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Modification of the IDEA (Issue, Discussion, Establish, and Apply) Model to Enhance Learning Effectiveness

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Abstract

The abrupt transition to online learning resulted in unprepared instructional practices and reduced academic control, leading to a sustained decline in students' motivation even after the return to face-to-face learning. This condition contributed to a high failure rate in the Probability and Statistics course. Addressing this challenge requires an innovative learning approach that not only promotes active participation but also supports advanced learning competencies. This study proposes a modified IDEA (Issue, Discussion, Establish, Apply) learning model by integrating flipped learning, structured worksheets, and continuous lecturer scaffolding. Using a research and development approach, the model was implemented in a Probability and Statistics course involving undergraduate engineering students. Quantitative and qualitative analyses indicate that the modified model significantly improves student participation and learning outcomes compared to conventional instruction. The key novel finding of this study lies in the identification of structured scaffolding and guided reflection as critical mechanisms that transform the IDEA model from an active learning strategy into an advanced learning framework. The modified model strengthens self-regulated learning, reflective engagement, and learner autonomy core attributes of advanced learning in post-pandemic higher education. These findings position the modified IDEA model as an instructional innovation that extends student-centered learning toward deeper, more sustainable learning effectiveness.

Keywords: active learning, advance learning, cooperative learning, flipped learning, IDEA learning model, innovative learning, student center learning, teaching innovation

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1. Introduction

The COVID-19 pandemic led to a sudden shift to online learning, which had a significant impact on the learning process and outcomes of university students. Several studies reported that online learning offered flexibility and encouraged independent learning (Imanto & Hendrik, 2021; Haiyudi & Art-In, 2021; Rahmadi et al., 2024; Akpen et al., 2024; Wiitavaara & Widar, 2025). However, on the other hand, limitations in direct supervision, reduced social interaction, and technical challenges such as unstable internet connections contributed to a decline in student motivation and participation (Nasriani, 2022; Cahyawati & Gunarto, 2021; Gherheș et al., 2021; Afni, 2021).

The impact of declining motivation has persisted even after the return to face-to-face learning. Rossa (2024) stated that around 40% of students in Indonesia experienced a loss of learning motivation during the pandemic. Damanik (2021) emphasized that the responsibility for restoring motivation

does not rest solely on students, but also on innovations in teaching methods designed by educators. Therefore, innovation in instructional approaches has become an urgent necessity, particularly those that can reactivate student engagement (Ambarwati et al., 2021).

Student-centered learning (SCL) approaches have been proven to enhance student engagement and motivation (Bremner et al., 2022; Abdullah, 2017; Salamah & Rifayanti, 2023). One model that supports this approach is the IDEA model (Issue, Discussion, Establish, and Apply), which is designed to foster active involvement through phases of problem exploration, discussion, concept formation, and application (Setiawan & Mustangin, 2020).

Although the IDEA model has shown positive effects in improving student participation, initial evaluations revealed several limitations in its implementation. These include difficulties in independent learning, limited use of learning resources outside the classroom, and a lack of monitoring and reflection mechanisms throughout the learning process (Mustangin & Setiawan, 2020; Andiwatir, 2021). These findings indicate the need for a modified version of the model that is more adaptable to post-pandemic learning challenges (Massie & Nababan, 2021; Faza et al., 2024; Goyibova et al., 2025).

While existing studies have positioned the IDEA model as an effective form of active and cooperative learning (Setiawan & Mustangin, 2020), limited attention has been given to its potential role in fostering advanced learning competencies. Advanced learning emphasizes self-regulated learning, reflective practice, learner autonomy, and the ability to transfer knowledge across contexts capabilities increasingly required in post-pandemic higher education (Goyibova et al., 2025). The challenges observed in the original IDEA implementation, particularly students limited independent preparation and reflection, indicate the need for an instructional innovation that extends beyond participation toward deeper learning regulation and metacognitive engagement (Bremner et al., 2022). Therefore, modifying the IDEA model by embedding flipped learning, structured scaffolding, and systematic reflection represents an important step in aligning student-centered instruction with the principles of advanced learning.

This study aims to answer two main research questions: (1) How effective is the modified IDEA model in increasing student participation and learning outcomes in the Probability and Statistics course? (2) Can the combination of flipped learning, structured worksheets, and lecturer support address the limitations of the original IDEA model? The objective of this research is to develop and evaluate the effectiveness of a modified IDEA learning model in enhancing student motivation and academic achievement in post-pandemic face-to-face learning.

