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The Validity Of The Statistical Literacy Learning Module

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Abstract
Statistical literacy is the ability to read and interpret data in statistics learning. The main problem raised in this research is how to produce valid statistical literacy learning module tools and instruments. This type of research is quantitative research, the research instruments validated in this study are 14 instruments, namely 5 instruments. Statistical literacy learning tools include (1) Semester Learning Plans, (2) Lecture Units, (3) Books Instructions for Using Modules, (4) Statistical Literacy Module, and (5) Student Activity Sheets, and 9 test and non-test instruments including; (1) Statistics Learning Outcomes Test, and (2) Statistical Literacy Learning Outcomes Test. While the non-test instruments, namely; (1) Assessment sheets for all instruments by expert assessors, (2) Learning module assessment sheets by expert assessors, (3) Lecturer Response Questionnaire Sheet for Statistics Learning, (4) Student Response Questionnaire Sheet for Statistics Learning, (5) Observation Sheet of Statistics Literacy Learning Implementation, (6) Observation Sheet of Lecturers Ability to Manage Statistics Literacy Learning, (7) Observation Sheet of Student Activities on Statistical Literacy Learning, (8) Lecturer Response Questionnaire Sheet Against Statistical Literacy Learning, (9) Student Response Questionnaire Sheet on Statistical Literacy Learning. The results showed that 5 statistical literacy learning instruments and 9 types of test and non-test instruments were declared valid, so that the statistical literacy learning module could be used.

Keywords: Statistical literacy learning, validity of the learning module

INTRODUCTION

Statistics learning today is still strongly influenced by the traditional way for two reasons. First, there is still an assumption that statistics is part of mathematics (delMas, 2002). Thus, statistics learning still tends to emphasize deriving formulas and calculations, not statistical thinking (Garfield, 2002). Second, statistical learning today is still a legacy from traditional ways that have not made use of information technology (Cobb, 1992; Schield, 2004). With the presence of information technology such as computers, the internet, and statistical software, there are changes in statistics learning. This change needs to emphasize statistical thinking, and not spend much time deriving formulas and calculations by manual (Goodall, 2005; Moore, 1997; Wahab et al., 2018).

Modules are a form of teaching material that is packaged in a comprehensive and systematic manner, which contains a set of planned learning experiences designed to help students master specific learning goals (Donnelly & Fitzmaurice, 2005).

Literacy comes from the Latin word littera, which is defined as mastery of writing systems and conventions that accompany them (Kern, 2000). Furthermore, the term literacy is more defined as the ability to read and write, then it develops to include the processes of reading, writing, speaking, listening, imagining, and seeing (Moore, 2000).

Statistical literacy is the ability to read and interpret data, namely the ability to use statistics as evidence in argument (Gal, 2002). (Schield, 2005) states that statistical literacy is competence, namely the ability to think critically about statistics (Wahab et al., 2021). (Tiro, 2017) states that statistical literacy includes the ability to understand statistical concepts, the ability to apply statistics, the ability to perform statistical calculations, the ability to interpret statistical results, and the ability to visualize and communicate statistics.

1. Ability to understand statistical concepts
The concept of statistics is a scientific discipline that studies a set of concepts and methods of collecting, presenting, analyzing, and interpreting data to making decisions. Statistics discusses various concepts, namely descriptive statistics and inferential statistics. Therefore, a statistician should be able to master the concept of statistics before performing calculations and statistical applications.

2. Statistics application capabilities
Statistics is a general intellectual method that is applied when dealing with accidental data, variations, and events. Statistics is also a fundamental method because of the data, variations, and coincidences that occur everywhere in modern life.

3. Ability to perform statistical calculations
The use of statistical calculations does not escape the discussion of population and samples. Population according to cloud statistics does not only include individuals or objects in a certain group, but also includes measurement results obtained from certain variables. Population can be defined as all certain aspects of a feature, phenomenon, or concept (for example body weight, national exam scores, etc.) that are the center of attention in a study or research. While the sample is a number of members who are selected from a population.

Statistical tests included in descriptive statistics include, among others, the measure of central tendency (mean, median, mode, quartile, decile, percentile, variance, standard deviation, etc.), while inferential statistics include the mean difference test (t test, z test, F test), relationship test (correlation, regression and others).

d. The ability to interpret statistical results.
Statistical literacy focuses on making decisions that use statistics as evidence, such as reading literacy focuses on using words as evidence. Statistical literacy involves reading skills, namely understanding and interpreting what is read, checking reading comprehension and then turning to interpretation.The interpretation of statistical results is a difficult task, because it requires

high skill, careful attitude, careful consideration and objective attitude. If the interpretation of the data can be carried out properly, then we will get a correct conclusion.

e. Statistical visualization and communication capabilities.
Visualization is a technique of using computers to find the best method of displaying data. By using visualization, the data displayed can make it easier to see data that is difficult to see with thought so that it can be observed by simulation and computation (Wahab, 2017).

