variance	Class VIII D	Class VIII A
Number of students	32	32
Average value	81,4	91,5
Maximum value	100	100
Minimum value	45	70

The data results show that the average collaboration of students in class VIII A who applied the TPS learning model reached 91.5, while in class VIII D who used the discovery learning model was 81.4. These results indicate that the average learning using the TPS model is relatively better than the discovery learning model. Collaboration skills were measured using a collaboration assessment rubric that includes aspects such as communication, cooperation, responsibility, and conflict resolution. The score is

given on a scale of 1-5, where 1 reflects the lowest achievement and 5 reflects the highest achievement.

Making a questionnaire using collaboration indicators according to Trilling and Fadel, namely cooperation, responsibility, communication, compromise and flexibility (Trilling, & Fadel, 2009). The questionnaire is used for control and experimental classes to test the TPS (Thinking, Pairing and Sharing) learning model whether it has an effect or not.

The results of the comparison of the average scores for each critical thinking skill indicator are presented in Figure 2.

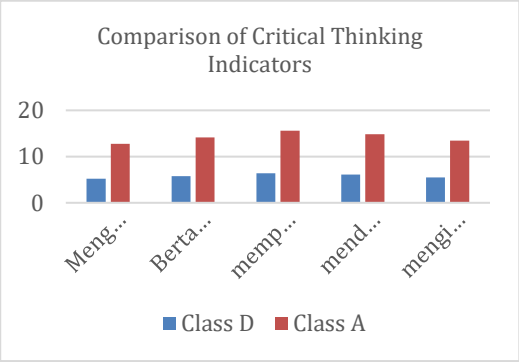

Figure 2. Comparison of critical thinking indicators

Based on Figure 2, it can be seen that the critical thinking skills of students in both classes show significant differences, where Class A as a whole has a deeper ability to analyze arguments, actively asks and answers questions, and is more thorough in assessing the credibility of information sources compared to Class D. This indicates that the TPS learning model assisted by Quizizz is more effective in training students' critical thinking skills.

Meanwhile, the results of the comparison of the average scores for each collaboration skill indicator are presented in Figure 3.

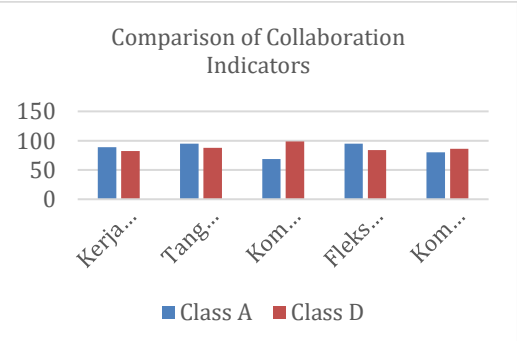

Figure 3. Comparison of collaboration indicators

Based on Figure 3, it can be seen that the collaboration skills of students in both classes show differences, with students in Class A outperforming those in Class D in terms of cooperation, responsibility, and flexibility. This indicates that the learning environment and the TPS learning model assisted by Quizizz implemented in Class A are more conducive to the development of collaboration skills. Although the collaboration skills in Class A are generally higher than those in Class D, there are indicators of compromise and communication that still have relatively low values. This suggests that students are still struggling to reach mutual agreements and effectively communicate their ideas or opinions to group members.

The data that has been obtained is then carried out a prerequisite test analysis before the main hypothesis test. The goal is to find out and ensure that the data can meet the assumptions required by the statistical model used. The normality test is carried out using the Kolmogorov-Smirnov test which assumes that the data is normally distributed or not. The results of the analysis are presented in the following Table 3.

Table 3. Normality test results

Statistics	Class	
	Experiment	Control
N	32	32
Mean	81.17	55.19
Std. Deviation	8.637	12.404
Absolute	.186	.151
Positive	.091	.118
Negative	-186	-151
Test Statistic	.186	.151
Asymp. Sig. (2-tailed)	.006	.061

Table 3 can explain the results of the Asymp Sig value. (2-tailed) shows 0.111> 0.05. The decision istaken based on the Asymp Sig. value; if the value is less than 0.05, then the data value is not normally distributed, whileif it is more than 0.05, then the data value is normally distributed. From the results of the normality test using SPSS Statistic 24, it shows 0.111, which means that the data is normally distributed.

The next prerequisite test is the homogeneity of variances test, used to determine whether the variance of several groups of data is the same (homogeneous). The results of the analysis are presented in the Table 4.

