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PACE LEARNING MODEL AND SELF-ESTEEM ON STUDENTS' STATISTICAL LITERACY ABILITY

***)Alman[1], Tatang Herman[2], Sufyani Prabawanto[3], Almuhaimin Sarnav Ituga[4]**
[1,2,3]Program of Elementary Education, Universitas Pendidikan Indonesia, Indonesia
[4] Islamic Guidance and Counseling, Institut Agama Islam Negeri Sorong, Indonesia
**)Corresponding author*
Alman87@upi.edu

Abstrak

Statistik adalah ilmu yang berkaitan dengan pengumpulan, pengolahan, analisis, dan penyajian data. Di kelas V Sekolah Dasar, siswa belajar bahwa statistik dapat digunakan untuk memahami informasi dari data yang mereka kumpulkan. Penelitian ini bertujuan untuk menganalisis pengaruh model pembelajaran PACE (*Project, Activities, Cooperative, Excercises*) dan self-esteem terhadap kemampuan literasi statistik siswa. Sampel penelitian adalah siswa kelas V Sekolah Dasar Negeri Karya Baru Kota Baubau. Metode yang digunakan adalah *Quasy Experimental Design* dengan desain factorial 2x3. Teknik pengumpulan data dilakukan melalui tes kemampuan literasi statistik dan angket self-esteem. Analisis data dilakukan dengan uji normalitas, uji homogenitas, dan uji Anova Dua Jalan. Hasil penelitian menunjukkan bahwa terdapat pengaruh signifikan dari model pembelajaran PACE terhadap kemampuan literasi statistik siswa. Tidak ditemukan pengaruh yang signifikan dari self-esteem terhadap kemampuan literasi statistik. Selain itu, analisis juga menunjukkan bahwa tidak ada interaksi antara model pembelajaran PACE dan self-esteem dalam mempengaruhi kemampuan literasi statistic siswa. pentingnya penerapan model pembelajaran yang tepat untuk meningkatkan literasi statistic dengan menggunakan model pembelajaran PACE.

Kata kunci: Kemampuan Literasi Statistika; Model Pembelajaran PACE; Self Esteem

Abstract

Statistics is the science that deals with the collection, processing, analysis, and presentation of data. In fifth grade elementary school, students learn that statistics can be used to understand information from the data they collect. This study aims to analyze the influence of the PACE (Project, Activities, Cooperative, Exercises) learning model and self-esteem on students' statistical literacy Ability. The sample of the research are fifth-grade students at Karya Baru state Elementary School in Baubau City. The method used is a Quasi-Experimental Design with a 2x3 factorial design. Data collection techniques include tests of statistical literacy Ability and self-esteem questionnaires. Data analysis is conducted using normality tests, homogeneity tests, and two-way ANOVA tests.The results of the study indicate a significant effect of the PACE learning model on students' statistical literacy abilities. No significant effect of

self-esteem on statistical literacy Ability was found. Additionally, the analysis shows that there is no interaction between the PACE learning model and self-esteem in influencing students' statistical literacy Ability. This emphasizes the importance of implementing appropriate learning models to enhance statistical literacy using the PACE learning model.

Keywords: PACE Learning Model; Statistical Literacy Ability; Self-esteem.

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INTRODUCTION

Statistical literacy has become one of the important life Ability today (Gal, 2004). Being statistically literate is very important for every individual, including students, as informed citizens who can interpret statistical messages in various contexts (Hafiyusholeh et al., 2018). The curriculum must also be able to shape students with strong abilities, where the teaching of statistical mathematics needs to be strengthened through the development of statistical literacy to solve problems and address real-life needs (Lase, 2019). Therefore, as statistical literacy becomes an increasingly integral part of the school mathematics curriculum, it plays a crucial role in equipping students to respond to societal demands upon completing their elementary education. NCTM, for example, states, "A knowledge of statistics is necessary if students are to become intelligent consumers who can make critical and informed decisions."

