# Development of *Competency Test* Instruments (Level Management) In The Practical Exam Of Navigation Functions At *The Bridge Simulator of* The Barombong Shipping Polytechnic

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**Abstract.** This research was carried out with the aim of developing a competency test instrument for the results of the navigation function practice exam in the *bridge simulator* for student officers (management level) of Nautical Studies at the Barombong Shipping Polytechnic. This research was conducted at the Barombong Shipping Polytechnic Campus. The research was conducted from April 2023 to October 2023 for 7 (seven) months. The development model used to develop the measurement instrument for the navigation function practice exam in the *bridge simulator* is *4-D* Thiagarajan, Samuel and Semmel which includes four stages, namely *Defining, Designing, Developing* and *Disseminating*. Sampling technique when all members of the population are used. In this study, the research sample is the Pasis of the Nautical Study Program which consists of two batches between batches I and II. The data analysis technique in this study uses *analysis of variants (Anova). Analysis of Variance (ANOVA).* The results of the study are if Fcal (2.7) is smaller than Ftabel (3.1) then Ho is accepted and Ha is rejected. Stated that there was no significant difference between the three assessors (P1, P2, P3) in the navigation function practice exam. This means that this management level navigation function practice competency test instrument is declared effective to be used during the re-test. The researcher uses $t_{tables}$ as the test standard, so from all the tables above it can be seen that there is no difference between the three testers on average. Referring to $t_{calculate} <$ from $t_{table}$, the conclusion is that Ho is accepted and Ha is rejected. Thus, from the test, it can be concluded that the competency test instrument for the practice of the level management navigation function is declared valid and at the same time reliable, which means that the instrument has met the requirements.

**Keywords:** *Bridge Simulator*, Navigation Function, Level Management Instrument.

## 1 Introduction

A data collection instrument or tool is a tool used to collect data. The data collected in the form of numbers *(numeric)* using certain instruments will be described and attached or used to test the hypothesis proposed. Instruments play a very important role in determining the quality and quality of a data, because the validity or validity of the data obtained will be greatly determined by the quality of the instruments used, in addition to the data collection procedures taken.



R. Mahmud et al. (eds.), *Proceedings of the 3rd International Conference and Maritime Development (ICMaD 2024)*, Advances in Engineering Research 255,
https://doi.org/10.2991/978-94-6463-628-4_40

Suharsimi Arikunto (2010: 203) stated that, "an instrument is a tool that is selected and used by researchers in their activities to collect data so that these activities are systematic and facilitated by them." An evaluation tool or instrument in Suharsimi (2012: 40-51) is something that can be used to make it easier for a person to carry out a task or achieve a goal more effectively and efficiently". Based on some of the expert opinions above, it can be said that instruments are tools used to collect information about the variables being studied. Assessment is a systematic process that includes the collection of information (numbers or verbal descriptions), analysis, and interpretation to make decisions.

An important component in using measurement instruments is valid and reliable research data in the form of numbers (numerical) that can be accounted for. The process of collecting research data requires the meticulousness and accuracy and foresight of the researcher in determining the data needed. This is also determined by the accuracy and meticulousness of the selection or development of instruments in the system and the objectivity of data collection. The merger between the National Higher Education system and International Standards has given birth to a superior institution that is accredited and equipped with a sophisticated Simulators and Ship Practice Laboratory. *Full Mission Ship Bridge Simulator* is a ship platform simulator, where the entire working system and equipment are made to resemble the conditions on a ship. This simulator is used by cadets of the nautical study program, as a stabilization before carrying out Sea Practice. There is a Bridge Simulator Practice exam room for the Officers to practice on the platform with qualified computers. *The bridge simulator* is designed to be similar to a ship platform in general, as well as familiarizing cadets and cadets with the shape of a ship platform.The use of simulators is a specific part of the maritime education and training curriculum regulated by international conventions, namely by the *Standards of Training Certification and Watchkeeping (STCW).* To be able to ensure that prospective seafarers can act in the correct and safe way, STCW emphasizes that simulators must be usable for training and assessment.

