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Application of problem based learning to improve lower passing volleyball for 5th grade students

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Abstract

The failure of volleyball psychomotor learning outcomes is because not all children can perform the basic movements of lower passing properly. The objective of this research is to measure the psychomotor learning outcomes of lower passing by applying problem-based learning as a learning model. The design of classroom action research with a two-cycle diagram was applied involving 29 children (Male=14, Female=15, Mage=11,034) as the sample of this research. Percentage calculation and descriptive statistics are the analysis techniques determined with the help of Microsoft Excel to review the proportion of completeted and non completed of psychomotor learning outcomes. The results of the study showed an increase in the average value from cycle I of 70.93 to 77.51 in cycle II. Meanwhile, the results of the frequency distribution of completeness also increased from cycle I of 65.50% (19 students) to 82.20% (24 students) in cycle II. The results in this study have contributed to affirming PBL as a model worthy of being used as an alternative learning strategy for volleyball lower passing, especially in the psychomotor domain. Self-confidence, motivation level, and learning burnout experienced by students are observational notes of obstacles that are not considered as objective measures in this study. Future researchers need to take into account these predictor variables in depth through multivariate analysis.

Keywords: problem based leaning, psychomotor learning outcomes, lower passing

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INTRODUCTION

Learning strategies that need to be prepared by every physical education teacher include methods, assessment instruments, media, teaching materials and learning models designed into a teaching module. This structured learning strategy can help physical education teachers guide students to achieve the learning outcomes that have been set. Although the learning outcomes achieved can increase students' learning motivation to be involved in physical learning movement activities. This argument is strengthened by Fernando et al. (2024) who stated that there is a significant positive correlation between learning outcomes and learning motivation. The involvement of movement activities supported by students' learning motivation can actually encourage students' physical fitness.

In essence, there are two dimensions measured in physical fitness variables, namely the health dimension and the biomotor skills dimension (Panggraita et al., 2021). Furthermore,

Panggraita et al.(2021) explained that the health dimension consists of several components including cardiovascular endurance, muscle strength and endurance, flexibility and body composition. Meanwhile, the biomotor dimension of fitness compiles the components of agility, balance, coordination, power, reaction time, accuracy, and speed. Ideally, a comprehensive measure of fitness status needs to take into account all components contained in the two dimensions, and this measure is relevant to the duties of sports achievement (coaching) as the main orientation of athlete performance. However, physical fitness in the context of the sports education pillar is sufficient to measure the health dimension (Katch, McArdle, & Katch, 2011) .

PE is one of the concrete mechanisms to encourage students' physical fitness from a young age. The movement activities in the learning scenario become an intervention to increase the frequency of physical activity which in turn promotes students' health and biomotor skills. Ideally, PE has become a compulsory subject for students in educational units. However, in reality, not all students are actually serious about learning PE. This opinion is corroborated by several studies that show that not all students have a high interest in participating in PE learning (Febrianti, 2024; Nazirun, Gazali, & Fikri, 2020; Sitanggang et al., 2024; Tunru, Ilahi, & Hikmah, 2023) . This low interest can weaken student motivation which in turn reduces learning outcomes as a sign that these variables are positively and significantly correlated (Budiariawan, 2019; Chulsum, 2017; Jemudin, Makur, & Ali, 2019) .

The challenge becomes more complex when PE learning has the uniqueness and diversity of sports material. For example, basketball game material and volleyball, which although have the same basic movements such as passing, but actually the implementation of movements and games is different. So it becomes normal if some students have the perception that one of the PE materials is difficult. This difficulty needs attention and guidance by teachers to provide motivation and feedback that can help students achieve their learning success. Therefore, the learning strategy designed by the teacher is actually an essential component that deserves strict consideration.

The results of initial observations in this study showed that some class 5A students had difficulty returning the volleyball using an underhand pass. This is based on the achievement of learning outcomes that are seen, namely that not all students can do underhand passes independently with their own abilities. This is rational when the learning process that takes place emphasizes the fun aspect with a modified team game method using a large rubber ball, so this becomes an obstacle when students pass the large rubber ball in groups and not

independently. However, the feelings of joy and enthusiasm seen from the students in the game provide an opportunity for how good the students' interest and motivation are in learning volleyball material. This condition helps in the next action by tracing previous literature as a reference that can be an alternative solution.