The same is expressed in the Minister of Education and Culture Regulation No. 21 of 2016 concerning the Content Standards for Basic and Secondary Education, which states that the goal of mathematics learning is for students to have mathematical Ability as part of the life Ability that students must possess, especially in developing reasoning, communication, and problem-solving Ability faced in everyday life. One of the objectives of mathematics learning according to the Minister of National Education is that students can perform problem-solving, which includes understanding problems, designing models, solving, and interpreting

solutions (Damayanti & Kartini, 2022). According to Suryadi et al., mathematical problem-solving is considered one of the important mathematical activities by both teachers and students at all levels, from elementary school to high school (Rohana, 2015). However, it remains one of the most difficult areas of mathematics, posing challenges for both students in understanding the material and teachers in delivering it. It is recommended that teachers enhance the frequency of assigning statistical practice problems that relate to real-life situations, in order to help students develop familiarity and confidence in applying their statistical problem-solving skills.

Statistical literacy is a skill that is necessary for all students, both in elementary school and in higher education, it includes the Ability to read the given statistical information, as well as the Ability to imagine data that is often unreported and the assumptions underlying this information (Büscher, 2022). Statistical literacy refers to an individual's Ability to understand, analyze, and interpret statistical data presented in various contexts. Statistical literacy encompasses the Ability to comprehend the language, symbols, and terms related to statistics; to interpret graphs and tables; as well as to read and understand statistical data presented in news, media, and other sources (Callingham et al., 2016; Hidayah, 2017). In a broader perspective, Gal (2002) posits that statistical literacy consists of two interrelated elements: first, the Ability to understand and evaluate statistical information, arguments related to data, and random phenomena occurring in various situations; second, the Ability to discuss or convey their responses to statistical information, including understanding the intent of that information, opinions regarding its impact, or agreement with conclusions drawn based on the available data.

In the Merdeka curriculum, elementary school students in phase C, specifically in grades five and six, are taught how to describe, explain, understand, and interpret statistics in the form of tables, bar charts, and graphs. The Merdeka Curriculum encourages in-depth use of statistical literacy as part of strengthening numeracy competencies in mathematics. This study highlights the importance of

statistical literacy in supporting students' understanding of data and making informed, data-based decisions (Alman et al., 2023). They learn to obtain representative samples from a population, use mean, median, and mode to solve problems, and analyze data. Evaluation results indicate that many elementary school students in Indonesia still struggle to understand basic statistical concepts, which can hinder their Ability to think critically and solve problems. The presence of issues in statistics (Zieffler et al., 2008) illustrates that statistical Ability have not been optimally achieved. Teaching statistics presents challenges due to variations in abilities and negative experiences (Garfield & Ben-Zvi, 2009; Tishkovskaya & Lancaster, 2012). Therefore, there is an urgent need to develop effective teaching methods so that students can master statistical literacy well.

One of the learning models that can be adopted is the Project Activity Cooperative Exercise (PACE). This model is designed to enhance student engagement through collaborative projects, where students work together to complete tasks related to the concepts being studied. By using the PACE learning model, students not only learn theoretically but also apply their statistical knowledge in real-world contexts. The PACE model is expected to address students' conceptual understanding issues and encourage active participation in classroom learning. The PACE model was developed by Lee in 1999, which stands for Project, Activity, Cooperative Learning, and Exercise. They conclude that the PACE model is more engaging and less boring compared to conventional methods, thus motivating students in mathematics learning and making them active during group discussions to solve core problems. Raharjo & Sulaiman (2017) found that the average learning completeness score in the experimental class exceeded the Minimum Completeness Criteria (MCC). Previous research has shown that active and collaborative learning models can enhance students' motivation, confidence, and learning outcomes. Therefore, the implementation of the PACE model is expected to have a positive impact on elementary students' statistical literacy Ability.

In addition to the importance of developing learning models, it is also necessary to pay attention to the psychological aspects of students in the process of effective learning. The development of positive psychological aspects is expected to contribute to the improvement of students' statistical literacy Ability. Self-esteem in the learning process is anticipated to enhance students' affective abilities or attitudes. According to Coopersmith in Aroldi & Vittadini (2017), individual self-esteem levels can be categorized into three groups, each with its own characteristics: individuals with high self-esteem, moderate self-esteem, and low self-esteem. Students' self-esteem is categorized into three groups: high, moderate, and low. Each member of these groups expresses their views about themselves, their environment, and how they respond to experiences that influence their perception of self-esteem (Apriatama et al., 2022). Students with high self-esteem demonstrate outstanding achievements, good social interactions, and creative. Students with moderate self-esteem exhibit characteristics similar to those with high self-esteem but require development to achieve high self-esteem. Negative behavior can be caused by low self-esteem. Various factors influence a person's level of self-esteem and assertive behavior. Low self-esteem in students often occurs because they have not fully understood or accepted themselves, both in terms of their abilities and their shortcomings (Aryanto, et al., 2021). Self-esteem is a personal assessment expressed in an individual's attitude towards themselves, resulting from the interaction between the individual and their environment, as well as the treatment they receive from others. This assessment is expressed through the individual's level of confidence in themselves as capable, important, successful, and valuable or not (Asif et al., 2017). Self-esteem is the evaluative component of self-concept, representing the evaluation of the ideal self and the perceived self. Low self-esteem occurs when individuals feel they cannot meet their ideal self, while high self-esteem arises when individuals feel their ideal self has been fulfilled (Maqbool et al., 2014). This means that individuals with good character typically

