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Validity and Reliability Test of Assessment Instrument of the Suitability of Electric Power Steering Media

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Abstract

Assessment instrument is one of the important parts of a research, it should be suitable with the things that are going to work with. This research is purposed to test the validity and reliability of the instrument that is going to use to examine the visual aid media electric power steering. The validity analysis model used in this test is Content Validity Ratio or CVR to asses the validity of the instrument. Meanwhile, the reliability instrument is tested trough Intraclass Correlation Coefficient; ICC). The result showed that the points of the instrument reach the CVR number of 0.99 which means that the instrument is valid. Furthermore, the number of ICC is 0.835 (media expert instrument), 0,815 (material expert instrument) and 0,732 (user response instrument). From the findings, it can be concluded that the instruments for media and material experts are in high stability category, while the user response instrument can be categorized as adequate. Finally, these instruments are valid to asses the suitability of the electric power steering media.

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INTRODUCTION

Sugiyono (2014:102) defines that assesment instrument is a toll to measure the natural or social phenomenon. The existence of the assessment instrument in natural science is usually available. Moreover, in this field the instrument has been tested the both validity and reliability. However, the development of the test for social science has not yet as developed as the natural one. Thus, it is a must to do test the validity and reliability of the instrument in social science to support the research. The developed instrument should meet the requirements to be used properly in the research namely valid and reliable.

A valid instrument means that the tools to measure the data is valid. It is capable to measure what it is supposed to (Sugiyono, 2014:121). The internal validity instrument such as test should fulfill the construct validity and content validity. However, the non-test instrument to measure behavior only deals with the construct validity. To measure the construct validity, the theories from experts are the fundamental base. The instrument is constructed to aspects which are going to measure based on certain theories, then it is consulted to the experts about.

Reliability strongly refers to a definition that if an instrument is reliable enough to collect the data because it is proper, it means that whenever it is used it will produce the same result (Arikunto, 2010). Reliability test is supposed to test the level of the effectiveness of a research instrument (Arikunto, 2010). The instrument is reliable if it is not tendentious, the data are real after taken several times the result is still the same.

There are two purposes of this research; 1) to test the validity level of research instrument, 2) to test the reliability (stability) of research instrument that are going to use to develop electric power steering. This is important because the accuracy of the measuring tools has strong influence to the quality of the product developed. It is also useful to maintain the instrument to produce high quality product. Martins (2016) defines that the test of the assessment instrument should be valid and reliable as its use in the research so that it will arise high credibility.

METHOD

The method used in this research is the part of development research, the procedure of validity and reliability test of the instrument that is carried out in this research is written as follow.

Determine the Type of Instrumen

The instrument used in this research is questionnaire, it is a tool for collecting the data in the form of questions and statements that should be filled by the subject of the research, both individual and in a group that provide the information. The kind of the instrument is close instrument which the answers are already provided so that they only need to give check ‘v’ in the column that is suitable to their answer. The questionnaire is given to the validator and research respondents to collect the data.

Find Reference and Make Blue Print

To produce an appropriate blue print instrument and in accordance with the purpose, the process of making the instrument should refer to the material in the base competence syllabus about electric power steering in the chassis maintenance and automotive ligh vehicle power transfer subject. It is also adjusted with the reference from the experts. These are the syllabus and instrument blue print from the experts:

Table 1. Electric Power Steering Basic Competence

Chassis Maintenance and Power Transfer Syllabus (TKR)		Achievement Indicator Competences
BC	Core Material	
Understanding electrical power steering.	Identifying electric power steering based on the literature review.	Mention the components of electric power steering.
Maintain electric power steering.	Checking the function of electric power steering based on the standard.	Explain the function of electric power steering component.
	Diagnose, fix and test the electric power steering based on the standard..	Explain how electric power steering works.
	Maintain the electric power steering and its component based on the standard.	Explain how to maintain electric power steering.
		Diagnose the error in electric power steering component.
		Do services and fix electric power steering.
		Overcoming the error in electric power steering.
		Test the repair and maintenance of electric power steering.