Previous research was conducted as an alternative choice of learning strategies that are relevant to use. Atsani's research (2020) chose the play approach as a learning strategy to improve the passing ability of junior high school level students. While Prayoga (2021) focuses on learning strategies with problem-based learning (PBL) models combined with a play approach. Furthermore, the other three studies have in common by implementing the project-based learning (PjBL) model as a learning strategy to improve lower passing skills (Ani, Mawarti, & Gani, 2025; Raaiyatini, Basuki, Mashud, Pebriyandi, & Ridha, 2024; Utami, Setiyawan, Santoso, & Prasojo, 2024). So far, the five literatures that have been mentioned have contributed to enriching references to learning strategies that have been proven to be able to improve lower passing learning outcomes. However, the lack of detailed explanations regarding the use of model syntax and the level of samples that are not from elementary schools (SD) is considered to have been a limitation of the five previous studies

Looking at Jean Piaget's theory of cognitive development in the formal operational stage occurs at the age of 11-15 years, where children show the ability to formulate deductive hypotheses to solve problems and draw conclusions in a structured manner (Marinda, 2020) . Conceptual learning oriented to problem solving is considered relevant to PBL and PjBL models. Although the syntax of PBL and PjBL are both problem-oriented, some researchers apply more PjBL at the upper secondary level (Ani et al., 2025; Ariyudha, 2023; Azzahra, Tarigan, & Carsiwan, 2024; Raaiyatini et al., 2024; Utami et al., 2024) . While very limited researchers have applied PjBL for lower passing material at the elementary level (Aini, Indahwati, & Tarigan, 2024) . This is reasonable because in general students at higher levels are able to remember complex instructions along with their cognitive development which is able to think more critically, abstractly, and logically (Addzaky, 2024) so as to encourage problem-solving creativity through the output of work or products that characterize PjBL. Based on the description that has been described, this study chose the PBL model as a learning strategy to improve lower passing learning outcomes. Therefore, the purpose of this study is to measure the results and completeness of learning lower passing (psychomotor) of 5th grade students with the PBL ..

METHOD

This study was designed as a classroom action research (CAR) by applying a flow of two cycles. CAR is research based on learning problems that occur in the classroom faced by teachers to be improved in order to improve the quality of learning with the concept of cycles (Susilo, Chotimah, & Sari, 2011). Each cycle contains four stages consisting of planning, implementation, observation, and reflection. This research activity was conducted at State Elementary School Dukuh Menanggal 1/424 Surabaya with 29 students (14 boys and 15 girls, M_{age}=11,034) in class 5A who were selected as research samples. The duration of research data collection began on February 12, 2025 for the first cycle and February 19, 2025 for the second cycle.

The research instrument used a modified rubric assessment in the available teaching module with data collection techniques through observation sheets and practical tests (Arham, 2022). Observation sheets and practical test are needed to assess student learning outcomes and completeness based on the psychomotor domain. In this case, the observation sheet and the practical test are a single unit of data collection carried out simultaneously to assess the psychomotor domain. As a concrete example, a practical test was conducted on syntax 5 PBL to evaluate students' underhand passing skills. The practical test took place with the assistance of two members of the research team who were tasked with throwing a volleyball at a distance of 1.5 meters for girls and 2.5 meters for boys. At least the return of the ball through the underhand pass to a distance of half the distance set, then it will be considered successful and counted how many without looking at the level of accuracy of the pass. Because, the assessment of passing accuracy is more suitable for basic technique test for athletes. It should be noted that this distance was chosen and reached a consensus after discussing with the supervising teacher who considered the characteristics of the sample's abilities. Thus, there is a probability that this distance can be modified by researchers or other teachers by considering the abilities of students in different schools (outside the sample of this study) considering that there are no standard provisions for the ideal distance for underhand passing to be tested. Furthermore, when the ball is thrown, it must then be returned by the student by passing underhand. This test provides students with the opportunity to pass underhand 12 times. During this opportunity, other research members are tasked with observing and assessing the three psychomotor components modified from Arham's (2020) teaching module. The modified part is the psychomotor aspect which is measured with its components being; 1). The ready attitude of the feet and hands when doing the lower pass, 2). Ready attitude of hands and body when doing

lower passing, and 3). Returning the ball when making a lower pass. While other aspects that are omitted as indicators are ball contact which is tied to the position of the hands, foot position, and body position.