2. Method

This study used a Research and Development (R&D) approach, adapting the stages proposed by Setiawan & Mustangin (2020), which include: (1) initial investigation, (2) design, (3) realization or construction, (4) testing, evaluation, and revision, and (5) dissemination or implementation. This design was selected because the main objective was to develop and evaluate a modified version of the IDEA (Issue, Discussion, Establish, and Apply) learning model.

a. The IDEA Learning Model

The IDEA Learning Model is a plan or framework used to design instructional materials and guide classroom learning, based on four key activities: (1) Issue, where students engage in activities that generate ideas for solving simple problems; (2) Discussion, where these ideas are discussed to identify a concept as the basis for understanding; (3) Establish, where a concept is solidified based on the ideas identified; and (4) Apply, where the established concept is applied to solve mathematical problems or real-life situations related to the concept being studied (Setiawan & Mustangin, 2020).

The research and development procedure for the IDEA learning model consists of five stages: (1) initial investigation, (2) design, (3) realization or construction, (4) testing, evaluation, and revision, and (5) dissemination or implementation (Setiawan & Mustangin, 2020).

The short-term function of the IDEA learning model is to help students gain information about concepts and systematic thinking processes in understanding concepts in Probability and Statistics. The long-term function is to encourage students to habitually use their ideas to grasp concepts in Probability and Statistics, making it easier and more effective for them to learn and understand these concepts. The primary goal of the IDEA learning model is to enhance and develop conceptual understanding (Setiawan & Mustangin, 2020). In general, the IDEA learning model is illustrated in Figure 1, while the syntax of the IDEA model is described in Table 1.

Based on the previous research, the validity test results of the IDEA learning model indicate that the model is valid and can be used to enhance conceptual understanding (Setiawan & Mustangin, 2020). In terms of practicality, the IDEA learning model achieved a score of 73.47%, indicating that it is feasible for use (Mustangin & Setiawan, 2020). The application of the IDEA learning model is illustrated in Figure 2(a) and 2(b).

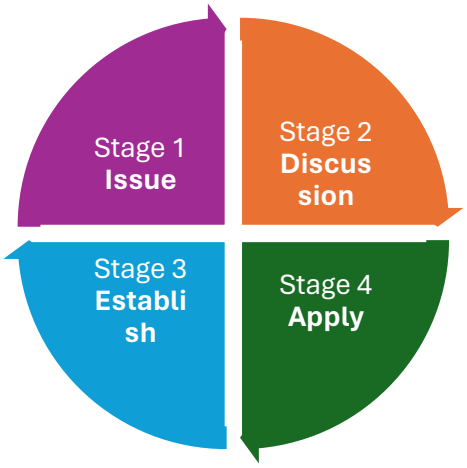

Figure 1. The IDEA Learning Concept

Table 1. Syntax of the IDEA Model

No	IDEA's Steps	Definition	Explanation
1	*Issue*	Generating ideas	Learning activity to generate ideas when solving simple problems.

2	*Discussion*	Discussing ideas	Discussing ideas to solve simple problems, leading to the discovery of ideas as the basis for a concept.
3	*Establish*	Establishing the concept	Defining a concept from the ideas that have been identified.
4	*Apply*	Applying the concept	Applying the established concept to solve probability and statistics problems or real-life issues related to the concept being studied.