Source : Chassis Maintenance and Power Transfer Syllabus (TKR)

Tabel 2. Learning Media Assessment Aspects According to Arsyad

Variable	Explanation
Relevance with with the learning objectives	The relevance between the objectives and learning syllabus, between objectives and mateial, between picture and material, between chapter title and content, and suitable to mastery level of the learners.
Simplicity	Neat, well arranged, pure without irrelevance material and object, no disturbing background
Up to Date	Old version mode might be a joke and the being meaningless to the students
Scale	The relative measurement of an object should be clearly presented from the picture, the common object can show scale comparison between the common object and strange object
Technique quality	The good quality and sharp contrast that focuses on the clean detail, natural and realistic color
Measurement	Presented appropriately and suitable for the big and small group.

Source : Arsyad (Learning Media)

Tabel 3. Learning Media Assessment Aspect by Wahono

Variable	Explanation
Learning Design Aspect	Clarity of learning objectives (formulation, realistic), Relevance of learning objectives with SC / BC / Curriculum, The scope and depth of learning objectives, The accuracy of the use of learning strategies Interactivity, Provision of learning motivation, Contextuality and actuality Completeness and quality of study assistance materials, Suitability of the material with the learning objectives, Material depth, Ease to understand, Systematic, continuous, clear logic flow,

	Clarity of description, discussion, examples, simulations, exercises, Consistency of evaluation with learning objectives, The accuracy and permanence of the evaluation tools.
Visual Communication Aspect	Communicative, in accordance with the message and can be received / in line with the wishes of the target Simple and alluring (attractive).

Source : Wahono (Learning Media Assessment Aspect)

Constructing Questionnaire

Questionnaire is arranged based on the previously made, the points of the blue print are developed into a question or short statement, so that they can be presented and can be easily understood.

Data Type Analysis

This type of research data is qualitative data and quantitative data, the data are analyzed statistically descriptive. Qualitative data in the form of comments and suggestions to improve the products from media experts and practitioners' assessments are then analyzed and described descriptive qualitatively to revise the product being developed. Later quantitative data were obtained from media expert assessment scores, practitioner ratings and student questionnaire response scores.

Analysis Technique

Data analysis is an activity to research, examine, study, compare existing data and make interpretations as needed. In this research the ready-made instrument is then tested for its validity and reliability to experts, from the test results obtained data which will then be analyzed statistically, the following is the analysis of the instrument test results:

a) Data Analysis and Instrument Validity Result

Content Validity Ratio (CVR) will be used to test the validity of instruments / measuring instruments that have been made in this study is proposed by Lawshe (1975) In this approach, a number of subject-matter experts (SMEs) are asked to indicate whether an item is "important" as a form of operationalizing the theory building. This panel input is then used to calculate the CVR for each item in the research instrument.

Institutional validation involved five experts, namely two lecturers and three teachers who were experts in the field of automotive engineering. To calculate the CVR, the five experts were asked to rate each item on the research instrument. Input from experts is then analyzed in the following way:

1) Validator Assessment Criteria

The score of the validators' response has criteria as follow:

Table 4. Validator Assessment Criteria

Criteria	Score
Yes	1
No	0

2) The score given in each answer is counted using CVR

After all of the items have score, the score is calculated using the following formula:

$$CVR = (2ne/n) - 1 \quad \ldots\ldots\ldots\ldots\ldots (1)$$

Information :

ne : The number of SME that score an item is essentials

n : The number of SME who do the testCriteria:

a) When it is less than half of the total respondents stated Yes, the CVR value = -.

b) When half of the total respondents stated Yes then the CVR value = 0.

c) When all respondents stated Yes, the CVR value = 1 (this is set to be 0,99 adjusted with the number of respondents)
d) When the number of respondents who said Yes is more than half of the total respondents, the CVR value = 0 - 0.99.

After identifying each sub question on the questionnaire instrument using CVR, the content validity index (CVI) is used to calculate the total number of sub questions. CVI is an average of the CVR value for the instrument that has been made.(Lawshe, 1975).

$$\text{CVI} = \frac{\text{CVR}}{Jumlah\ item\ instrumen} \qquad \text{..... (2)}$$

Here is a table of Lawshe critical CVR number of different experts.