According to *the Conference of Parties to The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers,* 1978 *Resolution 2 The Manila Amendments to the Seafarers' Training, Certification and Watchkeeping (STCW) Code*, *Section* A-I/12 page 28 *Standards governing the use of simulators PART 1 – PERFORMANCE STANDARDS General performance standards for simulators used in training* in conducting simulator-based training that is mandatory in education. During the implementation of the practical exam in the *bridge simulator*, each student officer will be given an assignment in accordance with the position on the ship. Then they will be given an assignment in the form of a shipping route which will later be carried out in teamwork by the student officer concerned. Each of these duties and responsibilities has a different level and job responsibilities so that the lecturer as an assessor must have an assessment number instrument in the form of a measuring tool that can be used to measure objectively and given an assessment score to find out how good the student's competence is in running the simulation exam in *the bridge simulator*.

The important thing in the performance assessment (practical exam) in *the bridge simulator* is to determine how to observe and score the abilities of student officers. Performance assessment can be carried out with two approaches, namely: (1) holistic method, by using a single score (single rating) on the overall performance results, (2) *analytic* method, by giving scores on various aspects. Different are related to the practical exam to be assessed, with a check list or rating scale. Competency standards mean the level of proficiency that must be achieved for the proper performance of functions on board the ship in accordance with internationally agreed criteria as established and incorporating standards or levels of knowledge, defined understanding and skills displayed (STCW/CONF.2/34 3 August 2010 : *CHAPTER I Standards Regarding General Provisions*).

In a ship that is sailing, the hierarchy of positions related to competence greatly affects the security and safety of a voyage. One example of a position whose position is considered vital and crucial is a captain (*management level*). The captain is the final decision maker in a shipping problem. The implementation of research instrument development can follow the *Research and Development procedure* and the resulting instruments are the products of the implementation of this research. Through this paper, scientific research instruments are tools used to assess the results of students' practical exams, which are used in order to evaluate the assessment of practical exam results in bridge simulators.

The competency practice exam test instruments in the *bridge simulator* are still in the stage of continuous improvement. The competency test instrument in this *bridge simulator* is made to be easy to understand because the instrument functions to reveal facts into data, so that if the instrument used has adequate quality in the sense of valid, reliable, objective and effective, the data obtained will be in accordance with the facts or the actual situation in the field *(bridge simulator).* Previously, the values taken during the implementation of practice in the *bridge simulator* only relied on subjectivity assessments and did not produce data in the form of numbers (numerical), so that the value data obtained could not be accounted for validly and validly. The preparation of research instruments is always carried out in a research because the instruments are needed to collect the necessary research data. Instruments can be composed on their own or using existing instruments or in other words adopting instruments available from previous research whose instruments are related to the research being conducted at the moment.

Instruments that have been available in general are instruments that have been considered standard for collecting data on certain variables. However, if a standard instrument is not yet available to collect data on research variables, then the instrument to collect data on these variables must be made by the researcher himself. In order to understand the development of instruments, the following will be discussed about several things related to it, including the steps for the preparation and development of instruments, techniques for preparing and assessing instrument items, assessment norm standards, reliability of value data, validation process, and empirical validation process through trials.

Researchers found problems that occurred in the field that to conduct assessments of seafarer competency practice exams in bridge simulators, several UPTs, especially Shipping Polytechnics under the Transportation Human Resources Development Agency, currently do not have competency test instruments that meet objective, valid, reliable and effective assessment standards. The implementation of competency exams (practice) is only given a subjective assessment even though there are scores in the form of numbers, but it is given based on subjective personal assessments only and has not met the standard criteria of valid, objective, reliable and effective assessment norms. The assessment instrument for the results of the level management practice exam in the *bridge simulator* is expected to produce flexible development, meaning that it can be used at any time if needed by a program or institution. Assessment time can be carried out continuously, periodically and at any time. The results of the assessment are for the needs of the program or institution. In this study, the researcher seeks to develop a competency test instrument in the practical exam of navigation function management at the Nautical Studies level on a *bridge simulator* at the Barombong Shipping Polytechnic campus.

