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The Effectiveness of the Think-Pair-Project-Share (TP2S) Learning Model in Facilitating Collaborative Skills of Prospective Teachers in Elementary Schools

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Abstract

This study aims to test the effectiveness of the think-pair-project-share (TP2S) learning model in facilitating collaborative skills. This quantitative study employed a static group comparison design. The design of this study used two classes given different treatments but still in the same cluster. The population in this study was sixth-semester college students, while the research sample consisting of 60 students (30 in experimental class and 30 in control class) was taken by purposive sampling. The technique of collecting data on collaboration skills used a post-test instrument in the form of a self-assessment questionnaire. Self-assessment questionnaires were given to students in the form of a questionnaire reflecting indicators of collaboration skills. Before being used in the study, the instrument was tested for validity and reliability utilizin. The content of the test was validated by expert opinion and analyzed using the Gregory SPSS data computing software formula. The reliability was tested using Cronbach's alpha. Then, the analysis test of collaboration skills was carried out using the t-test. Before the t-test, the data for students' collaboration skills were previously tested for prerequisites in the form of data normality and data homogeneity tests. The t-test results uncovered that the collaboration skills between the experimental and control classes were not the same. There was a significant difference between the experimental and the control classes. By looking at the mean value of collaboration skills in the experimental class (7.1), which was higher than in the control class (6.640), it can be concluded that the collaboration skills of students in the experimental class were better than those in the control class.

Keywords: Think pair project share, learning model, collaborative skills, elementary school

Introduction

The 21st-century skills are crucial to apply. In the 21st century, students not only rely on the knowledge, but skills play a role in 21st-century learning. Skills are an essential component needed in various fields of life (Rifa Hanifa Mardhiyah, Sekar Nurul Fajriyah Aldriani, Febyana Chitta, 2021). In developing 21st-century skills in learning, it is hoped that every individual has the skills to live in the 21st century with countless opportunities and challenges that will be faced in the era of technological and information advancement. Several experts have explained the importance of mastering various 21st-century skills to succeed in a century where the world is developing rapidly and dynamically (Septikasari & Frasandy, 2018).

One of the skills required for 21st-century skills is collaborative skills. Collaborative skill is the ability to work something together with one goal. The more children have the opportunity to do something together, the faster they can learn (Sunbanu, 2019). Collaboration is a concept in studying academic problems and is an effort to train a good generation through academic learning for students to create a harmonious social life through innovative ideas (Degeng et al., 2022).

Today, collaborative skills are considered important and needed in almost all areas of life. Collaborating increases student motivation and encourages active learning. In addition, this method can be useful and save time for instructors in managing large groups. Collaborative learning is an educational teaching and learning approach involving groups of students working together to solve problems, complete tasks, or create products (Andriyani & Anam, 2022). According to Trilling and Fadel (2009: 4), collaboration is identified as an educational outcome needed in 21st-century learning that includes 4C: collaboration, creativity, critical thinking, and communication. In this case, collaboration is one of the skills that today's students must possess to be ready when they enter the world of work; today's students are also required to collaborate in the school environment and with the global community (Pratiwi, 2020).

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Collaborative skills also need to be possessed by students in a learning process because they are useful to support learning achievement. Collaborative learning involves the active involvement of students in the learning process, small group learning, and the development of thinking skills (Lu'luilmaknun, 2021). It means that students with collaborative abilities can make individual contributions at separate times or places or be done separately from other team members at the same time or place. In other words, collaborative skills are especially important needed in the 21st century today to face the 4.0 revolution. The collaboration process is also vital since it relates to students' cognitive skills. Collaboration skills also positively impact social and behavioral changes during the learning process (Rasyid & Khoirunnisa, 2021).

Semester VI students have sufficient collaborative abilities. This is shown in group learning. Each member is still not actively involved in working together in a team, so only a few students are active. This is also because the group is not heterogeneous so that one group dominates in learning. Responsibility in working together is also still low, indicated by the inequality of students in doing assignments. The ability of students to organize tasks to achieve common goals needs to be improved.