also possess good thinking abilities, which are acquired through the learning process (Rohana, 2015).

Several relevant studies on the Project Activity Cooperative Exercise (PACE) learning model and self-esteem have been conducted by various researchers, concluding that the PACE model is effective in enhancing students' conceptual understanding (Haswati et al., 2019), improving students' mathematical communication Ability (Assaibin & Husain, 2020), increasing students' problem-solving abilities (Dwiyani et al., 2021), and also boosting students' mathematics achievement. The impact of the PACE learning model on problem-solving Ability has also been examined (Dwiyani et al., 2021). Furthermore, the role of self-esteem in mathematics learning has been explored (Verdianingsih, 2018), along with its influence on student engagement (Nurrindar & Wahjudi, 2021) and its effects on the learning processes and outcomes of students (Ningsih & Hayati, 2020).

Self-esteem is the subjective assessment of an individual's own value and worth. It reflects the extent to which a person feels satisfied with themselves, their confidence in their abilities and potential, and their positive attitude towards themselves. An individual's level of self-esteem can significantly impact their mental and emotional well-being. Baumeister and Campbell (2021) state that self-esteem is essential in the learning process. According to, self-esteem is one of the most fundamental human needs. argue that students' self-esteem plays a mediating role in the relationship between mathematical literacy Ability and academic achievement. Healthy self-esteem is closely related to a person's Ability to adapt to social environments and cope with stress. According to, high self-esteem can have a positive impact on an individual's mental health.

The PACE instructional model represents four key components: Project, Activity, Cooperative Learning, and Exercise. It serves as a comprehensive framework for teaching and learning that incorporates these four elements. This model promotes active student participation throughout the learning process.

Among its components, the project element plays a vital role, as it introduces an innovative learning approach focused on engaging students in complex, problem-solving tasks.

The activities in the PACE model aim to introduce students to new information or concepts as a guide for them in studying the material and solving problems related to the mathematical problem-solving Ability they will learn (Raharjo, 2017). Cooperative learning within the PACE model serves as a guide for students to study the material and work on problems, allowing them the opportunity to discover the concepts they will learn on their own. The exercises in the PACE model are designed to reinforce the concepts that have been constructed during the activity and cooperative learning phases in the form of problem-solving. This is because the PACE learning model is suitable for training and developing students' statistical abilities.

It is important to pay attention to students' self-esteem when implementing the learning model, as it can significantly influence their statistical literacy Ability. Students with high self-esteem have more ways to express their ideas or thoughts when solving statistical problems in mathematics compared to students who have auditory and kinesthetic learning styles (Danaryanti & Noviani, 2015).

Differences in self-esteem are a significant variable that affects how students understand lessons in school. Therefore, positive self-esteem among students is crucial for teachers to recognize each learner, making it an important aspect when implementing the PACE model. This approach helps in forming heterogeneous study groups where students can assist one another. Consequently, it is essential for teachers to consider students' positive attitudes before starting the learning process to achieve optimal results.

In addition to selecting effective teaching methods, several other factors can influence statistical literacy and self-esteem. Initial statistical Ability is considered vital in the development of both statistical literacy and self-esteem. According to

research conducted by Pioke et al. (2022), if an educator successfully enhances students' initial abilities in learning mathematics, the desired learning outcomes can be achieved. Before receiving treatment, the students in this study underwent a test to evaluate their initial mathematical abilities. The results of this test were then categorized into three groups: high, medium, and low.

The focus of this study is to explore an area of knowledge that has not been previously investigated. This motivates the researcher to conduct a study titled "The Project Activity Cooperative Exercises (PACE) Model and Self-Esteem on Elementary School Students' Statistical Literacy Ability."