RESEARCH METHODS

Based on the main objective of this research is to produce valid statistical literacy learning tools and instruments. Thus, this type of research is a descriptive study (Sugiyono, 2013). The learning tools that were validated in this study were statistical literacy learning tools, the statistical literacy learning Tool consisted of (1) Semester Learning Plans, (2) Lecture Units, (3) Manuals for Using Modules, (4) Statistical Literacy Module, and (5) Student Activity Sheet. Furthermore, the test and non-test instruments. The test instruments consist of; (1) Statistics Learning Outcomes Test, and (2) Statistical Literacy Learning Outcomes Test. While the non-test instruments, namely; (1) Assessment sheets for all instruments by expert assessors, (2) Learning module assessment sheets by expert assessors, (3) Lecturer Response Questionnaire Sheet for Statistics Learning, (4) Student Response Questionnaire Sheet for Statistics Learning, (5) Observation Sheet of Statistics Literacy Learning Implementation, (6) Observation Sheet of Lecturers' Ability to Manage Statistics Literacy Learning, (7) Observation Sheet of Student Activities on Statistical Literacy Learning, (8) Lecturer Response Questionnaire Sheet Against Statistical Literacy Learning, (9) Student Response Questionnaire Sheet on Statistical Literacy Learning.

The validity of the statistical literacy learning equipment is determined by matching the total validity average of all the assessment items with the following criteria:

Table 3.1. Validity criteria

Interval score	Category
$3{,}5 \leq \bar{X} \leq 4$	Very valid
$2{,}5 \leq \bar{X} < 3{,}5$	Valid
$1{,}5 \leq \bar{X} < 2{,}5$	Quite valid
$\bar{X} < 1{,}5$	Invalid

The criteria used to decide that the learning device has an adequate degree of validity are: (1) the total average value ($\overline{\mathrm{X}}$) for all minimum aspects in the sufficiently valid category, and (2) the $\bar{A}_i$ value for each minimum aspect in the legal category (Nurdin, 2007). If declared valid, then proceed with the calculation of reliability. The reliability value is calculated using the formula:

$$R = \left[1 - \frac{A - B}{A + B}\right] x100\%$$

with: R = reliability coefficient, A = the highest average value of the expert appraiser's assessment, B = the lowest average value of the expert appraiser's assessment, If the reliability coefficient obtained is greater than 0.75 (R> 0.75), then has high reliability.

RESULTS AND DISCUSSION

The validity testing activities are carried out to determine whether the initial draft to be used is valid or not. The activity of validity testing is carried out in two stages, namely; the validity test carried out by each expert in their field, and the field validity test (empirical) to determine the validity and reliability of the instruments used.

1) Expert validity test
Expert assessors who assess research instruments, the initial draft consists of 3 academics, namely expert evaluators in the field of research and educational evaluation, and expert assessors in the field of statistics and learning materials. The validity test method is to ask the experts to assess the instrument using the legality test sheet that has been prepared in advance. Each expert assessor provides an assessment of the relevance of the questions with the aspects and theories on which they are based.

The summary of the test results of the validity of the average test of learning devices, test instruments and non-test instruments of statistical literacy learning can be described in Table 3.2.

Table Summary of Test Results of the Average Validity of Module Devices, Test Instruments and Non-Test Instruments

No	Type of instrument being rated	Average	Reliability Coefisient	Decision	
				Valid	appropriateness
I	**Module Device**				
1	Semester Learning Plans	3,43	0,947	Valid	Proper to use
2	Lecture Units	3,57	0,967	Very Valid	Proper to use
3	Manuals for the Use of Modules	3,57	0,987	Very Valid	Proper to use
4	Statistical Literacy Module	3,32	0,988	Valid	Proper to use
5	Student Activity Sheet	3,38	0,818	Valid	Proper to use
II	**Test Instrument**				
6	Statistics Learning Outcomes Test	3,32	0,978	Valid	Proper to use
7	Statistical Literacy Learning Outcomes Test	3,47	0,956	Valid	Proper to use
III	**Non-Test Instrument**				