Furthermore, collaboration skills can be realized if the teacher applies the steps through the learning model. The learning model is a plan or pattern used to guide planning learning in the classroom. The learning model refers to the learning approach used, including teaching objectives, stages of learning activities, learning environment, and classroom management (Irvy, 2020). A learning model is fundamentally a form of learning illustrated from beginning to end, presented specifically by the teacher. In this case, the teaching and learning technique of thinking in pairs (four) was developed by Frank Lyman (think-pair-share) as a structure for cooperative learning activities. A cooperative learning model with a think-pair-share (TPS) type is a kind of cooperative learning designed to influence student interaction patterns (H Kara, 2014).

The think-pair-share model is one of the learning models that can be applied. It is a learning model that provides opportunities for students to think and respond to the material being discussed. In addition, this model can guide students to help each other so that some of these things become strong factors in maximizing and improving students' learning abilities. This model can be applied in elementary schools, especially in higher grades. It is based on the fact that higher-grade students can understand and express concepts in learning and can express their ideas through observation, speculation, and other analysis (Wuryandani & Herwin, 2021). The think-pair-share learning model also provides opportunities for students to generate their correct ideas from the subject matter actively. Students are made to be active participants in the teaching and learning process individually. Other advantages of think-pair-share include allowing all children to develop answers, longer and more complex answers can be given, and answers will have reasons and justifications because they have been thought about and discussed, and then students become more daring in taking risks and expressing ideas because they have "tested" the idea with their partner (Bamiro, 2015).

It is in line with previous research conducted by Zainal Abidin (2017) regarding the Application of Think-Pair-Share Learning Methods to Improve Natural Science Learning Outcomes for Class VI Students at SD Negeri 001 Binamang. The results showed that the think-pair-share method could influence student interaction patterns, increasing student activity. Giving group rewards could also increase student motivation, activity, and learning outcomes so that student activity also increased. In cycle I, there was two supergroups (groups 4 and 6); in cycle II, there were four supergroups (groups 2, 4, 5, and 6).

Previous research has applied the think-pair-share model, which Dwi Astuti carried out in 2017. The results revealed that the think-pair-share (TPS) learning model could improve learning achievement in class I social studies subjects in elementary school. A previous study was also conducted by Berty Sadipun in 2020. The results uncovered that the achievement of improving learning outcomes was also consistent with an increase in teacher activity and student achievement.

In a study conducted by Rama Dania and Elfia Sukma in 2020 about Improving the Integrated Thematic Learning Process Using the Think-Pair-Share with Cooperative Learning Model Type in Elementary Schools, it can be seen that the cooperative learning thematic integrated learning process with the think-pair-share type increased, starting from the first cycle until the second cycle. In addition, research was carried out by Oki Ribut Yuda Pradana in 2021 on the Effect of the Think-Pair-Share (TPS) Cooperative Learning Model on the Mathematics Achievement of Junior High School Students. The results exposed that the group treated using think-pair-share had a higher mean than the conventional group.

However, the think-pair-share model still has several weaknesses in its application to the learning process. These weaknesses include not always being easy for students to think systematically, fewer ideas coming in, and some students depending on their partner when completing assignments (Handayani, 2017). In addition, it has been implemented in schools where the average student had low abilities and limited time, but the number of groups was too large, and no project has been carried out in groups. Therefore, it is necessary to modify the model, one of which is the addition of syntax for making projects in groups, known as team-based projects.

The application of team-based projects in elementary schools can lead students to identify problems, discuss to exchange ideas, design from selected ideas, and create and evaluate projects that have been produced. Project-based learning also helps students improve interpersonal relationships and social skills, followed by positive interdependence and individual accountability (Abidin, 2020; Imaduddin, 2021; Leisey, 2014). In project-based learning, the teacher provides topics for individual or group learning to be developed by students through research or project work and monitored by the teacher. Team-based projects are also student-centered learning. It does not require students to memorize any theory or formulas; on the other hand, students are required to be more analytical and think critically by analyzing the information collected to solve problems through projects. This pragmatic approach concentrates more on process than content. Some prerequisites for using team-based project learning efficiently include students having to feel responsible for their education because it is an approach where students are in the middle. Thus, it is expected that motivation to acquire new knowledge increases if students feel responsible for problem-solving, project development, and process management. Also, it is preferred to apply knowledge from various disciplines or scientific fields in the problem-solving process. In addition, different perspectives lead to a deeper understanding of the problem and the creation of better solutions (Mahasneh & Alwan, 2018; Pinter & Cisar, 2018; Sumarni, 2015).