METHOD

This research employed a quasi-experimental design with a 2 × 3 factorial design. In this study, there are two classes: the experimental class and the control class. This research utilizes the Project Activity Cooperative Exercise (PACE) learning model in the experimental class and a conventional learning model in the control class. The sample for this study consists of all fifth-grade students at Karya Baru State Elementary School in Baubau City for the 2023-2024 academic year, totaling 50 students. The sampling technique used is simple random sampling, and the samples are first tested for normality and homogeneity. The normality and homogeneity tests are conducted using the SPSS program. Below are the results of the normality and homogeneity tests..

Table 1. Normality of Samples Data

	Shapiro-Wilk		
	Statistic	df	Sig.
Eksperiment	.935	25	.116
Control	.926	25	.071

Table 2. Homogeneity of Samples Data

Levene Statistic	df1	df2	Sig.
970.216	5	19	.001

Based on Table 1, it can be seen in the Shapiro-Wilk column that the significance value is < 0.05. Therefore, it can be concluded that the population is normally distributed. Meanwhile, Table 2 shows that the significance value is < 0.05. Thus, it can be concluded that the population is homogeneous. After obtaining the results indicating that the population is normally and homogeneously distributed, the next step is to take samples using the simple random sampling technique. The research sample in the experimental class I applied the PACE learning model in class V-A, while the control class applied conventional learning in class V-B. The variables in this study are as follows: the independent variable is the PACE learning model, the dependent variable is the students' statistical literacy Ability, and the moderating variable is the difference in self-esteem.

The preparation stage includes several steps as follows: Preliminary Study (Conducting a literature review on relevant theories related to learning at Karya Baru State Elementary School in Baubau, as well as analyzing the curriculum); Establishing the Research Schedule (Determining the timing and sequence of research activities); Determining the Sample Class (Selecting the class that will be the subject of the research); Preparing the Lesson Plan (Developing the lesson plan that will be used during the research); Preparing the Student Worksheet (Preparing the materials that will be provided to the students); Preparing the Research Instruments (Preparing the measurement tools that will be used in the research); Validating the Lesson Plan, Student Worksheet, and Research Instruments (Ensuring that all materials and instruments prepared are valid and usable); and Administering the Self-Esteem Questionnaire (Providing a self-esteem questionnaire to students before applying the PACE model in learning).

The implementation stage will be explained further in Table 3 as follows:

Table. 3 Implementation Stages of the Experimental Class and Control Class

No.	Experimental class with PACE learning	Control class with conventional learning
1	**Project** The teacher assigns a project task to the students, which is to be completed in groups. They are asked to find solutions to real-life problems related to the learning topics currently being studied. They are required to create a report on the project they have worked on and submit it by a certain deadline agreed upon between the teacher and the students.	**Observer** The teacher presents a problem to the students. They are asked to observe events, situations, patterns, and phenomena related to mathematics and are gradually introduced to mathematical modeling in various forms.
2	*Activity* The teacher checks the Student Worksheets to determine whether they were completed at home or not before the lesson. Next, the teacher asks the students about the concepts that will be discussed in order to enhance their understanding of the concepts and provide guidance if any misconceptions arise.	**Asking Questions** The teacher gives students the opportunity to ask questions or raise issues related to the data and information collected, such as questioning why or how a phenomenon occurs.
3	*Cooperatif Learning* The teacher provides a set of questions for discussion to each group related to the material being covered. This is a continuation of the Discussion Practice Sheet and has a higher level of difficulty. Students have the opportunity to present their findings obtained during the discussion to facilitate the exchange of information, thereby forming a correct understanding of a concept.	**Collecting Data** The teacher provides space for students to gather and explore information through experimentation, examination, and discussion to deepen their understanding of the concepts related to the phenomenon.
4	*Exercise* The teacher assigns additional tasks to reinforce the concepts that have been constructed during the activity and cooperative learning stages in the form of solving problems.	The teacher provides students with the opportunity to make associations or critically analyze the relationships between concepts and to use and apply appropriate procedures/algorithms, as well as to construct reasoning and generalizations.