That aspect is omitted because it is less relevant to students (especially elementary school level and not athletes) who are learning movements (PE) but are required to focus on the ball's imposition by regulating the details of the position of the hands, feet and body are irrational. Which means, this aspect is more suitable to be applied in the realm of coaching (athlete performance) which is oriented towards the perfection of basic lower passing techniques by paying attention to the ball's contact through the location of the hands, feet and body. Although there are different views among experts where ball contact is used as a component in the learning mechanism of lower passing (Fauzi & Sapulete, 2023) , but this study agrees more to following Supriatna(2024) which focuses on the learning mechanism of movement towards a ready attitude not towards ball contact, and this is considered in accordance with the ability of the research sample (grade 5 students). Even so, the existence of this omitted aspect is still important to convey to enrich students' insights. So far, the differences in experts opinion are reasonable and can be perceived as equally true depending on the needs of the teacher by considering the phase of the students. In addition, each researcher can provide observable field notes related to the obstacles that become difficulties and/or failures of students to return the ball through underhand passing during the practice test. These notes are useful as feedback for students and actions in cycle II.

Furthermore, the technical filling of the instrument is carried out by ticking the score interval 1 (the smallest value) to 4 (the largest value) according to the characteristics of the Likert scale rubric type four alternative choices, which are then converted into a final score with a maximum range of 100 points through the percentage calculation technique. Judging from the process of collecting the collected data, the data source of this research can be categorized as primary. Although CAR is classified as qualitative type (Susilo et al., 2011) , but the type of data in this study was collected qualitatively (observation) which was then transformed into quantitative data results based on the teaching module rubric. So it is more relevant if this type of research is classified as mixed method research (qualitative-quantitative).

The stages in this study were carried out in two cycles. This study involved a series of stages including planning, implementation, observation, and reflection in each cycle following previous studies (Maulana et al., 2025; Pranoto, Indahwati, & Dhani, 2024). In essence, both

cycles contain the same stages. The slight difference lies in the implementation stage of PBL syntax in cycle II which has improved from cycle I (see table 1).

Table 1. Second Cycle Implementation Stage

Implementation Stage in Cycle I	Implementation Stage in Cycle II
Syntax 1: Directing students to the problem. 1. Students are asked to identify the problem: "Why is passing often not on target? What are the difficulties/obstacles? How to overcome it?"	**Syntax 1: Directing students to the problem.** 1. Students are asked to identify the problem: "Why is passing often not on target? What are the difficulties/obstacles? How to overcome it?"
Syntax 2: Organizing students to learn. 1. Students are divided into several groups (9-10 people). 2. Activity 1: Students practice underhand passing in pairs with their group members. 3. Activity 2: Students practice underhand passing in a circle and in groups.	**Syntax 2: Organizing students to learn.** 1. Students are divided into several groups (9-10 people). 2. Activity 1: Students practice underhand passing independently and in turns with their friends. 3. Activity 2: Students practice underhand passing in pairs with their group members. 4. Activity 3: Students practice underhand passing in a circle and in groups.
Syntax 3: Guiding individuals and/or groups in conducting investigations. 1. Each group analyzes and investigates the ideal body position (feet, knees, gaze), arm movement and coordination, as well as factors that are thought to influence the movement of the underhand pass (e.g. power, direction of the ball).	**Syntax 3: Guiding individuals and/or groups in conducting investigations.** 1. Each group analyzes and investigates the ideal body position (feet, knees, gaze), arm movement and coordination, as well as factors that are thought to influence the movement of the underhand pass (e.g. power, direction of the ball).
Syntax 4: Compiling and presenting learning outcomes 1. Students and their groups convey their understanding of the implementation of the underhand pass movement and the factors that are considered to cause failure in performing underhand passes based on the results of the discussions and demonstrations that have been carried out.	**Syntax 4: Compiling and presenting learning outcomes** 1. Students and their groups convey their understanding of the implementation of the underhand pass movement and the factors that are considered to cause failure in performing underhand passes based on the results of the discussions and demonstrations that have been carried out.
Syntax 5: Analyze and evaluate the problem solving process. 1. Students discuss to compare the findings of all groups regarding underhand passing. 2. Students and teachers summarize good underhand passing movements in volleyball.	**Syntax 5: Analyze and evaluate the problem solving process.** 1. Students discuss to compare the findings of all groups regarding underhand passing. 2. Students and teachers summarize good underhand passing movements in volleyball.

