THE USE OF *PRO-GEAR* INNOVATION IN IMPROVING THE UNDERSTANDING OF PROBABILITY TOPICS OF STATISTICS COURSES IN THE DEPARTMENT OF COMMERCE, PORT DICKSON POLYTECHNIC

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[1]Noryanti Binti Samsudin, [2]Nur Saádah Binti Mohd Hisam, [3]Noor Suriani Binti Nazruddin

[1,2,3]Department of Commerce, Port Dickson Polytechnic, Negeri Sembilan - Malaysia

e-mail:
[1]*noryanti@polipd.edu.my (*corresponding author*)
[2]saadahhisam@polipd.edu.my
[3]noorsuriani@polipd.edu.my

ABSTRACT

The purpose of this study is to identify students' interest in and understanding of the probability topic in the Statistics courses after engaging in a demonstration learning session using the Pro-Gear innovation. The research methodology used is a descriptive and experimental method. A total of 42 first-semester Diploma in Marketing students were separated into two equal groups, A and B. Group A experienced demonstration learning that utilized Pro-Gear innovation, while Group B experienced conventional learning that lacked Pro-Gear innovation. The average score from the End of Chapter (EOC) evaluation of both groups was used to assess student understanding. The level of interest of students is analyzed using the survey form distributed to Group A, which went through demonstration learning using Pro-Gear innovation. Based on the average EOC score analysis, group A had a higher average score than group B. The average difference in EOC score is 7.7%. This shows that the level of understanding of a group of students who utilize Pro-Gear innovation is more advanced than that of a group that does not use Pro-Gear innovation. Meanwhile, the survey form analysis reveals a high average mean value for the eight items investigated. Thus, demonstration learning using the Pro-Gear innovation can enhance the understanding and interest of students in the probability topic.

Keywords: Demonstration; Innovation; Probability

INTRODUCTION

The Statistics course, DPB30063, is a core course taken in the first semester by Diploma in Marketing (DPR1) students of the Commerce Department of Port Dickson Polytechnic. One of the learning outcomes objectives for this course requires students to have cognitive skills that allow them to apply a variety of statistical techniques and formulas to solve a problem accurately. Achievement of this objective is tested through an end-of-chapter (EOC) structured assessment that covers probability topics. In this assessment, students are tested on how they build probability thinking by listing all outcomes and effects for a situation and determining the probability values for each outcome and effect. Probability topics in the Statistics course DPB30063 cover mastery of sample space concepts and the rules of addition and multiplication operations for probability calculation. This topic has significant importance in the field of marketing. Understanding the probability idea enables marketers to develop probability thinking and use it when making choices like estimating the risk of an investment, selecting the market for their product, forecasting the volume of demand for their output, etc. Therefore, a marketing student must develop probability thinking skills to assist in future decision-making. To keep students' interest and attention and help them comprehend probability and calculate it smoothly, a variety of teaching techniques should be developed. Therefore, the Pro-Gear innovation demonstration approach has been designed to aid the learning process in capturing student interest and making the probability concept simpler for students to understand as referred to the research facts by Onyeka (2023). Following the research facts found by Thahir (2019) that mentioned the tangible props multiplication board props tool for understanding multiplication rules, a similar concept is simulated in Pro-gear innovation, where tangible instruments for learning the fundamental ideas of probability are applied. This tool is a compact box filled with objects that students can use to experiment with each fundamental event that is frequently introduced in the teaching and learning session to describe the Probability of a situation (Kim et al., 2008). These boxes include dice, coins, marbles, experiment cards, picture cards, and marker pens. The ten experimental cards in the box are activities that students will demonstrate according to the instructions on the cards. Each experiment will be observed, and the findings will be recorded by the students. The lecturer will help the students comprehend the concept and calculate the probability results based on the experiment observations. It is anticipated that the demonstration method of Pro-Gear innovation will attract students' interest and improve their level of understanding and mastery of the concept of probability.

