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Exploring Simulator-Based Model in Teaching Navigation

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ABSTRACT

The study explored the simulator-based model in teaching navigation at Biliran Province State University, Naval, Biliran, Philippines. This study conducted on the 1st quarter (January to April 2024). A descriptive-experimental research design was used and there were one hundred (100) maritime students involved to this study. The t-test with two means was employed to measure the significant difference between identified variables. Results revealed that the navigation performance of experimental group was good compared to controlled group in simulator-based model. There was no significant difference of the navigation performance between controlled and experimental group. Simulator-based model was efficient and proven to provide quality learning and teaching to the students.

1. Introduction.

The shipping industry (Johansson & Donner, 2014) is the pillar of global trade, and coherent navigation. It's the heart of securing safe and successful maritime operations (Walters & Bailey, 2013). With the increasing intricacy of modern shipping systems and the high-risks of maritime safety, it is critical to equip maritime students with the skills and competencies necessary to navigate vessels effectively (Fan & Yang, 2023).

A simulator-based model (Tusher et., 2024) in teaching navigation have emerged as an innovative and practical approach to address these education challenges. By integrating simulator-based model in teaching navigation. This would provide students with a restrained, realistic, and immersive environment to practice critical navigation skills without the risks associated with real-world training.

This paper explored why the simulator-based model should be integrated and adopted in teaching navigation. This would emphasize its ability to raise maritime students' well-being, connect viewpoints into practical application, and prepare them for the vigorous and uncertain environment of maritime operations.

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According to Sellberg et al. (2018), highlighted that simulator provides a safe environment for students to practice navigation without the risks associated with real-world settings. In addition, multifarious simulators used in teaching and training such as virtual and augmented reality technologies offered realistic scenarios onboard ship that help learners developed situational awareness, decision-making, and problem-solving skills. Thus, it is important that the navigation performance of maritime students must be evaluated on how this simulator-based model influence the performance of maritime students in navigation.

In order to bridge this learning gap, simulator-based model is needed and this study conducted to make possible for the maritime students become globally competitive and efficient seafarers in the future. In addition, it could help eliminate the ship's accidents at sea.

2. Statement of the Problem.

The study aimed to explore the simulator-based model in teaching navigation at Biliran Province State University from January to April 2024. Specifically, it sought to answer the questions how simulator-based model influence on the navigation performance of the students.

1. What is the navigation performance of controlled group in simulator-based model?

2. What is the navigation performance of experimental group in simulator-based model?
3. Is there any significant difference between the navigation performance of controlled and experimental groups in simulator-based model?

3. Methodology.

This section presents the research design, respondents of the study, locale of the study, research sampling techniques, research instrument, data gathering procedures, and data analysis.

3.1. Research Design.

This study involved a quantitative design to enhance the research and make the study reliable and valid. The quantitative design emphasizes objective measurements and the statistical, mathematical, or numerical analysis of data collected through rough polls questionnaires, and surveys, or by manipulating pre-existing statistical data using computational techniques. The population of the present study was college students at Iloilo State University of Fisheries Science and Technology. This research study used two research designs or methods which are descriptive research and cross - sectional. A descriptive research study described categories of information such as gender or patterns of interaction by simply recording what is being observed or what is being asked with the specific group that is under the study of the researcher. Descriptive study report summary data such as measures of central tendency including the mean and quantitative description. The cross - sectional study includes research or design involving using different groups of people who differ in the variable of interest or depending on the study that was conducted which share other characteristics, such as socio-economic, educational background and ethnicity. Cross sectional study or design would base on observations that take place in different groups. A cross sectional study may also be used to compare groups from different backgrounds with the use of tools such as 20 questionnaires, etc. The researcher was able to gather the data that was needed for the study or research.

3.2. Research Design.

The study used descriptive-experimental research design. This design was utilized since present study aimed to test the navigation performance between controlled and uncontrolled group before and after using simulator-based model.

3.3. Respondents of the study.

The respondents were maritime students enrolled in marine transportation program at Biliran Province State University.

Table 1: Distribution of respondents.

Variables	*Respondents*	*Percentage*
Controlled Group	50	50%
Experimental Group	50	50%
Total	100	100%

Source: Author.

