

Integrating Artificial Intelligence (AI) into the Think-Pair-Share Cooperative Learning Model to Enhance Elementary School Students' Collaborative Skills

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Abstract: The development of Artificial Intelligence (AI) technology has opened new opportunities for innovation in elementary education, particularly in fostering 21st-century skills. This study aims to describe the effect of integrating AI into the Think-Pair-Share (TPS) cooperative learning model on elementary school students' collaborative skills. The research employed a quantitative method with a causal associative approach, in which the TPS model was combined with AI-based media support during the think, pair, and share stages. Research instruments included questionnaires, observation sheets, and documentation to measure teachers' responses, students' activities, and collaborative skills. The findings indicate that the implementation of the AI-assisted TPS model enhanced active participation, shared responsibility, and mutual respect within groups. Observational data revealed a significant increase in student engagement, with collaborative skills reaching 96% on the mutual respect indicator. Both teachers and students expressed highly positive responses toward the effectiveness of AI integration in supporting the learning process. Therefore, the AI-based TPS cooperative model can serve as an innovative alternative for improving collaborative skills in elementary schools.

Keywords: Artificial Intelligence, TPS Learning Model, Collaboration, Students, Elementary Schools

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INTRODUCTION

Education is a deliberate process of equipping individuals with knowledge, understanding, skills, and specific competencies to foster the development of their talents and character (Darmawati 2020). Education plays a fundamental role in fostering the development of individual potential and in equipping learners to respond effectively to ongoing societal changes. The rapid advancement of the modern era has significantly transformed the educational landscape. In Indonesia, this transformation is reflected in the transition from the 2013 Curriculum (Kurikulum 2013), a nationally standardized competency-based curriculum, to the Merdeka Curriculum (Kurikulum Merdeka), a more flexible and student-centered national curriculum framework. The Merdeka Curriculum is designed to strengthen competencies and character as foundations for lifelong learning, provide greater pedagogical autonomy for teachers in selecting and developing instructional strategies, and emphasize the development of soft skills alongside academic achievement (Santiani et al. 2024). Addressing the demands of 21st-century education requires the development of essential competencies. Among the fundamental skills emphasized in the 21st century is collaboration (Erlina Yusliani, Hanana Laila Burhan 2019).

Collaborative skills are regarded as a critical component of classroom practice, as they facilitate the achievement of learning objectives through structured group-based problem-solving processes (Wulandari, Rita, and Nurul 2021). As social beings, learners inherently rely on interaction and cooperation with others in both present and future contexts; therefore, collaborative skills must be systematically developed within educational settings. To cultivate 21st-century competencies, particularly collaboration, meaningful and well-designed instructional practices are required. Ideal learning environments are characterized by a student-centered approach, in which the teacher assumes the role of facilitator while learners take primary responsibility for the learning process. Within such contexts, learners are expected to explore knowledge independently and actively engage in gathering data or information throughout the learning activities (Handika Dony Rahmadani and Fachrur Rozie 2024). The realization of meaningful learning across educational institutions depends on teachers' professional capacity to design, select, and implement innovative and engaging instructional models (Krisna 2020). An instructional model serves as a structured framework that

systematically outlines the process of achieving learning outcomes and facilitating students' attainment of specific educational objectives. As a fundamental component of the teaching-learning process, an instructional model represents a conceptual framework consisting of systematic procedural patterns grounded in theoretical principles that guide the organization and implementation of learning activities to achieve intended outcomes (Dr. Arden Simeru et al. 1385). One important aspect of the instructional process is students' active participation, group cohesion, and cooperation during collaborative learning activities. The use of appropriate instructional models can serve as an effective alternative for fostering active engagement and teamwork in the learning process. In this context, cooperative learning represents an instructional approach that organizes students into small, heterogeneous groups composed of members with varying levels of academic achievement, gender, and diverse backgrounds, who work collaboratively to support one another in mastering the learning material (Tibahary 2018). Cooperative learning refers to instructional practices that promote structured student collaboration, where the teacher assumes the role of facilitator by designing tasks, posing guiding questions, and supplying relevant materials and information to assist learners in the problem-solving process (Salamun et al. 2023).