3. evaluation of students' lower passing grades through practical test.	3. evaluation of students' lower passing grades through practical test.

The addition of the number of independent demonstration activities in cycle II was done so that students have the opportunity to get used to the underhand passing movement. Activity 1 in cycle II was done in stages. More specifically, the first repetition of independent underhand passing was done with a ball bounce height that did not exceed the head to make it easier for students to control the ball. Furthermore, in the second repetition, ball control with underhand passing was done with a bounce height above the head. After the raw data is obtained, the data is then processed using excel software. The overall data analysis in this study applied the percentage technique as applied in

RESULT

Table 3 shows the results of the data description in this study**.**

Table 3. Descriptive Statistics of Cycle 1

Component	Results
$\underline{x} \pm SD$	70,93 ± 10,83
median	75
mode	75
min	50
max	92
N	29
sum	2057

The results of the research data analysis show that the average value of the lower pass for students in class 5A SDN is 70.93 in cycle I, which can also be interpreted as the acquisition of this average has not yet reached the required learning completeness of 75. The distribution of average values comes from class 5A with 29 students as a detailed research sample of 14 male students and 15 female students. Furthermore, the smallest score obtained in cycle I was 50 point. While the highest score achieved in cycle I was 92 point. The other components of the resulting descriptive statistical analysis are listed in table 3.

Table 4. Cycle I Learning Outcomes

Range	Category	Frequency (%)	Description
$x \geq 92$	Very good	3,4%	Completed
$80 < x < 91$	Good	13,8%	Completed
$74 < x < 80$	Simply	48,3%	Completed
$55 < x \leq 74$	Evolve	24,1%	Not Completed
≤ 55	Less	10,4%	Not Completed

Learning results in cycle I also showed that the acquisition of scores in the sufficient category dominated the frequency distribution by 48.3%. This was followed by the categories of developing (24.1%), good (13.8%), poor (10.4%) and excellent (3.4%). Table 4 illustrates the predicate of learning completeness for students who scored in the sufficient, good and excellent categories. While the less and developing categories inform the frequency distribution of students whose learning outcomes has not been completed.

Table 5. Descriptive Statistics of Cycle 2

Component	Results
$\underline{x} \pm SD$	77,51 ± 7,66
median	75
mode	83
min	58
max	92
N	29
sum	2248

In the results of cycle II, there was better progress in learning outcomes compared to cycle I. This is indicated by the average value of lower passing which increased to 77.51, which can also be interpreted as the acquisition of this average has reached the required learning completeness of 75. Furthermore, the smallest score obtained in cycle II was 58 point. While the highest score obtained in cycle II was 92 point, which was no different from the highest score in cycle I. Details of other components of descriptive statistical analysis related to cycle II learning outcomes are listed in table 5.

Table 6. Cycle II Learning Outcomes

Range	Category	Frequency (%)	Description
$x \geq 92$	Very good	6,9%	Completed
$80 < x < 91$	Good	37,9%	Completed
$74 < x < 80$	Simply	37,9%	Completed
$55 < x \leq 74$	Evolve	17,3%	Not Completed
≤ 55	Less	0%	Not Completed

The completeness of learning outcomes in cycle II was considered better than the completeness of learning outcomes in cycle I. This was indicated by the absence of the frequency distribution of students who scored in the less category (0%). This is indicated by the absence of the frequency distribution of students who scored in the poor category (0%). However, there were still students with developing category learning outcomes of 17.3%. The frequency distribution of other categories (sufficient, good, and excellent) can be seen in table 6.

Overall, the learning outcomes of the first cycle that had been completed were distributed by 65.5% and those who had not completed were 34.5%. Whereas in cycle II, the distribution of learning outcomes that were complete was 82.8% and those that were not complete were 34.5%. This data shows that there was better learning progress in cycle II compared to the previous cycle I. This means that the application of PBL proved to be able to improve learning. Which means, the application of PBL is proven to be able to improve the psychomotor learning outcomes of lower passing.