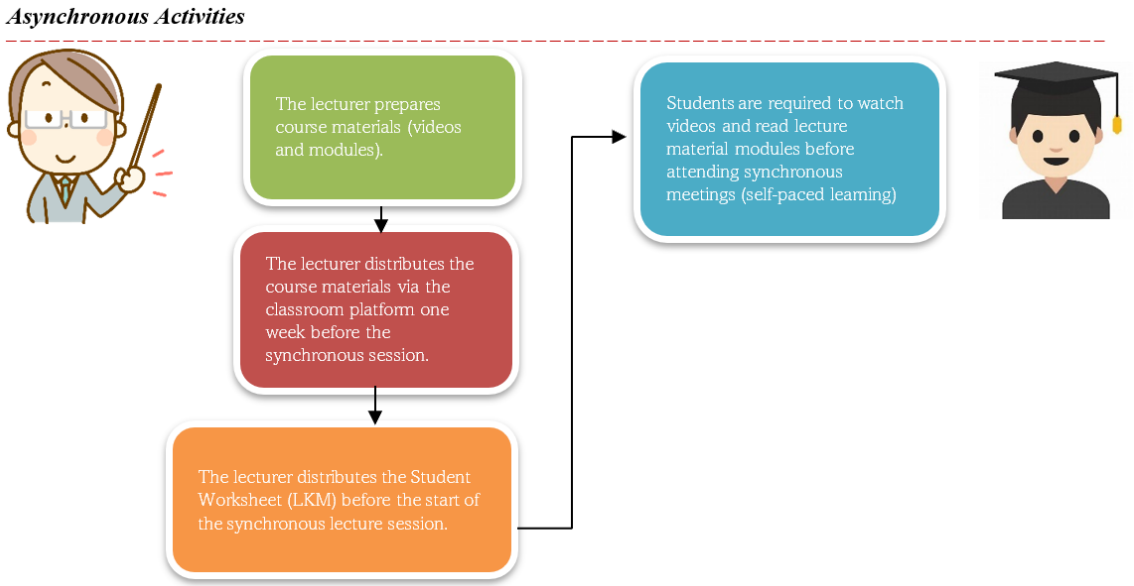

Figure 2(a). IDEA Learning Model (Asynchronous Activities)

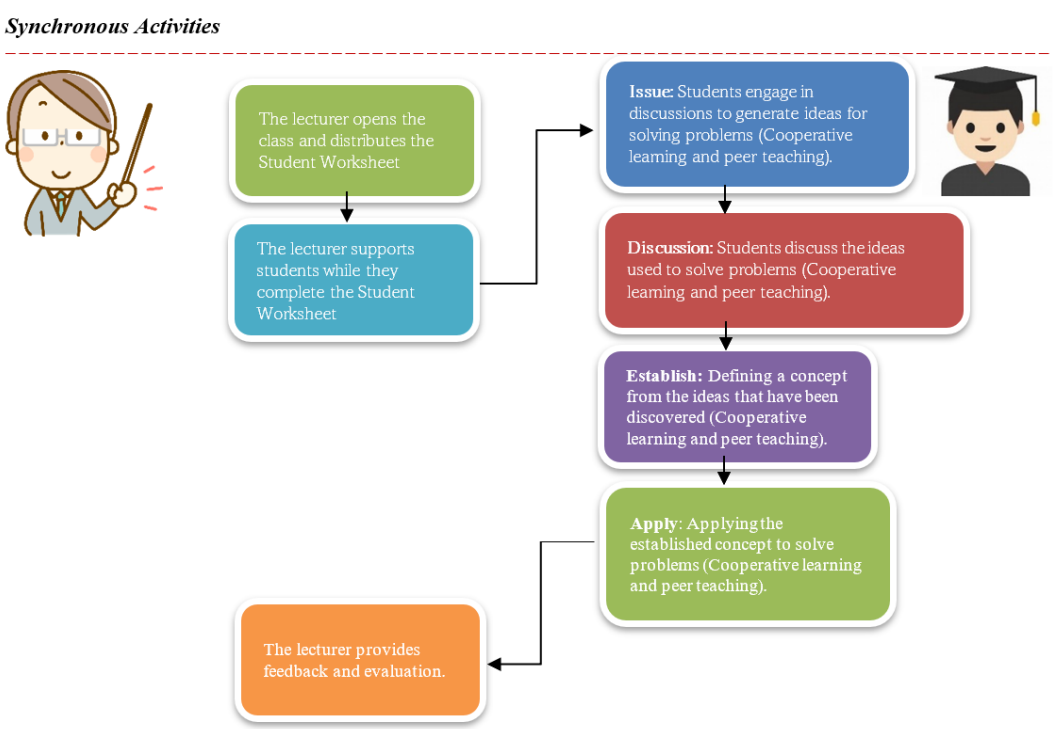

Figure 2(b). IDEA Learning Model (Synchronous Activities)

However, when initially implemented, the IDEA model still faced challenges (Mustangin & Setiawan, 2020):

1) Students had difficulty applying the IDEA learning model.

2) Students struggled to generate and record ideas for solving problems.
3) Students were confused about how to discuss their ideas with their peers.
4) Students found it challenging to define a concept or method used to solve problems.
5) Students had trouble solving problems because they had not yet understood the previously established concepts.

b. Modification Process of the IDEA Learning Model

To address the challenges mentioned above, this study implemented several modifications to enhance the effectiveness of the IDEA learning model. The modifications to the IDEA concept include:

1) Integrating the flipped learning method with the IDEA model. Flipped learning involves providing instructional material outside the formal classroom through videos or notes and using formal class time for collaboration and relevant activities (Yulianti & Wulandari, 2021). The flipped classroom approach helps students in generating ideas, engaging in discussions, and discovering concepts, as it ensures that students are familiar with the material before starting the class session.
2) Designing a student worksheet specifically for the IDEA model. The worksheet is created as a guideline for students to follow during the course, tailored to support the implementation of the IDEA learning model (Umriani et al., 2020).
3) Organizing group learning with ability-based grouping. Students are grouped based on their varying levels of ability. High-ability students are distributed across all groups to assist those with intermediate and lower abilities. This arrangement aims to ensure that students with higher capabilities can support and help their peers in achieving learning outcomes (Wilkinson & Penney, 2021).
4) Providing intensive support from the lecturer to each group. The lecturer closely supports each group to help them achieve their learning objectives effectively (Ouyang et al., 2024).