Learning theories rooted in Gestalt psychology, including the work of Jean Piaget, underscore the importance of meaningful learning experiences that are aligned with learners' developmental needs (Azzahra et al. 2024). Several core subjects are mandated at the primary education level, including Integrated Science and Social Studies (Ilmu Pengetahuan Alam dan Sosial/IPAS), Pancasila Education, Indonesian Language, and Mathematics. IPAS represents a curriculum innovation that integrates content from natural sciences and social sciences into a unified thematic framework for instruction. The natural sciences examine phenomena related to the natural world, while social sciences explore societal and environmental contexts, thereby allowing both domains to be taught through an integrative approach (Tamalene, Jusuf, and Paluu 2023). At the primary and secondary education levels, Social Studies plays a crucial role, as learners originate from diverse social and environmental contexts in which they function as members of society. Social Studies holds significant importance in fostering

the development of knowledge, attitudes, and skills that enable learners to assume active and responsible roles in future social life (Darmawati 2020).

Within the IPAS subject, particularly its Social Studies component, instruction is designed to develop learners' capacity to become knowledgeable and analytically competent members of society, capable of understanding and examining dynamic social environments. Social Studies instruction should therefore be implemented effectively by actively engaging learners in exploring and critically analyzing the concepts presented, enabling the application of acquired knowledge to real-life contexts (Azzahra et al. 2024). Therefore, the cultivation of collaborative dispositions and active learner engagement is fundamental to fostering meaningful learning experiences and achieving intended educational outcomes.

The demands of the 21st century require learners to possess critical thinking, creativity, communication competence, and strong collaborative skills. However, learners frequently encounter difficulties in expressing opinions, respecting diverse perspectives, and making decisions collectively within group settings. This condition indicates the presence of social gaps or interactional challenges among learners.

One pedagogical approach proposed as a potential solution to these challenges is the Think-Pair-Share (TPS) cooperative learning model. This model involves three structured stages: individual cognitive processing (*think*), collaborative dialogue in pairs (*pair*), and collective knowledge sharing within a larger group (*share*). Through this systematic progression, TPS is designed to enhance peer interaction, foster collective accountability, and develop collaborative competencies as a core educational goal.

To enhance students' active participation and collaborative abilities, teachers are required to possess the professional competence to design meaningful instructional experiences. One alternative approach is the implementation of cooperative learning models, which promote both active engagement and teamwork among students. Teachers are afforded the flexibility to select and adapt various types of instructional models in accordance with learners' needs. The application of such models has been shown to be effective in optimizing student participation and collaboration. In particular, the Think-Pair-Share (TPS) learning model has demonstrated its capacity to increase student activity and support the achievement of learning mastery, as the majority of students actively participate in the learning process individually, in pairs,

and within larger group interactions ([Sekarwati et al. 2023](#)). Accordingly, the implementation of the Think-Pair-Share (TPS) model creates structured opportunities for direct learner participation in instructional activities. Rather than functioning solely as recipients of information, students assume an active role in constructing and contributing to the learning process.

Numerous studies have indicated that cooperative learning models constitute an effective approach to enhancing students' active engagement during the instructional process. Through this approach, learners are encouraged to think independently and interact within groups to engage in discussion and exchange ideas. However, a study conducted by Wiji and colleagues reported that the Think-Pair-Share (TPS) cooperative learning model did not significantly influence students' active participation and collaboration. This finding may be attributed to the use of samples drawn from three different schools, which could have introduced contextual variations that limited the effectiveness of the TPS model in improving student engagement and cooperation ([Wiji Astuti, Mujiyanto, and Rispatiningsih 2022](#)). In a study conducted by Arlinah employing a Classroom Action Research design, the research sample was not explicitly specified, which may raise concerns regarding potential bias in the reported findings. Furthermore, the study was implemented over a limited number of cycles, which may not have provided a comprehensive understanding of the long-term effects of the Think-Pair-Share (TPS) model on student learning outcomes ([Sekarwati et al. 2023](#)).

Efforts to enhance students' active engagement and collaborative skills require the implementation of engaging instructional models that enable cooperative learning, questioning, and the expression of ideas. Accordingly, this study aims to examine the extent to which the implementation of the Think-Pair-Share (TPS) learning model influences students' collaborative skills. The application of the TPS cooperative learning model facilitates students' understanding of learning materials through diverse sources and provides opportunities for peer knowledge sharing. Furthermore, the implementation of this model is expected to increase learning engagement and strengthen collaboration among students. Based on these considerations, this study is entitled, "The Implementation of the Think-Pair-Share Cooperative Learning Model to Foster Students' Collaborative Skills."

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METHOD

A. Type of Research

The type of research employed in this study is quantitative research with a causal associative approach (causal relationship). Quantitative research is a research method used to test specific theories by examining the relationships between variables (Garcia et al. 2022). Causal associative refers to a cause-and-effect

relationship, in which there are independent variables (variables that influence) and dependent variables (variables that are influenced). The causal associative approach is a type of research that aims to determine the effect between two or more variables.