No	Type of instrument being rated	Average	Reliability Coefisient	Decision	
				Valid	appropriateness
8	Lecturer Response Questionnaire Sheet for Learning Statistics	3,28	0,972	Valid	Proper to use
9	Student Response Questionnaire Sheet for Statistics Learning	3,34	0,928	Valid	Proper to use
10	Observation Sheet of Statistics Literacy Learning Implementation	3,21	0,945	Valid	Proper to use
11	Observation Sheet of Lecturers Ability to Manage Statistics Literacy Learning	3,33	0,927	Valid	Proper to use
12	Observation Sheet of Student Activities on Statistical Literacy Learning	3,43	0,857	Valid	Proper to use
13	Lecturer Response Questionnaire Sheet Against Statistical Literacy Learning	3,33	0,952	Valid	Proper to use
14	Student Response Questionnaire Sheet on Statistical Literacy Learning	3,30	0,916	Valid	Proper to use

1) Empirical validity test

The summary of the empirical test results of the test instruments calculated using the biserial point correlation formula and the Spearman-Brown method, as well as the non-test instruments calculated using the moment product correlation formula and the Cronbach alpha technique can be described in Table below:

Table Summary of Test Results and Empirical Instrument Non Test

No	Instrument type	Reliability coefficient	Level of reliability
I	**Test Instrument**		
1	Statistics Learning Outcomes Test	0,946	High
2	Statistical Literacy Learning Outcomes Test	0,751	High
II	**Non-Test Instrument**		
1	Observation Sheet of Statistics Literacy Learning Implementation	0,892	High
2	Observation Sheet of Lecturers Ability to Manage Statistics Literacy Learning	0,905	High
3	Observation Sheet of Student Activities on Statistical Literacy Learning	0,894	High
4	Lecturer Response Questionnaire Sheet Against Statistical Literacy Learning	0,854	High
5	Student Response Questionnaire Sheet on Statistical Literacy Learning	0,931	High

The instruments prepared include; expert appraisal instruments used as an expert appraisal appraisal format and field instruments used as a field data collection tool. The expert assessment instrument consists of two formats, namely; a format for assessing all field instruments and a format for assessing learning tools. Then the field instrument consists of two formats, namely; test instruments and non-test instruments.

Furthermore, the validity test is carried out by the expert. the validity test is obtained through the expert appraisal instrument that has been prepared in advance. The assessment of expert appraisal instruments and field instruments is carried out by submitting all of these instruments. Each expert assessor was asked to assess the relevance of the statement items with the aspects and indicators as well as the theoretical basis used to develop the instrument. Furthermore, expert assessors are asked to provide scores on the available expert appraisal format as well as provide suggestions and comments on the instrument text.

The process of submitting a validity test can be done repeatedly depending on the value and suggestions of the expert assessor. All instruments developed in this study are minor revisions. Thus, the expert validity test in this study was carried out once for both test and non-test field instruments. Likewise, an assessment of learning devices.

In the initial testing process, it was found that the statistical literacy learning device was declared valid in terms of all aspects. Even so, some suggestions from expert assessors remain a consideration in the effort to improve the module. Revision suggestions are more directed at the instruments used and learning tools. Improvements to the research instrument relate to aspects of the validity test format and aspects of the instrument use instructions. After the revision has been made, the instrument sheet is submitted back to the expert appraiser to re-test the validity

Minor revisions to the learning tools were carried out on the Semester Learning Plan, Lecture Unit, Module Use Manual, Statistics Literacy Module, and Student Activity Sheets. Some of the focus of improvement of these tools which became input from expert assessors are (1) Revision of the semester learning plan and the Lecture Unit including statements including the words pre test and post test at the beginning of the meeting and at the end of the meeting, as well as legibility. the manuscript is enlarged with 1 point letter, (2) Revision of the manual for using the module and the statistical literacy module includes the readability of the manuscript in 1 point enlarged letters and includes a glossary before the bibliography, and (3) Revision of the student activity sheet covers typos in formative tests.

The criteria used to decide that learning has an adequate degree of validity are: (1) the total average value ($\overline{\mathrm{X}}$) for all minimum aspects in the valid category, and (2) the $\bar{A}_i$ value for each minimum aspect in the valid category

CONCLUSIONS

Based on the results of the validity test that has been stated previously, it can be concluded that the prototypes of statistical literacy learning include learning tools and instruments that are all compatible have been declared valid. The results of the validity test of experts and practitioners on the components of the learning tools developed have a strong theoretical foundation, the learning components are related to statistical literacy learning and have internal consistency

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