Tabel 5. critical CVR number

The Number of Expert	CVR minimum Number
5	0.736
6	0.672
7	0.622
8	0.582
9	0.548
10	0.520
11	0.496
12	0.475
13	0.456
14	0.440
15	0.425
20	0.368
25	0.329
30	0.300
35	0.278
40	0.260

(Wilson, 2012).

Meanwhile, the CVI result is in the form of ratio 0-1. The ratio is categorized in the table below:

Table 6. CVI Ratio

Ratio	Information
0 - 0.33	Inappropriate
0.34 - 0.67	Appropriate
0.68 - 1	Very Appropriate

b) Data Analysis and Reliability Data Results

This research uses observation sheets as a measurement tool. To determine the tolerance of differences in observations it needs reliability testing techniques (Arikunto, 2006). If measurements are made by more than two observers, reliability is assessed using intraclass correlation coefficient (ICC). It is developed by Pearson (1901; in Widhiarso, 2005). This coefficient was developed based on analysis of variance but in certain cases the results have similarities with alpha coefficients. The use of the ICC coefficient is appropriate when (a) the rater is used a lot and (b) the score of the assessment results is continuum (Widhiarso, 2005).

This study involved three rater who assess the items on the research instrument development of electric power steering props, through the rating scale instrument that produces ordinal data. Three rater

assessed the instability of measuring the appropriateness of electric power steering props using an observation sheet consisting of assessment items using five scoring alternatives (1 to 5). Reliability between the three raters is calculated in the following formula:

$$\text{ICC} = \frac{\sigma_s^2}{\sigma_s^2 + \sigma_o^2 + \sigma_e^2} \qquad \ldots\ldots\ldots\ldots\ldots (3)$$

Keterangan
σ_s^2 = Subject Variation
σ_o^2 = Rater Variation
σ_e^2 = Random Error Variation

Measuring instruments have adequate stability if the ICC number between is > 0.50, high stability if ICC between measurements ≥ 0.80 (Streiner and Norman, 2000; Polgar and Thomas, 2000).

RESULT AND DISCUSSION

The results of this study are in the form of a research instrument blue print and the level of validity and stability (reliability) of instruments that have been made and tested on experts in their field, the results of this study indicate that the level of validity of the instruments made is 99% valid, it was obtained from the calculation of the content validity ratio (CVR) which produced a CVR value of 0.99, while the level of instrument stability (reliability) in the category was very stable and adequate, this was indicated by the intraclass correlation coefficient (ICC) which was 0.835 (expert instruments media), 0.815 (material expert instruments) and 0.732 (user response instruments). The following is a more detailed discussion.

1. Blue Print Result of Research Instrument

Table 7. Blue Print Instrument for Material Expert

Aspect	Indicator	Questions Points
Relevance of the material and the basic competence *electric power steering*.	Menstion the Learning Objectives	2
	The availability material of *electric power steerin components.*	2
	Able to explain the function of electric power steering component.	1
	Able to explain how electric power steering works.	2
	Able to explain how to maintain electric power steering.	1
	Able to explain the error location in electric power steering component.	1
	Can be used to simulate the maintenance (service) on *electric power steering.*	1
	Test the repair and maintenance of electric power steering	1
	Covering all instructional learning	3
Visual Communication	Trigger students' motivation to learn the material	1
	Easy to understand	1
Learning Design	The media can help the teacher in learning basic electric competencies power steering.	1 1
	The media can be used for individual, small and large group learning.	3
Total Number of Questions		**20**

Tabel 8. Blue Print Instrument for Media Experts

Aspect	Indicator	Question Points
Product Effectiveness	The media is effectively used in small group learning	1
	The media is effectively used in large group learning	1
	The media is effectively used in individual learning	1
Ease	Media is easy to use	1
	Media is easy to understand and learn	1
Physical Suitability of Media	Relevance with learning objectives	1
	Relevance with comprehension level of the user	1
	Relevance with real shape of the component	1
	Relevance with symbol and picture	2
	Relevance with the size of the learning media	2
	Can show the electric power steering material	4
Completeness	Completed with the identity of the media	1
	Completed with media component	3
	Completed with related pictures	1
	Completed with guidance and maintenance instruction	1
Communicative and Interactive	The design is attractive	3
	The media is logically presented	1
	The media is well arranged	1
	The media is easily collaborated with other media	2
Total Questions Points		29