Table 4. Homogeneity test results

Data	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2134.180	26	82.084	2.304	.179
Within Groups	178.125	5	35.625		
Total	2312.305	31			

Table 4 can explain the results of the Sig value. 0.179 > 0.05. The data shows homogeneous or variant. The decision is taken if the significance value> 0.05 then the variance or data of more than two groups of population data is the same (homogeneous). However, if the significance value <0.05 then the variance or data of more than two groups of population data is not the same (not homogeneous).

After conducting the prerequisite test, then conduct the main statistical analysis, namely the t-test. The data hasmet the normal distribution and homogeneous variance. The main function of the t-test is to determine whether there isa significant difference between the means of two sample groups. Thus, it can find out whether the treatment or intervention in the experimental class has a real effect that can train critical thinking and collaboration skills through theTPS (Think, Pair, and Share) learning model assisted by Quizizz. The results of the analysis are presented in the following Table 5.

Table 5. Comparison of experimental class and control class t-test results

Data	t	df	∝	Sig. (2-tailed)
Equal variances assumed	9.725	62	5% or 0.05	.000

Table 5 can explain the results of hypothesis testing that can be accepted, namely the significant difference between critical thinking and collaboration skills of the control class and the experimental class. The results of the significance value show 0.000 <0.05. The decision is taken based on Asymp Sig.; if the sig value> 0.05 then H_0 isaccepted and H_1 is rejected, which means there is no influence between the experimental class and the control class. If the sig value < 0.05 then H_0 is rejected and H_1 is accepted.

The relationship between the TPS cooperative learning model assisted by Quizizz with natural disaster material that hones critical thinking and collaboration skills is related to each other. This can be interpreted in the following Table 6.

Table 6. Interconnection between TPS model, critical thinking and collaboration skills

TPS Phase	Critical Thinking Indicator	Collaboration Indicator
Delivering objectives and motivating students	Analyzing Arguments	Communication
	Identifying assumptions	
Presenting information	Ask and answer	Communication
	Considering the source trustworthy or not	
	Identifying assumptions	
Organize students into learning groups (pairs)	Analyzing arguments	Cooperation
	Ask and answer questions	Responsibility
		Communication
		Compromise
Guiding group work and learning	Analyzing arguments	Cooperation
	Ask and answer questions	Responsibility
	Deduce and consider results	Communication
	Identifying assumptions	Flexibility
Evaluation	Analyzing arguments	Cooperation
	Ask and answer questions	Communication
	Deduce and consider results	
Rewarding	Considering whether the source is trusted or not	Compromise

(Adaptation of (Kurjum et al., 2020) and (Utami & Adilla, 2022))

Based on Table 6, the phase of conveying goals and motivating students is carried out at the beginning of learning. Teaching is done face-to-face without using Quizizz but using PPT media displayed on the screen. In delivering objectives, it can encourage students to ask critical questions related to the relevance and application of what has been presented by the teacher. Motivation delivered by the facilitator plays a role to arouse students to learn independently. In the learning process, learners use critical thinking skills to ensure the information presented comes from reliable or relevant sources. With this, they can be better prepared to think systematically to find the right solution to a problem (Guntari et al., 2023).

The stage of organizing students into learning groups, learners are required to analyze a problem with theirown arguments based on the knowledge they already have. This phase is only done by two people in pairs to shareideas, understand different perspectives and help each other solve problems. This interaction improves learners' communication and cooperation skills (Suryanita et al., 2019). In addition, discussing can create an agreement between the two parties when differences of opinion arise. The decision reflects a willingness to accept a solution that accommodates their interests proportionally based on compromise. Collaboration can help learners to gain confidence in their ideas, reduce anxiety, and increase their likelihood of raising their hands in class discussions. This happens because students discuss and give feedback to each other, which reinforces their ideas. their understanding and reduce the anxiety they may feel when speaking in front of peers (Mundelsee & Jurkowski, 2021).

In the fourth phase of TPS, learners exchange information that has been obtained in the previous stage. They are more focused and detailed to explore data and facts related to the existing problems. In a group, cooperation, responsibility, communication and flexibility are key to achieving optimal results. Each group member must collaborate with each other and share responsibilities fairly to ensure that all tasks can be completed efficiently. Open and honest communication is also important to avoid misunderstandings and ensure that every idea and view is considered. Flexibility in accepting suggestions or changes allows the group to adapt to the dynamics at hand. By integrating all these aspects, the group can ensure that every decision taken is based on in-depth critical analysis and sound logic, resulting in the best and most appropriate solution (Sulistira et al., 2023). The relationship between Think-Pair-Share (TPS) and collaboration can encourage students to collaborate in small groups with different abilities, thus increasing student understanding and collaborative activities. With this, it can improve concept understanding and illustrate collaborative activities related to learning. In addition, collaborative activities in TPS include discussion, sharing ideas, and solving problems together, all of which contribute to better interaction and understanding among students (Utami & Adilla, 2022).