Moreover, this think-pair-project-share (TP2S) learning model was developed based on cooperative principles and oriented to student-centered learning. Therefore, its development requires integrating a cooperative attitude in the project, active student participation, and design development to the project results through the learning implementation.

Class activities should be student-centered, cooperative, and interactive. Problem-based learning also provides real problems that students often encounter in real life. With real problems and student-centered learning, this learning encourages students to be more involved in learning. With this encouragement, this learning is considered able to increase achievement motivation. Real-life problems can make students more motivated through exploration and discussion activities. Activities in problem-based learning also make students have personal responsibility in completing assignments, work creatively, and wholeheartedly in participating in these activities (Hellström, 2009; Mahasneh & Alwan, 2018; Sari, 2018; Selçuk, 2011)

Based on the above background, this article aims to assess the effectiveness of the modified think-pair-project-share (TP2S) learning model to empower collaboration skills. It is hped that this research can provide an overview of the effectiveness of the think-pair-project-share (TP2S) model because its learning steps encourage students to develop their collaborative skills.

In addition, this research is essential because it can evaluate the effectiveness of the modified learning model so that it is hoped that the developed learning model can be applied.

Method

This quantitative research employed a static group comparison design. The research was conducted at the Elementary School Teacher Study Program, Universitas Sebelas Maret. The population in this study was sixth-semester students. Meanwhile, the research sample was taken by purposive sampling. The sample used in this study were 60 students, consisting of 30 students in the experimental class and 30 students in the control class.

The technique of collecting data on collaboration skills used a post-test instrument in the form of a self-assessment questionnaire. Self-assessment questionnaires were given to students in the form of a questionnaire reflecting indicators of collaboration skills. Before being used in the study, the instrument was tested for validity and reliability utilizing SPSS software data computing. Validitas data berupa validitas isi menggunakan pengujian ahli yang hasilnya dianalisis menggunakan rumus gregory. The following is the Gregory formula tabulation.

Table 3.1. Gregory Formula Tabulation

Tabulation 2 x 2 *Less Relevant* *(skor 1 – 2)*		*Validator 1* *Relevan* *(skor 3 – 4)*	
Validator 2	Less Relevant (Score 1–2)	A	B
	Relevant (Score 3–4)	C	D

Based on the table above, content validity can be found using the Gregory formula as follows.

$$VC = VC = \frac{D}{A+B+C+D}$$

Remark:

VC : Content validity
A : Both validators disagree
B : Validator 1 agrees, Validator 2 disagrees
C : Validator 1 disagrees, Validator 2 agree
D : Both validators agree

The coefficient criteria 0–1 are as follows.

0.9–1.0 : Very high
0.6–0.89 : High
0.4–0.59 : Medium
0.2–0.39 : Low
0.0–0.19 : Very low

The data reliability was tested using Cronbach's alpha. The results were then compared with the r-table. If the result is greater than 0.6, the instrument is declared reliable.

The validity and reliability tests were carried out outside the class being studied. Items that did not pass the validity and reliability tests were corrected or replaced by novel items.

Then, the collaboration skills analysis test was carried out using the t-test. Before the t-test, the data for students' collaboration skills were previously tested for prerequisites in the form of data normality and data homogeneity tests. The way to analyze it is by comparing the p-value with the significance level value. If the p-value is greater than the significance level value, the collaboration skills between the experimental and control classes are equally good. On the other hand, if the p-value is smaller than the significance level, the collaboration skills between the experimental and control classes are not the same.

In addition, the way to determine which class collaboration skills were better was to compare the mean collaboration skills scores between the two classes. The data analysis technique in this study used a significance level of 5%. Hypothesis H0 is accepted if the significance value (p-value) is more than 5%, and hypothesis H0 is rejected if the significance value (p-value) is less than 5%.

Findings

Before the research was carried out, the post-test instrument of the collaborative skills self-assessment questionnaire was tested for validity and reliability. The validity test was conducted twice, i.e., expert and item validity, utilizing the computational assistance of SPSS data. Expert validity reviewed the instrument, covering elements from grammar to knowledge. Furthermore, the item validity test of the post-test questionnaire self-assessment collaboration skills obtained the results that 20 items were valid, while 10 items were invalid. Hasil validitas isi setelah dihitung menggunakan rumus gregory sebesar 0,83 yang menunjukkan validitas tinggi sehingga indikator instrumen penelitian telah valid untuk dapat digunakan sebagaimana mestinya.