Table 9. Blue Print Instrument for Material Experts

Aspect	Indicator	Question Points
Material and Basic Competence Relevance	Explain the learning objectives	2
	The availability of electric power steering component material	2
	Can explain the function of electric power steering component	1
	Can explain how electric power steering works	2
	Can explain how to maintain the electric power steering	1
	Can diagnose the error in the electric power steering component	1
	Can be used to simulate the maintenance of the electric power steering	1
	Can be used to test repair and maintenance in electric power steering	1
	Covering all instructional learning	3
Visual Communication	Trigger students' motivation to learn the material	1
	Easy to understand	1
Learning Design	The media can help the teacher in learning basic electric competencies power steering	1
	The media can be used for individual, small and large group learning,	3
Total Question Points		20

2. Result and Discussion of Validity Instrument Test

The instrument validity test in this study was conducted by involving five subject-matter experts; SME (examiners who are experts in the automotive field) consisting of two lecturers and three teachers, the five SMEs assessed each instrument points that have been made and the results in analysis with CVR calculations, the results are as follows:

Table 10. CVR number on each points of the instrument (valid)

Type of Instrumen	Point of Instrumen	CVR Number	CVI Number
Instrument (Media Expert)	2,3,4,5,6,7,8,10,11,13,14,15,17,18,19,20,21,22, 24,25,27,29	0.99	0.89
Instrument (Material Expert)	1,3,4,5,6,8,9,10,11,12,14,15,16,17,19	0.99	0.90
Instrument (User Response)	1,2,3,4,5,6,8,9,10,11,13,14,15,16,18,19,20,21, 22	0.99	0.95

Table 11. CVR number on each points of the instrument (invalid)

Type of Instrumen	Point of Instrumen	CVR Number	CVI Number
Instrument (Media Expert)	1,5,9,12,16,23,26,28	0.60	0.89
Instrument (Material Expert)	2,7,13,18,20	0.60	0.90
Instrument (User Response)	7,12,17	0.60	0.95

The table above shows that the CVR numbers on each instrument points are not the same number, if seen from the criteria of the CVR number using five rater, the minimum CVR number is 0.736. This means that there are some instrument items that do not meet the criteria and categorized to be invalid instrument items, table 10 addresses valid instrument items, while table 11 shows invalid instrument items. Invalid instrument items are not included in the instrument or in other words in disqualification. While the CVI coefficient on all instruments meet the criteria, so it can concluded that overall the instruments made have a good level of validity.

3. Result and Discussion of Reliability Instrument Test

The instrument reliability test in this study involved three rater consisting of two lecturers and one education practitioner who are experts in the automotive field, the three rater assessed each instrument items that had been made and the results were analyzed by ICC calculation, the results were as the following:

Table 12. ICC Coefficient on each Point of the Instrument

Type of Instrument	ICC Coefficient
Instrument (Media Expert)	0.835
Instrument (Material Exper)	0.815
Instrument (User Response)	0.732

The ICC coefficient figure in table 11 shows that the instrument has adequate and high stability, the instrument has adequate stability if ICC> 0.50, high stability if ICC ≥ 0.80.

CONCLUSION

Based on the results of the study it can be concluded that the assessment instruments developed have met the valid criteria based on the results of the analysis of the validity test of the instrument with a CVI coefficient 0.99 on each item. In addition, the research instrument developed also meets the criteria of adequate and high stability with an ICC rate of 0.835 (media expert instruments), 0.815 (material expert instruments) and 0.732 (user response instruments). Based on the results of the validity and reliability test of the instrument, it can be concluded that the instrument for evaluating the feasibility of the electric power steering visual aid media is valid and reliable for use in the development of visual media.

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