Completion Steps 1) Administer a statistical literacy Ability test to both the experimental and control classes using the same questions, 2) Process and analyze the obtained data according to the data analysis methods used, 3) Draw conclusions from the results obtained based on the hypothesis testing employed, 4) Compile the

research report. The instrumens used include statistical literacy Ability test and self-esteem questionnnaires. These instruments were validated by two experts, namely one mathematics to see the elementary school statistics material mathematics question instrument and one educational psychology expert to validate the self-esteem scale instrument, before the instrument was given to students'. The data analysis technique involved the use of a two-way ANOVA test with SPSS program. reliability test with alpha cronbach value of statistical literacy test is 0.80 which means that the test instrument is declared very reliable. While the reliability test reliability test with alpha cronbach value of self-esteem scale is 0.76 which means that the test instrument is declared very reliable. The instrument is said to be valid if the question item value is declared valid if r count > r table. In reliability testing, an instrument is considered reliable if its reliability coefficient, such as Cronbach's Alpha, reaches ≥ 0.70. The method used to measure the reliability of the questionnaire is the Cronbach's Alpha method. The questionnaire is said to be reliable if the Cronbach Alpha value is greater than r table (Anggraini, Aprianti, Setyawati, & Hartanto, 2022).

RESULT AND DISCUSSION

This study employs a quantitative approach with an experimental method. The research design employed is a 2x3 factorial design, conducted in two classes: one experimental class and one control class. The experimental class, V-A, implements the PACE learning model, while the control class, V-B, uses conventional methods.

Before the treatment is administered, each class is first tested using a pretest. The purpose of the pretest is to assess the students' statistical literacy abilities. Prior to the administration of the test, the questions are validated by experts to ensure their appropriateness. After validation, the test items undergo evaluation for both validity and reliability.

To ensure the quality of the statistical literacy test items, validity analysis was conducted. The results are presented in Table 4.

Table 4. Results of Test Item Validity

No.	r_{value}	t_{value}	t_{table}	Criteria Test
1	0,869	9,024	1,725	Valid
2	0,482	2,460	1,725	Valid
3	0,652	3,846	1,725	valid

In Table 4, it can be seen that three test items for statistical literacy Ability all obtained a calculated r value greater than the table value, or $t_{value} > t_{table}$. these result indicated that the tree test items for statistical literacy are valid and suitable for use in the study. This is the calculation of the validity of the test items for statistical literacy Ability."

Table 5. Results of Item Reliability

Test Items	r_{11}	Criteria Test
Statistical Literacy Ability	0,80	High Reliability

It can be seen in Table 5 that the value of $r_{11} = 0.80$ for the statistical literacy test items. This indicates that the statistical literacy test has high reliability. This is the calculation of the reliability test for the statistical literacy test items for students.

The results of the post-test on the statistical literacy Ability of students who were tested in both the experimental class and the control class are as follows:

Table 6. Descriptive Data of Posttest Results for Statistical Literacy Ability

Class	X_{max}	X_{min}	Measures of Central Tendency			Class Variance Measure	
			$\bar{x}$	M_o	M_e	R	sd
EXperimen	100	70	81,00	80	80	30	7,77
Control	85	45	58,20	55	55	40	8,64

Based on Table 1 above, which presents the descriptive data from the posttest results of students' statistical literacy Ability, the experimental class using the Project Activity Cooperative Exercise (PACE) learning model achieved a maximum score of 100 and a minimum score of 70, with a mean ($\bar{x}$) of 81.00, both the mode (Mo) and median (Me) at 80. The class variance is shown by a range (R)

of 30 and a standard deviation (sd) of 7.77, indicating a relatively small score distribution. Meanwhile, the control class had a maximum score of 85 and a minimum score of 45, with a mean ($\bar{x}$) of 58.20, both the mode (Mo) and median (Me) at 55. The range (R) for this class is 40, and the standard deviation (sd) is 8.64, signifying a broader variation in test results. These descriptive findings suggest that the class implementing the PACE learning model obtained the highest scores on the statistical literacy test, with a higher average score and a smaller—or relatively low—distribution of scores. The following are the self-esteem research results that have been obtained:

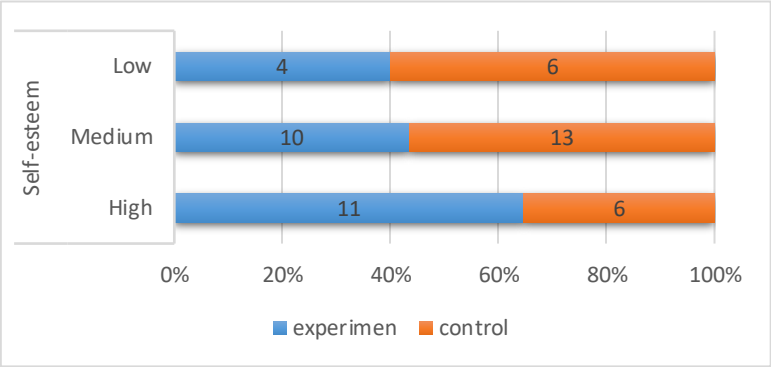

Figure 1. Data from the Students' Self-Esteem Questionnaire

Based on Figure 1, it can be seen that class V.A (the experimental class) consists of 25 students—11 students have high self-esteem, 10 have medium self-esteem, and 4 have low self-esteem. Meanwhile, class V.B (the control class) also consists of 25 students—6 have high self-esteem, 13 have medium self-esteem, and 6 have low self-esteem. Thus, the total sample for this study is 50 students. The findings suggest that the application of the PACE learning model is associated with improved statistical literacy outcomes, particularly among students with higher levels of self-esteem. After obtaining the data on students' statistical literacy test scores and their self-esteem questionnaire responses, the data will be analyzed. Data analysis is a method used to reinforce the results of hypothesis testing or the final conclusion in research. The students' statistical literacy test scores and self-esteem

questionnaire data from the experimental and control classes will be analyzed using normality tests, homogeneity tests, and hypothesis tests. If the data are normally distributed, parametric statistical methods can be used; however, if the data are not normally distributed, non-parametric statistical techniques may be employed.

The first step is to perform data analysis in the form of normality tests on the results of the statistical literacy test and the self-esteem questionnaire. The decision rule for the normality test is that if the p-value > α = 0.05, the data are normally distributed. Below are the results of the normality test calculations for students' statistical literacy and self-esteem questionnaires:

Table 7. Results of the Normality Test for Students' Statistical Literacy Ability

Class	p-value	significance	Distribution
Experimen	0,1444	0,05	Normal
Control	0,080	0,05	Normal

Table 2 above shows the data obtained from the normality test on students' statistical literacy Ability for two classes: the experimental class and the control class. This normality test aims to determine whether the data obtained from both classes are normally distributed. From the normality test results shown in Table 2, it can be concluded that both classes—the experimental class and the control class—have normally distributed data, as they meet the criterion of p-value > α, where the significance level used is α = 0.05.

Table 8. Results of the Normality Test for Students' Self-esteem Scale

Category	p-value	Significance	Distribution
High	0,200	0,05	Normal
Medium	0,200	0,05	Normal
Low	0,096	0,05	Normal

Table 3 above presents the results of the normality test for students' self-esteem scale, categorized into three levels: High, Medium, and Low. The purpose of the normality test is to determine whether the data from each category is normally distributed. The significance level used is 0.05. Based on the obtained p-values, the high category has a p-value of 0.200, which is greater than 0.05, indicating it is normally distributed; the medium category also has a p-value of 0.200, which is

greater than 0.05, thus it is normally distributed; and the low category has a p-value of 0.096, which is greater than 0.05, indicating it is normally distributed as well. From the results of the normality test displayed, it can be concluded that all categories of students' self-esteem (High, Medium, and Low) are normally distributed because they meet the criteria of p-value > α.Next, a data analysis will be conducted in the form of a homogeneity test on the post-test results of students' statistical literacy Ability. Below are the results of the homogeneity test calculations on statistical literacy Ability.

Table 9. Results of the Homogeneity Test for Students' Statistical Literacy Ability

Variable	Levene Statistic	Conclution
Statistical literacy Ability	0,719	Homogen
Self-esteem	0,332	Homogen

Table 4 above presents the results of the homogeneity test for two variables: students' statistical literacy Ability and self-esteem. The purpose of the homogeneity test is to determine whether the variances of the two variables are the same (homogeneous) or not. Based on the results of the statistical test used to assess the homogeneity of variance for statistical literacy Ability, the Levene Statistic value is 0.719 with a p-value > 0.05, while for self-esteem, the Levene Statistic value is 0.332 with a p-value > 0.05. From the homogeneity test results displayed in Table 4, it can be concluded that both variables (Statistical Literacy Ability and Self-esteem) have homogeneous variances because they meet the criteria of p-value > α. This means that the data from both variables can be compared statistically without concern for significant differences in variance.