The evaluation stage plays an important role in assessing the extent to which learners have achieved the learning objectives that have been set. Evaluation can provide learners with valuable feedback on their progress. Through evaluation, learners can find out which areas they have mastered well and which aspects still need attentionand improvement. The presentation of the evaluation stage in the form of an online platform is very beneficial for learners, one of which is Quizizz. This platform provides flexibility, allowing them to access and complete questions according to their allotted time. In addition, the online platform is equipped with interactive features, such as Quizizz and automated tests, which not only make the evaluation more interesting but also help learners to be more actively involved in the learning process. Teachers can utilize Quizizz as a tool to assess learning in a game format, so that students feel more relaxed about the exam. This allows teachers to measure learners' competency improvement effectively (Amany, 2020). The questions given through Quizizz can be given randomly to students, thus minimizing cheating. Thisensures that the evaluation results obtained are accurate and not distorted by external factors (Pamungkas, 2023; Amaliyah & Lismawati, 2019).

Critical thinking involves the ability of learners to reach a deep and consistent level of knowledge, as well as toreflect carefully on their goals, so that they can have a realistic understanding of themselves and the environment around them. By using the TPS model, students can strengthen relationships between groups, support classmates who are less academically strong, appreciate diversity, and increase their self-confidence, which overall facilitates the development of awareness of collaborative learning among them (Haerullah et al., 2024). Questions are made to train learners' critical thinking by identifying premises and inferring arguments, strengths and weaknesses. In the evaluation phase of the Think-Pair-Share

(TPS) learning model, students are encouraged to analyze arguments, ask and answer questions, and deduce and consider the results of discussions. In this phase, students reflect and evaluate their own understanding. The process of analyzing arguments occurs when students examine the opinions that arise during the discussion, consider their strengths and weaknesses, and determine the strength of the logic used. Asking and answering questions during evaluation encourages students to go deeper into the material and test their understanding, which strengthens critical thinking skills. Finally, deducing and considering results from multiple perspectives helps students to formulate conclusions that are based on sound evidence and logic, ensuring that decisions made are the result of mature critical thinking.

The rewards phase of learning can motivate learners to engage in learning and student achievement. In the context of critical thinking, these rewards can serve as additional encouragement to carefully consider the sources of information they use. Thus, giving awards in the TPS phase assisted by Quizizz not only increases motivation, but also strengthens students' critical thinking skills in considering the reliability of information sources. By giving awards, whether in the form of praise, points, or other forms of motivation, students feel valued for their contributions in group discussions. This encourages them to more actively participate, collaborate and reach a common agreement. In this process, students learn to listen and consider the views of their peers, as well as compromise to reach a common solution. The rewards given motivate students to contribute constructively, which strengthens their collaboration skills and enhances their ability to compromise in achieving the desired outcome.

The Think Pair Share (TPS) cooperative learning model was developed to improve students' active engagement and understanding. From several syntaxes that have been implemented, it can improve critical thinking and collaboration. The first step is to convey goals and motivate learners, this can hone critical thinking and collaboration. critical thinking and collaboration skills associated with information processing theory, critical thinking is a process that involves reviewing and assessing information. Communicating objectives and providing encouragement to learners can stimulate critical thinking, because learners will become more focused and involved in the learning process, so they can better understand and apply concepts (Wibowo, 2023). In addition, constructivism theory emphasizes the importance of interactive and applicable learning to trigger learners' thinking process. Conveying objectives and motivating learners can improve their critical thinking skills, this causes learners to show higher involvement in the learning process and can develop systematic thinking skills (Ikhtiana, 2023). In addition, the stage can improve collaboration in collaborative learning theory associated with conveying objectives and motivating learners to improve collaboration is a collaborative learning theorysupported by Piaget and Vygotsky. The idea that learners should perform social activities in the search and development of knowledge is the basis of this collaborative learning strategy. Learners should not just be passive spectators and listeners; instead, they should be involved in the learning process (Ntobuo, 2018).