The result of content validity after being calculated using the Gregory formula was 0.83, indicating high validity so that the indicators of the research instrument are valid.

After passing the validity test, the post-test instrument was tested for reliability using SPSS data computing software and got the results of Cronbach's Alpha = 0.855, α = 5%, and n = 30 so that the r-table = 0.361. By looking at and comparing the Cronbach's Alpha results with the r-table value, the results obtained Cronbach's Alpha > r-table. It indicates that the collaboration skills post-test instrument provided reliable data.

Result comparison of the collaboration skills was carried out in the experimental and control classes. The comparison results can be seen in Table 1.

The collaboration skills of the experimental class attained a total score of 214 with a mean score of 7.0, while the control class obtained a total score of 188 with a mean score of 6.2.

Table 1. Comparison of collaboration skills data between experimental and control classes

No	*Class*	*Total value*	*Number of participants*	*Mean*
1	Experiment	214	30	7.1
2	Control	188	30	6.2

Both classes used the same number of participants, i.e., 30 students. Before the analysis test, the collaboration ability data on the experiment and control were tested for data normality and data homogeneity utilizing the computational assistance of Minitab software.

Normality test results

The results of the post-test data normality test in the experimental study group with the Kolmogorov Smirnov normality test obtained p-value = 0.150 and α = 5% (0.05). By looking at and comparing the p-value with a significant level, the result revealed p-value > α. Thus, H0 was accepted, indicating that the sample of students who learned using the think-pair-project-share learning model came from normally distributed data.

Homogeneity test results

The results of the post-test data homogeneity test using the Levene's test obtained p-value = 0.053 and α = 5% (0.05). By looking at and comparing the results of the p-value with a significant level, the results attained a p-value > α, denoting that the variance of the two populations was homogeneous.

T-test results

The t-test results of collaboration skills between the experimental and control classes obtained p-value = 0.014 and α = 5%. By comparing the results of the p-value with α, the researchers got a p-value < α. The t-test results showed that the collaboration skills between the experimental and control classes were not equally good. There was a significant difference between the experimental and the control classes. By looking at the mean, the value of collaboration skills in the experimental class (7.1) was higher than in the control class (6.640). Hence, it can be concluded that the collaboration skills of students in the experimental class were better than those

Table 2. Scores of Collaboration Skills Indicators

No.	*Indicators*	*Mean*
1.	Actively contributing	7.125
2.	Working productively	7.812
3.	Flexibility and compromise	6.871
4.	Responsible	8.427
5.	Showing respect	7.324

in the control class. Collaboration skills in the class with the think-pair-project-share learning model in each indicator obtained the following mean scores:

Discussion

The results revealed that collaborative skills increased in the experimental class that applied the think-pair-project-share (TP2S) model. The TP2S learning model is team-based learning (TBL), combining four practical elements: strategic team building, readiness assurance, application activities, and peer evaluation. If combined, these elements represent the six best practices of evidence-based teaching: cooperative learning, feedback, reciprocal teaching, whole-class interaction, required concept-based decisions, and visual presentation. At the elementary school level, the team-based project model is the first step to fostering student interest in learning the knowledge principles by connecting knowledge with factual issues or problems in everyday life. The following describes the TP2S model implementation for each syntax.

a. Think

At this stage, the lecturer posed a question or problem related to the lesson and asked students to take a few minutes to think for themselves about the answer to the problem. Students were given time to think about their responses to the question before other peers answered it, and the discussion continued (Kaddoura et al., 2013). Questions posed by instructors or lecturers often require "analysis, evaluation, or synthesis" (Zohrabi et al., 2020).

In addition, this stage deals with responsible indicators. A student must be responsible for the thought processes he thinks to achieve the desired goal. The link between this stage and responsibility is that students in the thinking process are allowed to think more deeply individually to produce an idea that requires a broad range of ideas in their thinking process. Therefore, it takes a sense of responsibility to think about an idea. It is also crucial that students can take advantage of this waiting period, where they have the opportunity to think individually and generate ideas before sharing their thoughts with other collaborators (Minh Huyen et al., 2020).