c. Participants and Sampling Technique

The study involved 30 third-semester students from the Department of Electrical Engineering, Universitas Islam Indonesia, enrolled in the Probability and Statistics course during the 2021/2022 academic year. A purposive sampling technique was applied, based on the criteria that participants had experienced both online and offline learning. This group was considered suitable for assessing the effectiveness of the modified IDEA model. To measure the success of the learning model, this study uses performance indicators as presented in Table 2.

Table 2. Measurement Methods and Performance Indicators for Model Success

No	Measurement Method	Performance Indicator
1	Student Performance Analysis	Percentage of students passing the course and CLOs
2	Student Feedback Surveys	Levels of student satisfaction and perceived effectiveness of the model

d. Data Collection and Analysis

1) Self Assessment

Self-assessment in research aims to allow students to evaluate their own understanding and engagement, enhance

learning awareness, and encourage independent learning (Fisher et al., 2005). Benefits include increased motivation, development of reflective skills, adjustment of teaching strategies by instructors, and reduction of exam anxiety. By actively involving students in evaluation, self-assessment helps improve their engagement and understanding of the material, making it an effective tool for measuring and enhancing learning outcomes.

2) Statistical Testing

In this study, several types of analyses were conducted to ensure that the collected data provides accurate and meaningful insights, as delineated in Table 3.

Table 3 Statistical Testing

No	Test Type	Method	Description
1	Descriptive Analysis (Luo et al., 2018)	Mean, Median, Mode, and Standard Deviation	Provides an overview of the collected data by calculating the mean, median, mode, and standard deviation of student learning outcomes.
2	Normality Test (Khatun, 2021)	Kolmogorov-Smirnov	Determines whether the collected data is normally distributed.
3	Difference (Significance) Test (Dul et al., 2020)	T-test	Tests whether there is a significant difference in student learning outcomes before and after the implementation of the learning model.

3) Evaluating the Effectiveness of the Learning Model

Evaluating the effectiveness of the learning model through a questionnaire for students aims to gather data on their satisfaction, engagement, and perceptions of the implemented model. The questionnaire allows for the measurement of subjective aspects such as motivation and satisfaction, as well as the identification of the model's strengths and weaknesses. The results provide structured feedback, facilitate analysis, and help in adjusting and optimizing the learning experience based on student feedback.

3. Result and Discussion

a. Documentation of the Learning Process

Figure 3 demonstrates the collaborative learning atmosphere using the IDEA learning model. Which is in line with research by regarding collaborative & learner-centred learning (Bremner et al., 2022), engagement in offline classroom (Gherheș et al., 2021).

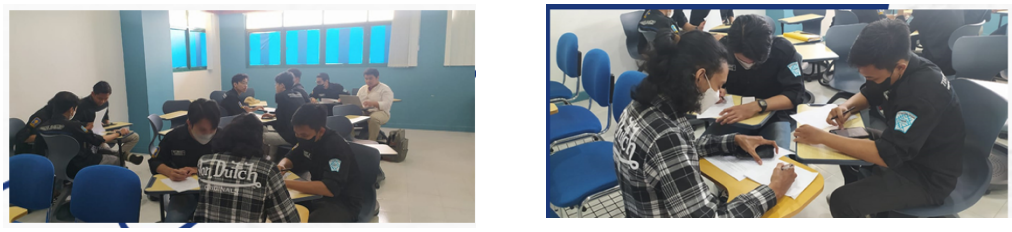

Figure 3. Atmosphere of the IDEA Learning Process

b. Self Assessment

Table 4 on Self-Assessment Results presents quantitative data on students' study habits and preparation for attending lectures. These data were obtained from students' self-assessment regarding several statements related to their learning activities.