Quantitative research methods can be defined as research methods grounded in the philosophy of positivism, used to examine specific populations or samples. Data collection is conducted using research instruments, and data analysis is carried out quantitatively/statistically with the purpose of testing predetermined hypotheses (Sugiyono 2022).

B. Research Variables

A variable is a construct that is assigned different values or conditions within a study (Hikmah 2020). A research variable is an attribute, characteristic, or value of a person, object, or activity that exhibits certain variations determined by the researcher to be studied and subsequently drawn into conclusions (Sugiyono 2022).

This study consists of two variables, namely the independent variable and the dependent variable. These two variables are identified in the research as follows:

1. Independent Variabel

The independent variable is the variable that influences or causes the emergence of the dependent variable and is symbolized by (X). In this study, the independent variable is the “Think Pair Share type of Cooperative Learning Model”.

2. Dependent Variabel

The dependent variable is the variable that is influenced or becomes the outcome, and it is symbolized by (Y). In this study, the dependent variable is “Collaboration Skills.”

C. Data Collection Techniques

Data collection techniques are methods used by researchers to obtain research data accurately. The data collection techniques employed in this study are described as follows:

1. Questionnaire

A questionnaire is a data collection technique conducted by providing written questions or statements to respondents to be answered (Sugiyono,

2020). The questionnaire used in this study is a closed-ended questionnaire, meaning that the answer choices related to the Think Pair Share learning model are already provided, so respondents (students) only need to select the most appropriate response.

The questionnaire contains a number of statements with alternative answers. Teachers' responses are measured using a Likert scale, while students' responses are measured using a Guttman scale. The following are the scoring criteria for the Likert-scale questionnaire on the Think Pair Share learning model:

Table 1. Scoring Criteria for the Questionnaire on the Think Pair Share Type of Cooperative Learning Model

Alternative Responses	Score
Strongly Agree	4
Agree	3
Disagree	2
Strongly Disagree	1

Resource: (Sugiyono 2022)

The blueprint of the questionnaire for the Think Pair Share type of Cooperative Learning Model is as follows:

Table 2. Blueprint of the Student Response Questionnaire on the Think Pair Share Type of Cooperative Learning Model

Stage	Indicator	Item Numbers	Number of Items
Thinking	Presenting information and providing questions to students	1, 2, 3, 4, 7	5
Pairing	Explaining how to form study groups and guiding groups while completing tasks	5, 6, 8, 11	4
Sharing	Evaluating learning outcomes on the material that has been studied by presenting the results	9, 10, 12, 13, 14, 15	6
Total Statements		15	15

Table 3. Blueprint of the Teacher Response Questionnaire on the Think Pair Share Type of Cooperative Learning Model

Stage	Indicator	Item Numbers	Number of Items
Introduction	Alignment with Learning Outcomes (CP) and clarity of the material	1, 2, 3, 4, 5	5
Thinking	Presenting information and providing questions to students	6, 7	2
Pairing	Explaining how to form study groups and guiding groups while completing tasks	8, 9, 10, 11	4
Sharing	Evaluating learning outcomes on the material that has been studied by presenting the results	12	1
Closing	Summarizing the lesson and providing reinforcement/rewards	13, 14, 15	3
Total Statements		15	15

2. Observation

Observation is a data collection technique carried out by directly observing the object under study (Sugiyono 2022). In this research, observation was conducted to examine and directly monitor students' collaboration skills during the learning process. The type of observation applied was systematic observation, as the researcher used an observation guideline as the instrument.

3. Documentation

Documentation is a data collection technique conducted through the analysis of various documents, including written materials, images, and electronic documents. This method is used as a complementary source of data covering teachers' and students' activities as well as events that occur during the learning process, utilizing recording devices or photographic documentation.

RESULT

A. Questionnaire

The use of questionnaires facilitates the researcher in identifying the responses of both teachers and students. Subsequently, the validation of the teacher and student response questionnaire sheets was conducted regarding the implementation of the Think Pair Share (TPS) type of cooperative learning model. The assessment results from the validators are as follows:

Table 4. 1 Questionnaire Validation Results

Aspects Assessed	Scale			
	1	2	3	4
A. Instructional Aspects				
1. The instructions for completing the questionnaire sheet are clearly stated				√
2. The response questionnaire sheet is easy to use				√
3. The assessment criteria are clearly stated				√
B. Content				
1. The categories included in the response questionnaire cover all aspects supporting the implementation of the Think Pair Share type of cooperative learning model				√
2. The description of each aspect is able to measure students' responses toward the Think Pair Share type of cooperative learning model				√
3. The clarity of statement items in the teacher and student response questionnaires				√
C. Language Aspects				
1. The statement items in the teacher and student response questionnaires use proper and correct Indonesian spelling				√