## 2 Research Methodology

This research was conducted at the Barombong Shipping Polytechnic Campus. The research was conducted from April 2023 to October 2023 for 7 (seven) months. The development model used to develop the measurement instrument for the navigation function practice exam in the *bridge simulator* is *4-D* Thiagarajan, Samuel and Semmel which includes four stages, namely *Defining, Designing, Developing* and *Disseminating* (Hobri, 2010). The population used in this study is the entire Pasis of the Nautical study program Batch I and II of the Barombong Shipping Polytechnic which which consists of 2 (two) classes. Each class consists of 20 people, so the total number of people used is 40 people. The *Total Random Sampling* technique is a sampling technique when all members of the population are used. In this study, the research sample is the Pasis of the Nautical Study Program which consists of two batches between batches I and II. The data analysis technique in this study uses *analysis of variants (Anova). Analysis of Variance (ANOVA)*

## 3 Results And Discussion

The instrument for measuring all variables in this study uses a questionnaire or questionnaire, submitted to respondents to be able to provide scores or values that are in accordance with the criteria for the instrument trials that have been carried out. The questionnaire as an instrument must meet the main requirements, namely valid and reliable. The effectiveness test was carried out to find out the extent to which the navigation function practice competency test instrument was effective to use. The results of the study show that if $F_{count}$ (2.7) is smaller than F table (3.1) then Ho is accepted and Ha is rejected. Stated that there was no significant difference between the three assessors (P1, P2, P3) in the navigation function practice exam. This means that

this management level navigation function practice competency test instrument is declared effective to be used during the re-test.

The development of management-level competency test instruments at the internal trial stage in the bridge simulator meets valid criteria. The level of validity is reviewed from the aspect of content, and the practicality of the lecturer and the language assessed by expert validators The validity of the content is measured by a validation sheet which is also a statement in the questionnaire. For the purpose of validity testing, content validity analysis from expert validators in the field of Nautics and assessments from the practicality of the examiner lecturers are used. For reliability data, the t-test technique is used, namely by comparing between the three testers at the time of the test and the re-test. Then to test the extent of the effectiveness of this competency test instrument, the researcher used a single-track anava test.

From the results of the assessment in terms of content and language, this validity content has an average score of 3.7 in the value category (A). Thus, this instrument test sheet is suitable for use in the practical exam of the navigation function at the management level. Based on the results of the assessment in terms of lecturer practicality, a validity score with an average of 3.8 in the value category (A) was obtained. Thus, this instrument test sheet is suitable for use in the practical exam of the navigation function at the management level. The conclusion of the two tests was that the instrument measuring the practice of the navigation function of the level management competency test was declared valid, which means that the instrument had met the requirements.

Reliability Test

For reliability tests, a technique (t-test) is used using excel. The measurement of the reliability value was carried out by means of a t-test between the three assessors (P1, P2, P3) at the time of the test and re-test. The $_{\text{t-value of the calculation}}$ is 0.0054 and the t-value $_{\text{of the table}}$ is 2.045, meaning: the t-value $_{\text{is}}$ calculated < from the t-value of $_{\text{the table}}$, so there tends to be no significant difference between the two assessors P1 (test) and P1 (re-test). Therefore, this management level competency test instrument is declared reliable (consistent). The formula used is: $t_0 = \frac{{}^{I}\bar{Y}_1 - {}^{I}\bar{Y}_2}{\sqrt{\frac{\sum_d 2}{n(n-1)}}}$

Where: $\sum_d 2 = \sum_D 2 - \frac{(\sum_D 2)}{n} = 37 - \frac{(1)^2}{30} = 37$

$\bar{Y}_1 = \frac{2111}{30} = 70{,}37$

$\bar{Y}_2 = \frac{2110}{30} = 70{,}33$

$t_0 = \frac{{}^{I}\bar{Y}_1 - {}^{I}\bar{Y}_2}{\sqrt{\frac{\sum_d 2}{n(n-1)}}} = \frac{70{,}37 - 70{,}33}{\sqrt{\frac{37}{30(30-1)}}} = 0{,}0054$

The calculated t-value is 0.0656 and the t-value $_{\text{of the table}}$ is 2.045, meaning: the t-value $_{\text{is}}$ calculated < from the t-value $_{\text{of the table}}$, so there tends to be no significant difference between the two assessors P2 (test) and P2 (re-test). Therefore, this management level competency test instrument is declared reliable (consistent).