This stage is also related to students' thinking process who contribute actively to learning. It is consistent with the opinion (Sumarsih & Sanjaya, 2013) that at this stage, students think independently about the questions that have been asked and form their ideas. It is the thinking process that makes students actively contribute to learning. Not only are teachers actively contribute to explaining the learning material, but students also take part in learning. It aligns with the opinion (Leng, 2020) that more capable peers and teachers will guide and support student learning and thinking when students participate in challenging activities.

Based on the description above, it can be concluded that at this thinking stage, students contribute actively to learning, obtained from the process of thinking independently to build their ideas. The process of thinking independently raises a sense of responsibility in them. A sense of responsibility is essential because what is thought must be accounted for in the process of thinking. This stage also fostered students to actively contribute to learning because each individual was given the opportunity to think deeply, and students participated in teaching and learning activities.

b. Pair

The teacher asked students to pair up and discuss their learning at this stage. The purpose of this stage is to provide a more motivating space for each individual student to provide real participation in the learning implementation. Interaction during the time allotted can unify answers if a question posed brings together ideas and if a specific problem is identified.

Normally, the teacher gave no more than four or five minutes to pair up. This pair stage brings about flexibility and compromise. It indicates that students were given the space to collaborate with their colleagues to discuss what was obtained from the previous thought process. It is in line with the opinion (Bamiro, 2015) that at this stage, students are given space to develop answers, longer and more complicated answers can be given, and answers will have reasons and justifications because they have been thought out and discussed. Students also created groups of two at this stage, creating the optimal potential for interaction patterns, developing team spirit, and fostering motivation and effective communication (Sumarni, 2016). Therefore, this stage creates a flexible and compromising attitude because students collaborate with colleagues to compromise to produce a more advanced and developed idea.

This stage also raised an attitude of responsibility. The relationship of this stage with the responsibility indicator is that at this stage, the teacher involves students in evaluating and reflecting on responsibilities during the learning process and follow-up for the next meeting. The involvement of students in planning, implementing, and evaluating the learning process contributes significantly to the achievement of their responsibilities (Aristiani, 2016; Maharani & Kristin, 2017; Rahayu et al., 2019)

Based on the description above, it can be concluded that at this pair stage, students formed teams in pairs to independently discuss ideas from their previous thoughts. The relationship at this stage created an attitude of flexibility and compromise, as evidenced by students working together as a team to produce a broader and deeper idea. The process of working together also raised a responsible attitude in students. The connection is that when the collaboration process runs, it must be balanced with the sense of responsibility that the individual has.

c. Project

Project is an additional step of the think-pair-share model. Students in groups (a combination of several pairs) made a project based on the results of discussions of the pairs carried out. Thus, in one group, there were several ideas from different pairs of students but with the same goals. Besides, the developed project had to accommodate science process skills and scientific methods to remain under the natural science characteristics. Students could express their creative ideas by communicating the results of their discussions with their groups. Students were also accustomed to conveying ideas through discussion activities to produce new and innovative products, understand learning objectives, and know the importance of responsibility for overcoming barriers to creativity. Working together to build a project can train students' scientific thinking skills (Misla & Mawardi, 2020 & Saraswati & Agustika, 2020).

This stage also raised the attitude of working productively to produce a quality and innovative product. Innovative products were generated from ideas between group pairs from projects resulting from group discussions. It corroborates with the theory of complex cognitive processes that mastery of divergent thinking can produce innovative products (Hermes et al., 2019; Low et al., 2019; Paul & Singh, 2020). Activities in the form of project assignments and simulations are the main media for practicing problem-solving skills. The design of easy and structured assignments, supported by an environmental design that frees students to express themselves, improves skills naturally (Rofik, 2022).

Based on the description above, it can be concluded that students formed a group to produce an innovative project at this project stage. This stage raised the attitude of working productively because, from the discussion results, product innovation was obtained from the proficiency in their divergent thinking, so they worked together productively in achieving the same goal. The discussions between diverse groups also produced ideas that could bring up a product, thus raising the attitude of working productively in students since they produced an innovative and quality product.

d. Share

In the last step, the lecturer asked the group to share what they had discussed as a group with the whole class. It is effective to go around the room from group to group and continue until about half of the group has had a chance to report. This stage aims to foster a classroom learning environment with better influence among groups of students (Klok dan Lau, 2015). At this stage, students shared their ideas with the class and discussed in detail the answers stated. At the same time, students might agree or disagree with the answers and offer reasonable ideas (Pllana, 2020).