Aspects Assessed	Scale			
	1	2	3	4
2. The statement items in the teacher and student response questionnaires use communicative sentences				√
3. The statement items in the teacher and student response questionnaires use simple, clear, and easily understood language				√
Total	-	-	2	7
Percentage			94%	

B. Observation

To ensure the proper implementation of the Think Pair Share (TPS) type of cooperative learning model and to assess students' collaboration skills during the learning process, the researcher employed an observation technique. This observation was conducted using a previously designed observation sheet, allowing the observation process to proceed systematically, purposefully, and in accordance with the indicators to be measured. The observation sheet included key aspects related to students' activities, such as the ability to work collaboratively, active participation in groups, mutual respect for others' opinions, and skills in completing tasks collectively. In addition, the sheet also covered aspects of the teacher's role in facilitating the learning process using the TPS model. To enhance objectivity and minimize assessment bias, the researcher involved a peer as an additional observer. The presence of this observer aimed to ensure that the observation results did not rely solely on the researcher's perspective but were also verified by another party. Therefore, the data obtained through observation are expected to be more valid and reliable, providing a comprehensive overview of the effectiveness of implementing the TPS model in improving students' collaboration skills.

The results of the observation of the teacher's activities in implementing the Think Pair Share (TPS) type of cooperative learning model can be seen in the following table:

Table 3.2 Results of the Observation of the Think Pair Share (TPS) Learning Model

No.	Observed Aspects	P1	P2	Average
1	The teacher greets the students and begins the lesson with a joint prayer.	4	4	4
2	The teacher greets the students by asking about their condition and checking attendance.	3	3	3
3	The teacher explains the chapter title and the learning objectives to be studied; the students listen attentively.	4	4	4
4	The teacher delivers material about Indonesia's landforms and the characteristics of lowland and highland areas using the student textbook and	3	3	3

No.	Observed Aspects	P1	P2	Average
	PowerPoint media.			
5	The teacher poses questions or problems related to the lesson material: "What are lowlands and highlands?"	4	4	4
6	After posing the question or problem, the teacher asks students to think about the answer independently.	3	4	3.5
7	The teacher forms study groups in pairs with seatmates.	4	4	4
8	The teacher asks students to express their individual answers.	4	4	4
9	The teacher asks students to discuss and unify their answers.	4	4	4
10	The teacher distributes the student worksheet (LKPD) and asks students to write their answers on the provided sheet.	4	4	4
11	The teacher asks students to exchange answers with another pair or group.	3	4	3.5
12	The teacher asks students to present the results of their discussion with their partner.	4	4	4
13	The teacher gives rewards/appreciation to the group that presents their discussion results well.	3	4	3.5
14	The teacher concludes the overall lesson.	4	4	4
15	The teacher closes the lesson with a joint prayer and greeting.	3	3	3
Total		54	57	55,5
Percentage			92,5%	

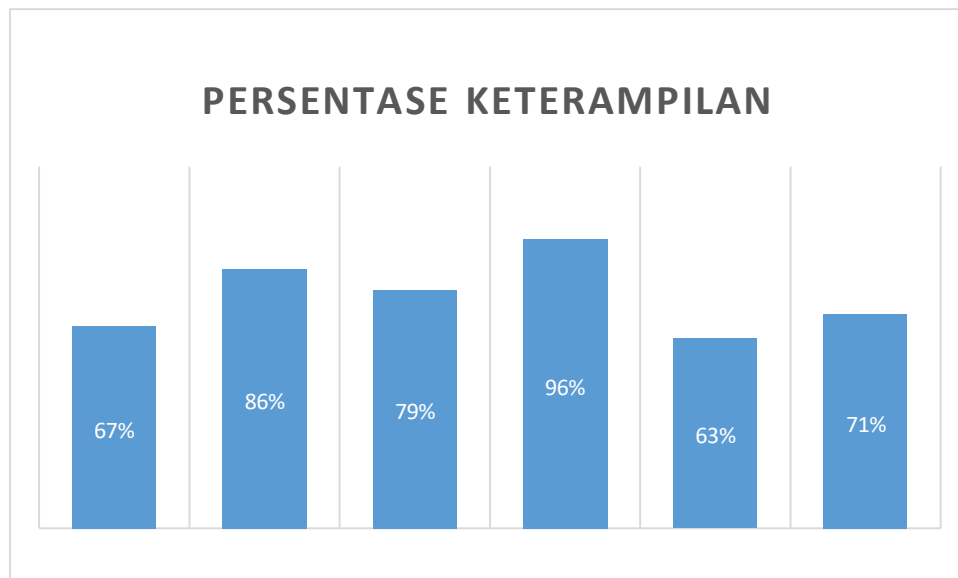


Diagram 1. Percentage of Collaboration Skills

Description:

A = Indicator of active participation

B = Indicator of working productively

C = Indicator of responsibility

D = Indicator of flexibility

E = Indicator of compromise

F = Indicator of mutual respect among group members

DISCUSSION

This discussion aims to provide an in-depth interpretation of the research findings concerning the implementation of the Think Pair Share (TPS) type of cooperative learning model in fostering elementary school students' collaboration skills, without reiterating the descriptive presentation of the data. Overall, the findings demonstrate that the implementation of TPS effectively achieved the research objective, namely enhancing students' collaboration skills through a student-centered learning approach.

The implementation of the TPS model provides structured and balanced opportunities for students to engage in independent thinking, paired discussion, and whole-class knowledge sharing. The *think* phase fosters individual accountability in comprehending the learning material, ensuring that each student develops initial cognitive readiness prior to engaging in peer interaction. This phase contributes to increased active participation and strengthens students' self-confidence in articulating their ideas. In the *pair* phase, reciprocal interaction between students facilitates the exchange of perspectives and cultivates the ability to work productively within small groups. Such collaborative engagement supports the development of interpersonal competence and problem-solving skills. Furthermore, the *share* phase plays a critical role in enhancing students' confidence, oral communication skills, and their capacity to demonstrate mutual respect for diverse viewpoints within a broader classroom context.

The high percentage of collaboration skills reflected in the indicator of mutual respect indicates that the implementation of TPS has created an inclusive and cooperative classroom climate. Students are not only actively engaged in the learning process but also develop the ability to accept differing viewpoints and reach shared decisions collectively. This finding aligns with the characteristics of 21st-century learning, which emphasize the importance of teamwork, flexibility, and social

responsibility. Therefore, TPS functions not merely as an instructional delivery strategy but also as a means of fostering students' social skills development.

The results of the observation of teacher activities indicate that the implementation of the learning process has been carried out systematically in accordance with the TPS syntax. The teacher's consistency in providing stimuli in the form of guiding questions, facilitating discussions, and offering reinforcement and appreciation contributes to students' engagement throughout the learning process. The teacher's role as a facilitator constitutes a critical factor in the successful implementation of the TPS model, as the teacher effectively guides group interactions without dominating the instructional process.

The findings of this study are consistent with previous research indicating that cooperative learning models, particularly TPS, are effective in enhancing students' active participation and collaboration. However, the present findings also reinforce studies emphasizing that the effectiveness of TPS is highly influenced by classroom context, students' characteristics, and the teacher's competence in managing the learning process. Differences between the results of this study and several prior studies reporting less significant effects of TPS may be attributed to variations in sample size, school setting, and the duration of the model's implementation.

Based on the foregoing discussion, it can be inferred that the Think Pair Share type of cooperative learning model holds substantial potential for fostering collaboration skills among elementary school students. The model is aligned with current curricular demands and contemporary learning needs, as it effectively integrates cognitive, social, and affective dimensions in a balanced manner. Therefore, TPS can be considered a viable and effective instructional alternative for promoting meaningful and collaborative learning in elementary education.

CONCLUSION

Based on the findings of this study, it can be concluded that the implementation of the Think Pair Share (TPS) type of cooperative learning model is effective in fostering students' collaboration skills. The questionnaire results indicate positive responses from both teachers and students, suggesting that the TPS model promotes active participation, enhances interaction, and facilitates group collaboration. The observation findings demonstrate that the teacher implemented the learning process systematically in accordance with the Think, Pair, and Share stages, thereby encouraging students' active engagement at each phase of the activity. Furthermore, documentation in the form of photographs and activity records supports the questionnaire and observation results, showing that students are able to collaborate effectively, respect differing opinions, assume responsibility for group tasks, and demonstrate flexibility during discussions.

This study affirms that the Think Pair Share model can serve as an effective alternative instructional approach for fostering collaboration skills in the context of 21st-century learning. Future researchers are encouraged to extend this investigation to more diverse contexts and subject areas in order to obtain a more comprehensive understanding of the effectiveness of the TPS learning model.

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