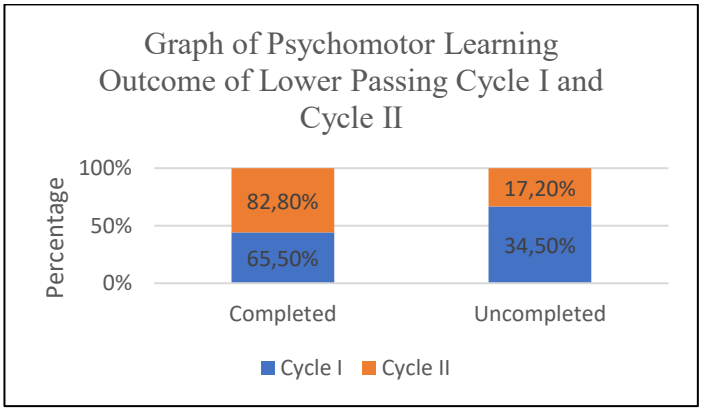

Figure 1. Comparison of Cycle I and Cycle II Learning Outcomes

DISCUSSION

The results of the distribution of learning success of 65.50% in cycle I indicate that action on learning needs to be continued in cycle II. The improvement notes from cycle I are the lack of opportunities for students to try underhand passing repeatedly. This is because the PBL

design in cycle I only accommodates two activities demonstrated in pairs and groups. Another note that is the focus of reflection is the implementation of activity 2 which is carried out in groups but the underhand passing movement carried out by each student member is disproportionate. This disproportionality can be seen in how students who are able to do underhand passing well in a more dominant frequency. While other students who are relatively new and developing get a recessive underhand passing frequency. In this case, it is important to develop other strategies in the PBL model so that the opportunity to do underhand passing is balanced or even.

Responding to the obstacles noted in cycle I, the number of PBL model activities in cycle II was added. Individual underhand passing movement activities allow students to get the opportunity to try the movement repeatedly. In addition, group learning activities in cycle I were previously given a rule so that each group member could do underhand passing a maximum of 3 times. This is solely to ensure fair distribution in demonstrating underhand passing. Improvements to the PBL procedure carried out in cycle II resulted in progress by reviewing the learning outcomes achieved distributed at 82.20%. This percentage declares that the PBL model applied in cycle II is classified as satisfactory. Even so, it is realized that cycle II in this study is not perfect in that 100% of students are able to achieve learning outcomes in accordance with the minimum value provisions. There are valuable notes in PBL cycle II regarding internal factors of students who have a risk of failing to do underhand passing which researchers are not fully able to mitigate.

Internal factors referred to in the observation of PBL cycle II include; 1). fear of the ball hitting other body parts, especially the face so that students often choose to avoid it. 2). Lack of self-confidence, there are students who are seen hunched over and hesitant to do an underhand pass, 3). lack of concentration marked by students being distracted by other situations, for example, their attention changes to looking at people walking rather than the direction of the ball. Of course, this internal condition has been attempted to be mitigated by providing a momentary icebreaker so that students can return to focusing on the flow of activities in PBL II. Even so, the focus of some students who were seen was not resistant until the learning was over.

The results of the research that have been reviewed are in line with several previous CARs which prove that the PBL model is able to improve the psychomotor learning outcomes of volleyball lower passing (Pakaya, Bengkal, Ilham, Hidayat, & Isnanto, 2024; Purwanto, Astra, & Adnyana, 2024; Triviona, Haetami, Hidasari, Atiq, & Bafadal, 2025; Waskita, Buhari, & Wahyudi, 2024). The comparison graph in Figure 1 interprets the improvement in

psychomotor learning outcomes from cycle I to cycle II which is reflected based on the magnitude of the distribution of learning outcomes. It was calculated that the acquisition of an increase in learning outcomes with complete status experienced an expansion in frequency of 17.3%. Which means, it is estimated that about half of the students from the total of all students who have not been completed in cycle I have experienced positive developments in achieving the minimum standard of learning outcomes provisions in cycle II.