Table 4. Self-Assessment Results

Questionnaire	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I always attend class on time.	0%	0%	23.5%	47.1%	23.5%
My class attendance is at least 75%.	0%	0%	4.8%	35.3%	59.9%
I study before the material is provided.	0%	0%	62.7%	23.5%	7.8%
I read the provided reference books.	0%	0%	33.3%	56.9%	9.8%
I study after the material is presented in class.	0%	0%	45.1%	43.1%	11.8%
I complete the assignments given by the lecturer.	0%	0%	17.6%	51%	31.4%
I prepare well for exams.	0%	0%	23.9%	54.9%	21.6%
I ask the lecturer if I do not understand the material.	0%	0%	35.3%	49%	15.7%

Table 4 provides an overview of students' study habits. The results indicate that most students demonstrate good discipline, such as attending class on time and regularly completing assignments. They are also active in interacting with lecturers. However, there are areas that need improvement, particularly in terms of preparation before the material is delivered. The findings indicate that students tend to study after the material is presented in class, rather than beforehand (Gherheș et al., 2021; Abidin et al., 2024). Based on the analysis, several steps can be taken to improve students' learning quality. First, efforts should be made to encourage students to engage in more active learning before class. Second, it is important to accommodate different learning styles in the teaching process. Lastly, the use of reference books and interaction with lecturers should be continuously enhanced. This is expected to further optimize student learning outcomes (Wu et al., 2024; Yotta, 2023).

These findings directly support the second research objective, which is to evaluate whether the integration of flipped learning, structured worksheets, and intensive lecturer support can address the limitations identified in the previous implementation of the IDEA model (Anggriyani et al., 2025).

The data suggest that while students demonstrate strong commitment during and after class sessions, their limited preparation before class highlights the importance of flipped learning components. By providing learning materials in advance and using worksheets to guide pre-class preparation, the modified IDEA model is well positioned to enhance active engagement and student autonomy, in line with the goals of this study.

c. Statistical Test

1) Descriptive Analysis

Based on the descriptive statistics presented in Table 5, students' learning outcomes (LO) are quite good, as reflected in the average score, which is above 60 for both LOs. The median score, slightly higher than the average, indicates a slight tendency for the data distribution to skew towards higher scores.

The descriptive analysis of Learning Outcomes 1 and 2 serves to address the **first research objective**, which examines the effectiveness of the modified IDEA learning model in improving student achievement. The average and median scores exceeding the minimum passing grade suggest that most students were able to meet the expected competencies. However, the high standard deviation highlights a variation in performance, indicating that while the model was effective overall, some students may require additional instructional support, something the modified IDEA model aims to accommodate through differentiated strategies such as group-based scaffolding. Additionally, factors contributing to the significant variability in students' learning outcomes need to be identified (Al-Tameemi et al., 2023).

2) Normality Test

Table 6 presents the results of the normality test, and Figures 3 and 4 show the visualization of data distribution on a normal distribution curve.

Tabel 5 Descriptive Analysis of Learning Outcomes

Descriptive Analysis	Learning Outcome 1	Learning Outcome 2
Mean	60.90	61.69
Median	63.33	63.67
Mode	60	60
Standard Deviation	17.09	19.25

Tabel 6. Normality Test Result

Learning Outcome	Alpha	Statistic value	P-Value	Decision
LO1	0.05	0.782	0,000024	**Reject H0**: Data is not normally distributed
LO2	0.05	0.780	0,000023	**Reject H0**: Data is not normally distributed

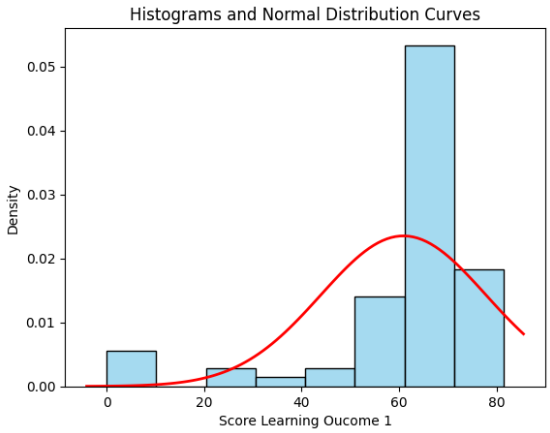

Figure 4. LO1

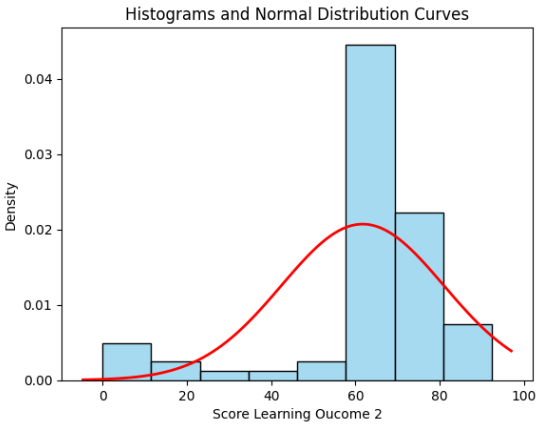

Figure 5. LO2

The data presented in the table shows the results of normality tests for two learning outcomes (LO1 and LO2). The alpha level for both tests is 0.05. The statistic values for LO1 and LO2 are 0.782 and 0.780, respectively. The corresponding p-values are 1.11 and 5.838. Based on these results, both learning outcomes are found to be not normally distributed, as the p-values are greater than the alpha level. This indicates that the data for both LO1 and LO2 do not follow a normal distribution.