As stated by Pfannkuch et al. (2016), probability thinking also involves the ability to explain a random event as well as understanding and making use of the proper context in problem-solving. To solve a problem situation or a problem that has never been encountered or imagined, students need good judgment skills to resolve the problem situation. This is because one's capacity to see or comprehend the likelihood of a condition depends on their familiarity with or understanding of the circumstances (Raya et. al, 2020). Raya et al. (2020) also stated different problem situations require students to think abstractly and become more creative in the aspects of probabilistic logic thinking where they need to understand the concept of randomness and consider the probability of a situation. The Final Semester Examination session 1:2022/2023 results analysis revealed that students struggled to provide adequate responses to the probability question. 80% of students obtain scores that are lower than 10 out of a possible 25 marks. Students can only answer Probability questions with the guidance of the lecturer during the teaching and learning session. The low continuous assessment achievement at the end of the

chapter that assesses the Probability topic also reflects the low level of student understanding. It is more challenging for students to pay attention during the Probability learning session since they are not interested in pursuing their academic courses that involve the study of mathematics. This is consistent with research by Refat et al. (2019), who discovered that students view probability as a difficult subject. Therefore, this study will identify whether the demonstration method of learning using the Pro-Gear innovation can attract interest and improve students' understanding of the concept of Probability in Statistics.

This research attempts to answer some questions: 1) Can Pro-Gear innovation's demonstrative learning increase students' interest in the Probability topic in a Statistics course? 2) Is the level of student achievement different between the groups that received demonstration learning using Pro-Gear innovation and the groups that did not?

The objectives of this research are to identify student interest in the Probability topic through demonstrative learning methods using Pro-Gear innovation and to identify the level of student understanding of the Probability topic through demonstration methods using Pro-Gear innovation.

LITERATURE REVIEW

Problem questions for the topic of probability are usually given in the form of essays, and students must replicate the sentences of the essay into calculations. Observations by Riswari et al. (2018) found that students find it difficult to understand mathematical problems in the form of essays. According to the study, students are more likely to memorize formulas alone and struggle to apply the concepts they have learned to solve problems. In other words, students struggle to understand the essay's problem and how to carry out the calculation. This is also covered in the study by Arum et al. (2018), which discovered that the difficulty of students solving probability problems was divided into three parts: difficulty in understanding probability questions, difficulty in using appropriate answering strategies, and difficulty in solving probability calculations.

Numerous earlier studies have looked at the significance and function of problem-based learning in courses or subjects that involve calculations, but the study by Riswari et al. (2018) proves that problem-based learning with the help of demonstration has a greater impact on students' answering skills and improves their scores compared to problem-based learning without demonstration. Thahir et al.'s (2019) findings that this demonstration method not only encourages student involvement in learning and produces a more enjoyable environment, but also aids in the understanding of mathematical ideas, further prove the effectiveness of this approach. Therefore, Pro-Gear Innovation has been developed as a teaching tool for this probability topic. Pro-Gear focuses on a demonstration-based learning approach that will assist students in imagining possible situations that could result in the tests included in these innovations.

METHOD
Research Design

This study involved experimental and descriptive methods. Experimental studies were conducted to compare the academic achievement of group A (DPR1A) students who learned through demonstrative learning using Pro-Gear innovation with group B (DPR1B) students who learned through conventional learning without Pro-Gear innovation. Following demonstration learning using Pro-Gear innovation, descriptive studies using the distribution of survey forms are conducted to collect data on students' interest in Probability subjects.

Research Implementation

This study involved 42 first-semester Diploma in Marketing students, session 2:2022/2023, from the Polytechnic of Port Dickson, Negeri Sembilan. The students were divided into two groups, group A and group B, each comprising 21 students. Students in Group A engage in a demonstration learning process that uses Pro-Gear innovation, whereas students in Group B engage in a traditional learning process that lacks Pro-Gear innovation. Students' achievements from both groups were assessed using End of Chapter (EOC) questions developed to test their understanding of Probability topics in the Statistics course.