Research with an experimental design also resulted in the effective of PBL which showed significant optimization of volleyball passing psychomotor learning outcomes (Kurniawan & Hidayat, 2023; Prayoga, 2021; Purnama, Rohman, & Prayogo, 2023) . Their three experimental studies can inform the interval range of increasing average scores by looking at the difference between posttest and pretest. The post-pretest difference of the three studies showed an interval of average increase in learning outcomes ranging from 6 to 12.78 points by applying the PBL model. The range of progress intervals corroborates the results of the CAR that has been carried out which can increase the average learning outcomes by 6.58 points in cycle II (see tables 3 and 5). It is also important to clarify that the interval of learning progress calculated at this time is not absolute, because it is still based on the source of the previous study. This means that newer experimental studies still have the potential to clarify the learning progress intervals by including higher/lower scores.

The results of data analysis in cycle I showed that the level of learning completed was 65.5% and the remaining 34.5% was incorporated as an uncompleted level. The proportion of this data means the need for cycle II by evaluating cycle I learning at the reflection stage. Reflection activities stem from observations of classroom dynamics and reflective discussion sessions at the end of the lesson. This reflection stage clarifies the obstacles faced by students (especially those who have not yet completed) including the lack of student focus which weakens students' readiness to perform lower passing. In addition, worry and hesitation were considered to have become a psychological burden for students to be able to perform the lower pass well. Therefore, the results of the first cycle reflection provide a basis for improving learning through strengthening motivation for students who have not yet reached learning completeness. Providing motivation is an important step to restore students' focus and confidence to help improve their learning outcomes. This argument is supported by the significant positive contribution between motivation and learning outcomes (Idham, Neldi, Komaini, Sin, & Damrah, 2022; Kesuma, Yoda, & Hidayat, 2021) .

The provision of external motivation is considered to show its effect by looking at the interpretation of the data generated in cycle II. It is known that the achievement of learning

completeness in cycle II has expanded the frequency of completeness to 82.8%. Then, the most prominent difference is also seen in the mode component in cycle II which is dominated by 83 (see table 5). The mode number is greater than the mode obtained in cycle I of 75 (see table 3). This data shows a positive trend in the development of students' psychomotor learning outcome in lower passing material.

The reflection stage in cycle II found that the failure of psychomotor learning outcomes tended to be experienced by female students. Similarly, the reflection of cycle I score data also noted that the failure of psychomotor learning outcomes was dominated by female students. The results of the reflection of cycle I and cycle II contradict the research of Martono et al.(2017) which shows the results of no difference in psychomotor learning outcomes between girls and boys. While the reflection results in this CAR actually support the research of Magdalena et al.(2021) which results in the psychomotor abilities of boys being more proficient than girls. This difference in opinion results occurs because of the incomplete explanation of what variables have an impact on student learning outcomes, for example the variables of motivation and psychomotor abilities (Asnaldi, Zulman, & M, 2018) .

However, the results of the reflection on learning in cycle I and cycle II showed indications of a gap in psychomotor learning outcomes with more failures experienced by female students. The follow-up plan to correct this problem was divided into two alternatives: following the remedial procedure and/or continuing to implement the renewal of learning strategies in cycle III. The chosen follow-up plan after this CAR is remedial learning. Remedial is defined as additional learning outside of regular learning for students who have not completed their learning with the aim of improving their learning outcomes (Simatupang, 2019)

Remedial learning is important so that students who have not reached the minimum standard of grades set by the school, get the opportunity to complete their learning outcomes. These completed learning outcomes can maintain student motivation to participate in PE learning. This is because the variables of learning outcomes and motivation are positively and significantly associated (Budiariawan, 2019; Chulsum, 2017). Maintaining this motivation helps students participate in learning movements that support their physical fitness.

CONCLUSIONS

The results of the data that have been reviewed can be concluded that the PBL model is able to improve the psychomotor learning outcomes of passing under volleyball for grade 5. This progress in learning outcomes is indicated by an increase in the average score and

completeted of learning outcomes in cycle II. This CAR study has contributed to confirming PBL as a model that is worthy of being used as an alternative learning strategy for lower passing volleyball, especially in the psychomotor domain. The cross-sectional study design analyzed by regression and Structural Equation Modeling (SEM) recommended for future research in this field focuses on variables that are thought to be synchronous to the failure and success of learning volleyball lower passes, so that this can explain the findings more comprehensively which is a limitation in our study.

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