Students were also involved in learning activities by forming collaborations with other groups using a structure designed to ask each group member to contribute with the help and encouragement of other team members so that an attitude of respect is needed among the group (Lia Yulianingsih, 2017). Thus, this share stage raised an attitude of respect between one another. The connection with this respect is that in group discussion activities, there are different opinions. Therefore, it is necessary to respect each other among friends.

In addition, one of the principal factors in the sharing stage is learning from each other even though the ideas they think are different. It encourages respecting each other and eliminating feelings of awkwardness in understanding a concept (Sembert et al., 2021). It is also in line with the opinion (Brame & Biel, 2015) that as a group, students need to respect each other to work together to learn or solve problems.

Based on the description above, it can be concluded that students shared ideas in class at this sharing stage, which were the results of group discussions. This share stage raised an attitude of respect for one another. In this case, each individual's ideas are different, so mutual respect is needed in the cooperation process between teams. They also learned from each other with the same goal of getting an idea of what was being asked. Therefore, at the sharing stage, mutual respect is vital in discussion and collaboration activities, which come from collaborating.

Moreover, the TP2S learning model facilitates students to interact with all learning environment elements. Here, lecturers have functioned as facilitators, mediators, and motivators. The real form is how the lecturer gives examples of up-to-date cases for which students must find solutions through the projects they carry out. Students are then expected to collaborate to produce products according to the material provided by the lecturer. The following is a description of each indicator applied to the TP2S learning model (Table 3).:

In this respect, the lecturer is one of the information sources in the learning implementation, so for the model to be more effective, the lecturer must enrich the references for teaching materials used in the learning implementation based on research results or trusted reference books. The material used in learning must also contain the latest issues so that students can increase their analytical power based on the stimulus provided by the lecturer. The stimulus given can be

Table 3. Matrix of Relationship between Think-Pair-Project-Share Model Development in Facilitating Collaborative Skills

Collaborative Skills Indicators	*TPS Model Stages --- > Project*
Actively contributing	1. Think
Working productively	2. Pair
Flexibility and compromise	3. Project
Responsible	4. Share
Showing respect	

in the form of questions that make students have to look for scientific references from trusted literature, make projects, and communicate the projects' results.

Furthermore, the application of team-based projects can lead students to identify problems, discuss to exchange ideas, design from selected ideas, and create and evaluate projects produced. Project-based learning also helps students improve interpersonal relationships and social skills, followed by positive interdependence and individual accountability. In addition, the project-based learning model helps students get used to thinking inductively and can connect students' knowledge and contexts of everyday life well (Abidin, 2020; Imaduddin, 2021; Leisey, 2014; Wijaya, 2021).

In project-based learning, students are assessed in many ways, from conventional written tests to more innovative modes of assessment, such as self-assessment, peer-assessment, co-assessment, portfolio assessment, performance appraisal, and reflective journaling. Regarding the advantages for students and teachers who use project-based learning in natural science classes, this method focuses on students' skills in asking questions that stimulate constructive thinking to provide answers, problem formulation, and solutions. Another important focus is peer assessment, collecting the resulting data, analysis, and reaching conclusions. In addition, project-based learning in the classroom is possible after providing the information needed for the project. Class activities should also be student-centered, cooperative, and interactive to improve collaborative skills.

Conclusion

The modified learning model consists of the stages of think, pair, project, and share. Each stage has the potential to develop collaboration skills following learning in the 21st century. Lecturers can apply the think-pair-project-share model as an alternative to innovative and creative learning models. The results of this study revealed that the collaboration skills between the experimental and control classes were not equally good. It was based on the t-test results showing a significant difference between the experimental and control classes. By looking at the mean, the value of collaboration skills in the experimental class (7.1) was higher than in the control class (6.640). Hence, it can be concluded that the collaboration skills of students in the experimental class were better than those in the control class.

This research is limited with the scope of only one elementary school teacher education study program with a relatively small number of samples. The researchers cannot control other variables that affect collaborative skills.

Thus, further researchers are suggested to examine other factors that can affect collaborative skills in addition to the use of learning models such as family background, environmental interaction, intelligence, etc.

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