A survey questionnaire that has been developed and adapted from the Salha (2014) study has been used to gather information on student interest in learning using Pro-Gear innovation in the teaching and learning process. There are eight items on this form, which is only given to group A students. The mean score obtained, interpreted based on the mean score table by Siti Fatimah and Abd Halim (2010), is shown in Table 1.

Table 1
Interpretation of score

Mean Score	Mean Score Interpretation
1.00 – 2.34	Low
2.35 – 3.67	Moderate
3.68 – 5.00	High

Source: Data Analyzed, 2023

RESULTS AND DISCUSSION

The results of a descriptive study of the statistical data carried out showed that the average student score for Group A which performed demonstrative teaching and learning using Pro-Gear innovation was higher than for Group B which did not. Between the two groups, there was an average significant difference of 7.7%.

Table 2
Average student scores for the End of Chapter (EOC) Exercise measuring understanding of probability topics

Valuation	Group A	Group B	Differences
Average score	87.5%	79.8%	7.7%

Source: Data Analyzed, 2023

The difference in scores between the two groups showed that students who used the Pro-Gear innovation demonstration method of learning had better understanding levels than students who did not use it. This finding aligns with those of Zokhi's (2022) study, which showed that incorporating innovation into the classroom can improve students' grasp and level of understanding of the impact of their learning. Onyeke (2023) also explained that demonstrative learning methods showed better levels of achievement than deductive learning.

Next, to determine students' interest in demonstrative learning methods using Pro Gear innovation, questionnaires were distributed and analyzed to calculate the average score.

Table 3
Average Scores Analysis of Student Interest in Demonstrative Learning Using Pro Gear Innovation

No.	Item	Min	Level
1	I am willing and have a high interest in using Pro-Gear in my learning for the Statistics course.	4.19	High
2	I've always been excited to participate in demonstrative learning using Pro-Gear to improve my understanding of the Probability topic of the Statistics course.	4.24	High
3	The questions raised during the demonstration learning session using Pro-Gear were able to attract my interest in learning rather than just using printed materials.	4.33	High
4	The understanding gained from learning using Pro-Gear allowed me to easily do calculations and answer probability questions in Statistics.	4.1	High
5	I'll pay more attention if the lecturer uses demonstration material during the teaching and learning sessions.	4.38	High
6	It's easier for me to grasp the topics delivered by the lecturer using demonstration materials like Pro-Gear.	4.24	High
7	Using Pro-Gear allowed me to be actively involved in solving the questions discussed in the teaching and learning sessions.	4.24	High
8	Two-way communication between me and the lecturer can be enhanced during teaching and learning sessions using Pro-Gear.	4.29	High
	Mean Score	4.25	High

Source: Data Analyzed, 2023

The results of the analysis using the average score to examine students' interest in demonstrative learning methods using Pro-Gear innovation overall show a high level of interest (4.25). This illustrates that students are very interested in pursuing demonstrative learning using innovation. The item with the highest average score (4.38) is the fifth item, which is "I will pay more attention if the lecturer uses demonstration materials during teaching and learning sessions".

According to Dalubah (2013), instructors should employ demonstrative learning techniques to pique students' interest in learning and motivate them to reach higher levels of comprehension to raise their academic performance. Therefore, educators can use a variety of teaching and learning methods, such as demonstrations and innovation

tools, to attract students' interest and attention to improve understanding and achieve better performance evaluation.

CONCLUSION AND SUGGESTION

In conclusion, the demonstration learning method using Pro-Gear innovation shows an improvement in student assessment performance. This clearly shows that demonstration learning can improve students' performance and interest in learning. The demonstration method provides interaction, real-world experience, and an understanding of a topic. Thus, the level of student achievement will be better compared to conventional learning. Demonstrative teaching and learning methods using appropriate innovative tools that suit the learning topic can increase students' interest and performance. The findings therefore support the findings of Onyeke (2013) and Zokhi (2022), which support the need for the demonstration of learning methods and appropriate innovation tools to attract interest and facilitate student understanding of learning.

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