The second syntax in TPS is presenting information that can motivate students to participate more actively and communicate with their peers. So it is related to the fourth syntax of guiding group work and learning. According to constructivism theory, learning that emphasizes learners as the center of the learning process can improve their critical thinking skills. In this approach, learners are encouraged to explore, extend, verify and communicate their findings. Learning models that involve active activities and interactions allow learners to develop their critical thinking skills.This theory highlights the importance of developing analytical, systematic, critical and creative skills. Setting goals and motivating learners to think in a systematic way can help them in improving their critical thinking skills (Firdaus et al., 2023).

Organizing learners into learning groups is the third syntax in the TPS cooperative learning model can foster learners in collaboration. Collaborative Theory focuses on cooperation and social engagement between learners. In its real application, collaborative learning usually involves learners working in pairs or small groups (Suryani, 2020). Behavioristic theory also supports that evaluating in learning can improve critical thinking. This theory emphasizes the learning process that focuses on behavior and response, can help learners develop critical thinking skills through information gathering and analysis (Rosiyanti & Purnomo, 2019). This is in accordance with the fifth part of TPS syntax that provides evaluation to learners who can foster critical thinking skills. The last stage in the TPS syntax is awarding which can be given in different forms, such as grades, applause, or crafts displayed on the *mading*. With the award can increase mutual trust and cooperation among team members. This has a positive impact on

team and individual performance, and reduces internalcompetition that can inhibit information flow and knowledge sharing (Anwar et al., 2024). It can help learners hone their communication skills, both in conveying task results and in interacting with teachers a n d friends (Fasha et al., 2022). The interaction can support learners' collaboration with each other.

This research is in line with previous studies (Sunarti et al., 2023) showing the Think Pair Share (TPS) learning model has beenshown to optimally improve learning outcomes. Learners who learned with the TPS method showed better results compared to those who followed the conventional learning model (MPK) (F = 187.110; p <0.05). Another study (Meilana et al., 2020) showed that the implementation of Think Pair Share (TPS) learning model improved critical thinking skills of learners in elementary school. Critical thinking skills are very important to prepare learners to face problems in everyday life. Suggestions given include innovation in the selection of learning models, support from principals to teachers, and more careful preparation in further research.

Previous research by (Ismail et al., 2022) showed that the implementation of Think Pair Share (TPS) cooperative learning strategy can significantly improve learners' participation and performance in vocational and technical education. The results showed a clear improvement in post-test scores compared to pre-test, as well as an increase in learners' active participation during discussions. Learners reported positive perceptions of the method, including improvements in collaboration and motivation. However, challenges such as unclear questions, time constraints, and language barriers affected participation and confidence. The study recommends the implementation of TPS by VTE teachers considering best practices to maximize its effectiveness.

In addition, in line with previous research shows the TPS learning model is proven to not only improve learners' writing skills but also facilitate active engagement and cooperation between them. In the TPS method,learners are first asked to think independently, then discuss with their peers before presenting the results of the discussion to the larger group. This process results in an active and evolving learning atmosphere, where learners can exchange ideas and provide feedback, thus deepening their understanding of the material. Active engagement is very It is important, especially for learners with different learning styles, as it allows them to learn from each other and develop social skills that are essential in collaborative learning. Research shows that learners who are active in learning activities usually achieve better results and progress in collaboration skills (Erawati & Ramadhan, 2021).

It can be interpreted that the TPS learning model used in the experimental class can improve students' critical thinking and collaboration skills compared to the control class that applied the discovery learning model. The greater increase in critical thinking scores in the experimental class indicates that the active and interactive learning approach ismore effective in developing critical thinking skills with a ratio of 1 : 3. Likewise, the collaboration skill value data showed an increase of 12.4%.

CONCLUSIONS AND SUGGESTIONS

Based on the research that has been carried out, the TPS (Thinking, Pairing and Sharing) cooperative model assisted by Quizizz can train both 21st century skills, namely critical thinking and collaboration skills. This can be seen from the data that shows a significant difference between the control class and the experimental class in critical thinking skills, with an Asymp Sig. (2-tailed) of 0.000 <0.05. In addition, collaboration skills also increased, with an Asymp Sig. (2-tailed) of 0.024 < 0.05 based on analysis using SPSS Statistic 24. Future research is expected to conduct a long-term evaluation through a follow-up study several months after implementation. This study could include surveys and observations to assess the long-term impact of the TPS learning model.

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