Based on Figures 4 and 5, it can be concluded that the distribution of student learning outcomes tends to skew to the right. This indicates a tendency toward higher scores compared to lower ones. It further aligns with the second research objective, which aims to address learning variability through structured worksheets and continuous support from the lecturer to accommodate different learning paces and styles (Fatihatussa'adah et al., 2025). However, the data distribution does not fully follow an ideal normal curve. The presence of some outliers or extreme values on the left end suggests significant variation in students' learning outcomes. This variation may be influenced by factors such as differences in prior knowledge, learning motivation, learning styles, or even external factors like learning environment conditions.

From a pedagogical perspective, this type of score distribution has several implications. First, most students have understood the material well, but there remains a small group that requires special attention. Second, instructors should evaluate the teaching methods used to identify areas that need improvement or reinforcement. Additionally, providing more varied assignments or problems could help accommodate the diverse learning abilities of students. This, in turn, is expected to increase the class average and ensure that all students reach their optimal learning potential.

3) Correlation Analysis

Table 7 presents the statistical test results comparing the Probability scores between the 2021 and 2022 cohorts. The 2021 cohort applied the IDEA learning model, while the 2022 cohort did not. The t-test results indicate a significant difference (p-value = 0.031) between the two cohorts. This suggests that the implementation of the model in the 2021 cohort had a notable impact on their Probability scores compared to the 2022 cohort, which did not use the model. In other words, the use of this model is likely effective in improving students' understanding of Probability.

Figure 6 compares the Probstat scores between students from the 2021 and 2022 cohorts. In general, the Probstat scores of the 2021 cohort tend to be more spread out, with some very low scores (outliers). On the other hand, the scores of the 2022 cohort tend to be more concentrated. However, the median score for the 2021 cohort is slightly higher than that of the 2022 cohort. This indicates that, despite the extreme values in the 2021 cohort standing out, the overall median performance of 2021 students is slightly better in the Probstat course (Abidin et al., 2024).

The comparative analysis between the 2021 and 2022 cohorts directly supports the first research question, which investigates whether the modified IDEA model contributes to improved learning outcomes. The statistically significant difference in Probability scores ($p = 0.031$) provides strong evidence that the implementation of the model had a positive impact. Despite the presence of outliers, the higher median score in the 2021 cohort further confirms the model's effectiveness in enhancing conceptual understanding and student performance in Probability and Statistics.

Table 7. Results of the Significance Test

	Significance Level	T-Statistic	P-Value	Conclusion
2021 cohort (With Model Implementation) **Vs** 2022 cohort (Without Model)	0.05	2.17	0.031	Significant Difference

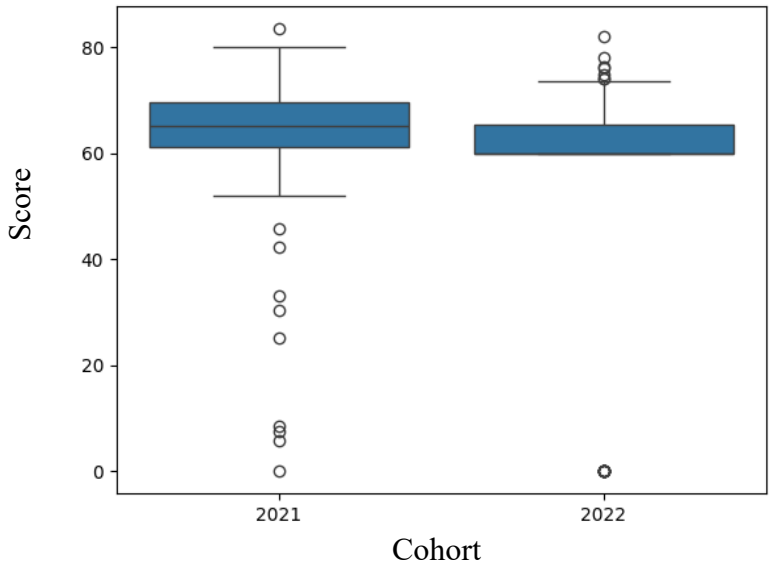

Figure 6. Box Plot Comparison of Learning Outcomes with and without the IDEA Method

Taken together, the descriptive statistics, normality test, and cohort comparison all support the overarching goals of this study. They demonstrate that the modified IDEA model not only helps students achieve expected learning outcomes but also provides a flexible structure that accommodates different learner needs thereby fulfilling both research objectives outlined in the study.