3.4. Locale of the Study.

The study was conducted from January to April 2024 at Biliran Province State University. This locale had been chosen because the institution equipped with the state-of-the art facilities (*ship simulator*).

3.5. Research Sampling.

Random sampling was employed to identify the sample size. There were (50) fifty sample size for controlled group, while the other (50) fifty assigned to the experimental group.

3.6. Research Instrument.

This study utilized a researcher-made instrument that undergone dry-run and validated of the University Research and Innovation Office at Biliran Province State University to ensure that the utilized survey instrument was reliable and valid to gather data from the identified respondents, respectively.

3.7. Data Gathering Procedures.

First, the researcher himself followed the research process as indicated in the research manual of the university. A letter request was sent to the University President for approval to conduct this research study. After the approved letter, the researcher himself used questionnaire to assess the navigation performance of previous marine transportation students in simulator - based model. Guide questions were distributed to the faculty. Then, the faculty observed and assessed the navigation performance of the students based on the indicated tasks. Data collected and analyzed to determine the performance in navigations.

3.8. Data Analysis.

The data gathered and collected would be analyzed through an exact statistical tool. Mean and t-test were used to analyze for the significant difference of the controlled and experimental group in simulator-based model.

3.9. Data Scoring.

Scale	*Range*	*Verbal Description*
5	4.21 – 5.00	Excellent
4	3.41 – 4.20	Good
3	2.61 – 3.40	Average
2	1.81 – 2.60	Poor
1	1.00 – 1.80	Very Poor

Source: Author.

4. Results.

Table 2: Navigation performance of controlled group in simulator-based model.

Navigation performance of controlled group		Mean	Description
1.	Ability to plan and conduct voyage planning.	2.75	Average
2.	Ability to operate simulator features and tools.	2.50	Poor
3.	Ability to create scenarios in navigations.	2.30	Poor
4.	Ability to communicate using maritime English terminologies.	3.72	Good
5.	Ability to use strategies to prevent collision and a grounding.	3.40	Average
6.	Ability to interpret features and tools in the simulator.	2.67	Average
7.	Ability to demonstrate optimal decision-making.	2.45	Poor
8.	Ability to complete the tasks on time.	2.25	Poor
9.	Ability to use charts and other navigational references found onboard.	2.47	Poor
10.	Ability to compute navigational problems such as true course, speed, time, distance, etc.	2.80	Average

Source: Author.

Table 3: Navigation performance of experimental group in simulator-based model.

Navigation performance of controlled group		Mean	Description
1.	Ability to plan and conduct voyage planning.	3.43	Good
2.	Ability to operate simulator features and tools.	4.70	Excellent
3.	Ability to create scenarios in navigations.	4.10	Good
4.	Ability to communicate using maritime English terminologies.	4.12	Good
5.	Ability to use strategies to prevent collision and a grounding.	4.00	Good
6.	Ability to interpret features and tools in the simulator.	3.95	Good
7.	Ability to demonstrate optimal decision-making.	4.37	Excellent
8.	Ability to complete the tasks on time.	4.18	Good
9.	Ability to use charts and other navigational references found onboard.	4.20	Good
10.	Ability to compute navigational problems such as true course, speed, time, distance, etc.	4.15	Good

Source: Author.

Table 4: Significant difference between the navigation performance of controlled and experimental group in simulator-based model.

Variables	**Mean**	**p-value**
Controlled Group	2.731	0.000
Experimental Group	4.002	0.000

Source: Author.

The *p*-value is less than 0.05 level of significance. It implied that there was no significant difference between navigation performance of controlled and experimental group in simulator-based model *(when p >0.05, no significant difference).*

Conclusions.

After fitted the model, the navigation performance of experimental group was good compared to controlled group in simulator-based model. There was no significant difference of the navigation performance between controlled and experimental group. Simulator-based model was efficient and proven to provide quality learning in teaching navigation courses to marine transportation students.

Recommendations:

1. The maritime school use the simulator-based model in teaching navigation courses.
2. Integrate the simulator-based model in the teaching course syllabus for better outcome.

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