The hypothesis test in this study was conducted using a parametric test, specifically a two-way analysis of variance (ANOVA). This is because the data used comes from a normally distributed population with uniform variances. Below is a table showing the results of the hypothesis test from the two-way analysis of variance (ANOVA) for the experimental class.

Table 10. Results of the Hypothesis Test from Two-Way Analysis of Variance (ANOVA)

Source	Type III sum of Squares	df	Mean Squares	F	Sig.
Corrected Model	8465,333 (a)	28	302,333	4,973	,000
Intercept	166060,193	1	166060,193	2731,538	,000
Model	2188,787	1	2188,787	36,004	,000
Self-esteem	1591,516	21	75,786	1,247	,309
Model**Self-esteem*	309,886	6	51,648	,850	,547

Table 5 shows the hypothesis test results from the two-way analysis of variance (ANOVA) that have been calculated. The conclusion from this data is that HoA is rejected because the p-value in the Project Activity Cooperative Exercises (PACE) learning model is 0.000, which is less than 0.05 (p-value $\leq \alpha$). Therefore, it can be concluded that there is a statistically significant impact of the Project Activity Cooperative Exercise (PACE) learning model.Next, H0B regarding the Ability for solving statistical problems is accepted because the p-value for Self-esteem is 0.309, which is greater than 0.05 (p-value > α). This concludes that there is no impact of Self-esteem on students' statistical literacy issues. Furthermore, H_0 AB regarding statistical Ability is accepted because the p-value for Self-esteem and the learning model is 0.547, which is greater than 0.05 (p-value > α). This concludes that there is no interaction between Self-esteem and the Project Activity Cooperative Exercise (PACE) learning model on students' statistical literacy Ability.

From these calculations, it can be concluded that there is a significant difference in statistical literacy Ability among students between the experimental class and the control class. This indicates that the learning model using the Project Activity Cooperative Exercise (PACE) and the expository learning method has different impacts on students' statistical literacy Ability.

These results align with previous studies, which showed that the PACE model can improve students' mathematical reasoning skills. In addition, other research found that applying this model in learning activities can also foster students' ability to think creatively in mathematics. Additionally, research by Maisyarah and

Afriyanti found that the application of the Project Activity Cooperative Exercise (PACE) learning model could improve students' mathematics learning outcomes (Maisyarah, Afriyanti, & Manurung, 2021). The results of this study differ from previous research in that the Project Activity Cooperative Exercise (PACE) learning model has an impact on statistical problem-solving abilities.

Based on the research findings, the implementation of the Project Activity Cooperative Exercise (PACE) model in the experimental class has a better impact on students' statistical literacy abilities compared to the control class that applied the expository learning model. This may occur because the Project Activity Cooperative Exercise (PACE) model has characteristics that differ from the expository learning model, particularly in its procedural steps. The Project Activity Cooperative Exercise (PACE) model and the expository learning model have different steps in their learning processes.

The research process began with a preliminary study to assess the initial abilities of the students. From the results obtained, it is evident that many students have not yet mastered statistical literacy Ability mathematically. This can be demonstrated by the low scores on each indicator of mathematical statistical literacy Ability (Rafianti et al., 2020). The scores for each indicator of statistical literacy Ability are categorized as low and still below average. Each score obtained refers to the previously established indicators (Amelia, Rusliah, & Noperta, 2025). By using the Project Activity Cooperative Exercise (PACE) learning model, students will be trained to master statistical literacy Ability.

The learning process in the experimental class allows students to be more actively involved in mathematics lessons on statistical material. Before starting the lesson, the session begins with greetings, prayers, attendance, and an outline of the learning objectives. The educator then prepares the necessary tools and materials for the learning process, guides students to form groups consisting of 4-5 members each, and provides information to the students to determine the topic of the problem to be solved later. The educator briefly presents the material to the students, then

distributes a Student Worksheet containing problems for group discussion. After students gather in their respective groups, the educator directs them to discuss and exchange ideas related to the concepts being studied. Representatives from each group then present the results of their discussions in front of their peers, allowing other students to respond to their classmates' work or provide suggestions. The teacher then gives individual exercises to reinforce the concepts learned by the students.

At the end of the session, the educator and students collaboratively summarize the learning outcomes. The lessons in the second and third meetings are conducted according to the lesson plans designed by the researcher. In the final meeting, or the fourth session, a post-test is administered to measure students' statistical literacy Ability after the implementation of the Project Activity Cooperative Exercise (PACE) learning model.