4) Student Feedback Surveys

a) Student Responses to the Flipped Classroom and Conventional Approaches

A total of 30 respondents provided feedback on their preferred learning model.

The results reveal that 53.3% favored the conventional method, which involves delivering material in class and assigning homework for practice, while 46.7% preferred the flipped classroom model, where students study the material independently before class and use class time for discussions and exercises. This relatively small difference indicates an interest in more flexible learning approaches, although most students still feel more comfortable with traditional methods, this finding is in line with (Yulianti & Wulandari, 2021; Akpen et al., 2024; Rahmadi et al., 2024).

b) Student Assessment of Video Media as a Learning Resource

Thirty respondents evaluated the importance of videos in helping them understand the learning material. The results indicate that most respondents consider videos to play a significant role, with 36.7% providing a rating of 4 and 33.3% rating it as 5 on a 1–5 scale. Another 30% selected a score of 3, and none of the respondents gave a score of 1 or 2. This suggests that, in general, students view videos as a crucial learning resource that enhances their understanding of the material, making their use in the learning process worth serious consideration, this finding is in line with (Wu et al., 2024; Haiyudi & Art-In, 2021; Gherheș et al., 2021).

c) Student Perceptions of Learning Videos

Student responses indicate that most of them view learning videos as a valuable tool in the learning process. Videos are considered helpful because they allow students to revisit material and better understand concepts at their own pace.

Some students noted that learning videos were important because they simplified complex material, as reflected in the following responses:

- *"Important because they make things easier."*
- *"Important because if there are parts of the material I do not understand, I can watch the video again."*
- *"Important because I can review the material that has already been taught."*

Despite the positive responses, some students expressed neutral opinions regarding the use of videos. These concerns were mainly related to the lack of interaction and time consumption:

- *"Neutral, because watching the video takes time."*
- *"Neutral, because there is no interaction in the video."*

These responses suggest that while flexibility is a major strength of video-based learning, some students still value interactive elements in the learning experience, this finding is in line with (Ravizza, S. M., et al., 2023; Wittmann, S., Wulf, T., & Müller, F. A., 2025; Al-Karadsheh, O., et al. 2025).

d) Effectiveness of Classroom Discussions and Problem-Solving Activities

Thirty respondents shared their views on how classroom discussions and problem-solving activities helped them understand the material. The results show that most students found these activities significantly beneficial, with 50% rating it as 4 and 23.3% providing a rating of 5 on a 1–5 scale. Meanwhile, 20% selected a score of 3, only 6.7% gave a score of 2, and none rated it as 1. This data indicates that discussion-based and problem-solving approaches in class are considered

quite effective in enhancing students' comprehension of the subject matter, this finding is in line with (Bremner et al., 2022; Anggriyani et al., 2025; Ouyang et al., 2024).

e) Student Responses to Group-Based Learning

Thirty respondents provided feedback on the effectiveness of group learning in supporting their understanding of the material. Most respondents gave positive ratings, with 36.7% selecting a score of 4, followed by 30% who provided a rating of 3, and 16.7% who gave a score of 5. However, 16.7% of respondents rated it as 2, and none chose a score of 1. These findings suggest that group learning is generally helpful for most students in understanding the material, although its effectiveness may vary depending on group dynamics and individual learning styles, this finding is in line with (Wilkinson & Penney, 2021; Goyibova et al. 2025; Salamah & Rifayanti, 2023).

f) Preferences in Seeking Help When Confused

When facing difficulties in understanding the material, most students preferred to ask friends rather than lecturers. This preference is mainly driven by interpersonal comfort and the simplicity of peer communication.

Students stated their preference in seeking help from peers as reflected in the following responses:

- *"Asking friends, because they are closer."*
- *"Asking friends, because it is more comfortable."*
- *"Asking friends, because the words they use are simpler."*
- *"Asking friends, because the interaction is more relaxed."*

This pattern highlights the importance of peer support and informal learning environments in facilitating better understanding. The familiarity and accessibility of peers appear to reduce anxiety and make it easier to ask questions, this finding is in line with (Bremner et al., 2022; Ouyang et al., 2024; Fatihatussa'adah et al., 2024).

g) Effectiveness of Note-Taking in Learning

Students' views on note-taking varied. Some believed that taking notes during problem-solving or class discussions greatly enhanced their understanding and retention:

- *"Very helpful because besides writing, we also understand what we are noting down."*
- *"Very helpful for reviewing lessons when needed later."*

However, other students were less convinced about its effectiveness, noting that taking notes does not always translate into comprehension:

- *"Neutral, taking notes does help in understanding the material, but I personally feel more comfortable watching explanation videos."*
- *"No, for me, just taking notes on problem discussions and having them as assignments does not guarantee understanding."*
- *"It depends on my mood for studying; if I pay close attention, I understand right away, especially if there are notes."*

This suggests that the effectiveness of notetaking is highly personal and context dependent. It may work well for some learners but not for others, depending on

learning preferences, motivation, and attention span, this finding is in line with (Fisher et al., 2005; Wu et al., 2024; Yotta, 2023).

5) Findings in Relation to Setiawan & Mustangin (2020)

Table 8. Comparative Study

Aspect	This Study (2025)	Setiawan & Mustangin (2020)
Research Objective	To modify and evaluate the IDEA learning model using flipped learning, worksheets, and lecturer support	To develop the IDEA model to promote active learning in higher education
Design	Research and Development (R&D), limited-scale implementation	Research and Development (R&D), preliminary development stage
Participants	30 undergraduate engineering students (Probability & Statistics course)	32 undergraduate mathematics students (Calculus course)
Modifications Made	Added flipped classroom, structured worksheets, ability-based groups, lecturer scaffolding	No major modifications (used base IDEA model)
Data Collected	Self-assessment, learning outcomes (LO1 & LO2), statistical comparison between cohorts	Observation, student worksheets, final test scores
Key Findings	Improved participation, positive perception, significant gain in learning outcomes	Improved engagement, but limited reflection ability
Model Limitation Observed	Students still rely on post-class learning, uneven score distribution	Difficulty encouraging reflection and transfer of knowledge
Contribution	Extends IDEA model with structured support mechanisms suitable for post-pandemic learning	Proposes initial IDEA model structure for active learning

Table 8 explained the comparative study between current research with previous study. These findings are consistent with Setiawan and Mustangin (2020), who reported that the original IDEA model improved student engagement and understanding in mathematics courses. Similar to their study, the current research found positive gains in student performance and participation. However, the current study extends the prior research by integrating flipped learning and structured worksheets, which specifically target the students' tendency to delay preparation a limitation also noted in our research.

Furthermore, while Setiawan and Mustangin highlighted challenges in encouraging deep reflection, this study addressed that issue by incorporating regular self-assessments and instructor-guided feedback. As a result, students not only demonstrated stronger academic outcomes but also higher awareness of their learning process.

From an advanced learning perspective, the findings indicate that the modified IDEA model facilitates a shift from surface-level participation toward deeper learning regulation. The integration of flipped learning encourages students to engage with content prior to class, while structured worksheets and lecturer scaffolding support reflective thinking and knowledge consolidation during and after learning activities. These elements collectively promote self-regulated learning behaviors, such as planning, monitoring, and evaluating learning progress. Unlike the original IDEA model, which primarily emphasized collaborative engagement, the modified

model strengthens students' capacity to manage their own learning processes an essential characteristic of advanced learning in higher education.

4. Conclusion

The modified IDEA (Issue, Discussion, Establish, Apply) learning model enhanced through the integration of flipped learning, structured worksheets, and lecturer support has proven effective in improving student participation and academic outcomes in the Probability and Statistics course. Quantitative analysis reveals that the 2021 cohort, which applied the model, achieved significantly higher Probability scores and pass rates compared to the 2022 cohort (p-value = 0.031), directly supporting the first research objective.

Survey responses and self-assessment results further confirmed increased engagement, the return of productive habits such as note-taking and collaboration, and strong student appreciation for video-based learning resources. These outcomes demonstrate that the incorporation of flipped learning and structured guidance partially addressed the limitations of the original IDEA model particularly the challenges of independent study and pre-class preparation thus fulfilling the second research objective.

Despite these positive findings, several limitations were observed. The learning outcomes were not normally distributed, indicating disparities among students related to motivation, learning styles, or prior knowledge. Additionally, this study involved a relatively small sample size from a single department and did not include long-term tracking, limiting the generalizability of its results.

Theoretically, this study advances the IDEA learning model by positioning it as an innovative framework for advanced learning rather than merely an active learning strategy. By embedding flipped learning, structured worksheets, and continuous lecturer scaffolding, the modified IDEA model explicitly supports self-regulated learning, reflective engagement, and learner autonomy. This contribution extends prior research on IDEA by demonstrating how instructional design modifications can transform student-centered learning into a more robust advanced learning approach suitable for post-pandemic higher education contexts.

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