The formula used is: $t_0 = \frac{|\bar{Y}_1 - |\bar{Y}_2}{\sqrt{\frac{\sum_d 2}{n(n-1)}}}$

Where: $\sum_d 2 = \sum_D 2 - \frac{(\sum_D 2)}{n} = 81 - \frac{(23)^2}{30} = 81$

$\bar{Y}_1 = \frac{2121}{30} = 70{,}70$

$\bar{Y}_2 = \frac{2098}{30} = 69{,}93$

$t_0 = \frac{|\bar{Y}_1 - |\bar{Y}_2}{\sqrt{\frac{\sum_d 2}{n(n-1)}}} = \frac{70{,}70 - 69{,}93}{\sqrt{\frac{81}{30(30-1)}}} = 0{,}0656$

The calculated t-value is 0.0743 and the t-value $_{\text{of the table}}$ is 2.045, meaning: the t-value $_{\text{is}}$ calculated < from the t-value $_{\text{of the table}}$, so there tends to be no significant difference between the two assessors P3 (test) and P3 (re-test). Therefore, this management level competency test instrument is declared reliable (consistent).

The formula used is: $t_0 = \frac{|\bar{Y}_1 - |\bar{Y}_2}{\sqrt{\frac{\sum_d 2}{n(n-1)}}}$

Where: $\sum_d 2 = \sum_D 2 - \frac{(\sum_D 2)}{n} = 56 - \frac{(-20)^2}{30} = 56$

$\bar{Y}_1 = \frac{2100}{30} = 70{,}00$

$\bar{Y}_2 = \frac{2120}{30} = 70{,}67$

$t_0 = \frac{|\bar{Y}_1 - |\bar{Y}_2}{\sqrt{\frac{\sum_d 2}{n(n-1)}}} = \frac{70{,}00 - 70{,}67}{\sqrt{\frac{56}{30(30-1)}}} = 0{,}0743$

The researcher uses t $_{\text{tables}}$ as the test standard, so from all the tables above it can be seen that there is no difference between the three testers on average. Referring to t $_{\text{calculate}}$ the < from the table t , the conclusion is that Ho is accepted and Ha is rejected. Thus, from the test, it can be concluded that the competency test instrument for the practice of the level management navigation function is declared valid and at the same time reliable, which means that the instrument has met the requirements.

## 4 Conclusion

Preliminary analysis at the stage of trial of the instrument (test) and (re-test) in the development of the level management competency test instrument in the practice of the navigation function obtained the results of the analysis of the implementation of the development of the instrument competency test for the learning competency test of the practice of the navigation function carried out in the bridge simulator was declared valid. The analysis of the implementation of the development of the learning competency test instrument for the practice of the navigation function carried out in the bridge simulator was declared reliable. The analysis of the implementation of the development of the learning competency test instrument for the practice of navigation functions carried out in the bridge simulator was declared effective. Curriculum analysis, especially in the arrangement of test materials according to the required SOPs, must still be updated according to the needs and applicable rules. With the analysis of the material, the researcher can identify competency materials according to the main SOPs to be tested and compile them systematically and look for the relevance of the concepts learned to the needs during the practical exam in the bridge simulator. At the literacy *review stage,* practical exam materials were obtained that were adjusted to the needs and analyzed so that they became the basis for the development of competency test instruments to improve practical skills of the management level navigation function in the bridge simulator. The development of management-level competency test instruments at the internal trial stage in the bridge simulator meets valid criteria. The level of validity is reviewed from the aspect of content, and the practicality of the lecturers and the language assessed by expert validators.

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