Students' interest in learning using the PACE model is evident from their positive responses during the educator's explanations, their comfort throughout the learning process, and their active participation, cooperation, and effective communication within their groups. At the beginning of the lesson, some students appeared less active and lacked confidence; however, overall, students were able to respond to and understand the statistical material presented in the form of tables and graphs. The obtained p-value for the Project Activity Cooperative Exercise (PACE) learning model is 0.000, which is less than $\alpha = 0.05$ (p-value $\leq \alpha$). The conclusion drawn from this calculation is that there is a significant difference in the statistical literacy Ability of students in the experimental class compared to the control class. Therefore, the treatment methods applied in the experimental and control classes can be used to measure the impact of the increased statistical literacy Ability resulting from the intervention.

Based on the explanations provided and several related studies, there is a noticeable difference between the treatment of the Project Activity Cooperative Exercise (PACE) learning model and the expository learning model. The results

indicate that mathematical problem-solving abilities are better taught using the Project Activity Cooperative Exercise (PACE) model compared to the expository learning model. This is because the Project Activity Cooperative Exercise (PACE) model is more effective than the expository model. The PACE model encourages students to be more active in the learning process, trains them to solve problems effectively, and helps them retain the knowledge they acquire for a longer period. This learning model is highly effective as it serves as a student-centered approach that prioritizes the role of students.These factors suggest that the elements influencing the Project Activity Cooperative Exercise (PACE) model can be applied to assist in tasks related to statistical problem-solving.

In this study, the author not only investigates the learning model but also observes the learning processes of students with varying levels of self-esteem: high, medium, and low. Based on the author's observations during the learning process using the Project Activity Cooperative Exercise (PACE) model or the expository learning model, there are students with high self-esteem who remain passive during lessons and receive poor test scores due to a lack of understanding of the material being taught. Conversely, there are students with medium or low self-esteem who are active during the teaching and learning process and demonstrate better understanding, resulting in higher test scores. Additionally, some students answer questions collectively, and several frequently ask questions about concepts they do not understand or find unclear. There are also students who show interest in mathematics, as indicated by the research findings, where the p-value for self-esteem is 0.309, which is greater than $\alpha = 0.05$ (p-value $> \alpha$). This suggests that there is no impact of self-esteem levels (low, medium, and high) on students' statistical Ability.

Using theory, it can be stated that factors affecting mathematical problem-solving abilities include self-esteem and the use of an appropriate learning model for educators. However, the researcher did not find a relationship between the learning model and self-esteem concerning students' statistical literacy Ability. This

may be due to factors such as students' lack of precision in solving problems; students with low, medium, and high self-esteem did not show differences in accuracy when solving statistical problems during the learning process. Meanwhile, the statistical literacy test requires a high level of precision. Additionally, factors that may have contributed to the study's inconclusive results include the presence of students who remained passive during discussions and teamwork among students during the learning process. Therefore, based on the calculations, the p-value for self-esteem and the learning model is 0.547, which is greater than 0.05 (p-value > α), leading to the conclusion that there is no relationship between the Project Activity Cooperative Exercise (PACE) model and self-esteem regarding students' statistical literacy Ability.

CONCLUSION

Based on the analysis and discussion, it can be concluded that the Project Activity Cooperative Exercise (PACE) learning model significantly improves students' statistical literacy Ability, particularly in presenting and interpreting data through tables and graphs. The study found no significant effect of students' self-esteem levels on their statistical literacy Ability. Furthermore, no interaction was found between the PACE learning model and students' self-esteem in influencing statistical literacy outcomes. This indicates that the PACE learning model and self-esteem independently affect students, with no combined or correlational relationship influencing their statistical literacy.

The PACE learning model is one of the teaching models implemented in elementary schools. This model emphasizes project activities, cooperative learning, and exercises. However, it is important to acknowledge the limitations in effectively applying this model.

Educators are encouraged to continue implementing the Project Activity Cooperative Exercise (PACE) model in their teaching practices, particularly for statistical literacy. Given its positive impact on students' abilities to present data in tables and graphs, this model can enhance student engagement and understanding.

Future research should explore other factors that may influence students' statistical literacy Ability, such as motivation, prior knowledge, and different teaching methodologies. Investigating these aspects could provide a more comprehensive understanding of how to improve statistical literacy among students.

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