

# Quality of Thesis Research Instruments of Mathematical Education Program Students, Unnes Postgraduate

Kartono<sup>1</sup>, Budi Waluya<sup>2</sup>  
{[kartono.mat@mail.unnes.ac.id](mailto:kartono.mat@mail.unnes.ac.id)}<sup>1</sup>

Universitas Negeri Semarang, Indonesia

**Abstract.** The quality of the results of educational research is very dependent on the quality of the instruments to obtain the research data. The quality of the research instrument is determined by two things, namely, validity and reliability of the instrument. Various methods and formulas can be used to prove validity and estimate the reliability coefficient of an instrument. The aimed of the study were: 1) Describe the results of the preparation of thesis research instruments of mathematical education program students, UNNES Postgraduate. 2) Analysing the quality of thesis research instruments of mathematical education program studenta, UNNES Postgraduate. The population in this study is the thesis of students of the mathematics education master program of the UNNES Postgraduate who have graduated in 2016, 2017, and 2018 totaling 119. The sample selection technique uses random sampling, sample size 10, consists of 2 thesis qualitative methods, 2 thesis development methods , and 6 theses of combined methods, instruments in this study in the form of observation sheets. Data is analyzed qualitatively. The results of the study showed that the thesis research instruments of the Mathematics Education Program students of the UNNES Postgraduate through instrument testing. The results of the instrument trial analysis include item analysis and estimated instrument reliability coefficients. Item analysis includes item validity test, item difficulty index, and item different power index. In the thesis of the development method, the validity test of the product is developed based on expert opinion or validator. Instrument validity test has not been carried out.

**Keywords:** analysis, instrument, quality, validity, reliability.

## 1. Introduction

In principle, conducting educational research is measuring the variables of social phenomena in the field of education. In general, research variables in the field of education are manifest variables that cannot be measured directly with the appropriate instruments. Educational research especially quantitative research it is recommended that novice researchers should use quality instruments. Instruments are said to be of quality if the instrument is valid and reliable [1]. The instrument is said to be valid if the instrument is able to measure the exact variable to be measured. Instruments are said to be reliable if the measurement results of these instruments are consistent [2]; [3]; [4].

The validity of the instrument can be proven by certain techniques, depending on the type of validity. There are three types of validity of an instrument, namely the validity of content,

constructs, and criteria. In educational research, content validity can be proven through expert opinion. Content validity can be proven by factor analysis. The validity of the criteria can be proven by calculating the magnitude of the correlation between the scores from the results of the measurement of the new instrument with the score on the measurement criteria. In the case of proof of the validity of the instrument, the minimum content validity must be given. There is often a proof of the validity of the instrument in educational research, which proves validity by calculating the correlation between item scores and total scores [4].

Instrument reliability is easier to show, namely by estimating the reliability coefficient of the instrument using a statistical formula. It is necessary to pay attention to the things that affect the results of the estimated reliability coefficient, according to [4] these things include: 1) measurement time, 2) length instrument, 3) the level of difficulty of the item, 4) distribution of respondents' score, and 5) scoring objectivity. Thus when you want to estimate the reliability coefficient of an instrument based on the score of the measurement results, you can anticipate the things that influence it.

The purpose of this study is as follows. 1) Describe the construct results of the thesis research instruments of the Mathematical Education Program students, UNNES Postgraduate. 2) Analyzing the quality of the thesis research instruments of the Mathematical Education Program students, UNNES Postgraduate.

The benefits of the results of this study include theoretical and practical benefits. The theoretical benefits of this research are supporting the theory of measuring and evaluating education, especially in the aspect of instrument development. The practical benefits of this study are as follows. For students, the results of the study can be used as a note when going through a thesis research instrument. For institutions, the results of this study can be used as information related to policy making regarding the preparation of the thesis, especially the quality of research instruments.

## **2. Method**

This research is a qualitative research based on the alumni thesis document of the Mathematics Education Study Program in the Postgraduate Program of UNNES. The subjects in this study were the alumni thesis of the postgraduate UNNES Postgraduate Mathematics Education Study Program who had graduated in 2016, 2017, and 2018. Numbered 119, consisting of 6 qualitative theses, 9 development theses, and 104 combination theses.

The technique of selecting research subjects using proportional randomly selected 10 subjects, consisting of 2 qualitative theses, 2 development theses, and 6 combination theses, the instruments in this study were observation sheets. Data were analyzed descriptively qualitatively.

## **3. Results and Discussion**

Based on the observation of the subject's research documents, the instruments used in each of the theses are described in Table 1 as follows.

**Table 1.** Thesis Research Instruments

Type	Instrument	Validity	Reliability
Combination	Tests, questionnaires, observation sheets, and interview guidelines	content validity indicated	Tests and questionnaires are shown when item analysis. The observation sheet and interview guidelines are not indicated..
Development	Tests, questionnaires, observation sheets, and interview guidelines	content validity indicated	Tests and questionnaires are shown when item analysis. The observation sheet and interview guidelines are not indicated
Qualitative	Tests, questionnaires, observation sheets, and interview guidelines	content validity indicated	Tests and questionnaires are shown when item analysis. The observation sheet and interview guidelines are not indicated

Based on Table 1, the thesis research instrument used for each type of research is the same namely tests, questionnaires, observation sheets and interview guidelines. Proof of the validity of the instrument indicated is content validity, both for the type of combination, development, and qualitative research.

Proof of content validity for development research instruments is carried out in conjunction with the feasibility testing of learning devices by experts. Likewise for combination and qualitative research instruments. That there is an understanding by the researcher that before the learning device is used it must be validated by the validator. In this case, the understanding of the researcher is good in preparing the research instrument, but when the validator must be in addition to the supervisor it can be an obstacle for the researcher himself.

Unlike the estimation of reliability coefficients, the estimation of instrument reliability is only done on test instruments and questionnaires, while for observation sheet instruments and not indicated. Estimates are carried out at item analysis.

In item analysis activities, it is generally done well, which includes the index of grain difficulty and the different items for test instruments and questionnaires. Some even do excessive grain analysis, for example, the different grain indexes have been calculated and the validity of the items is also calculated. The validity of the item is obtained by correlating the number of items with the total score. Even though the validity of the items and the power of different items have the same function, you should choose only one. Tragically, proof of item validity is considered to prove the validity of the instrument [4]. There is a misunderstanding of the validity of an instrument, so researchers feel that they have proven the validity of the instrument turns out wrong. Likewise as if there is an assumption that the coefficients can be estimated. instrument reliability is only tests and questionnaires, while the reliability

coefficient estimation for the observation sheet or interview guidelines is not done. It is possible that researchers do not understand about estimating the reliability coefficients of various instruments. Actually there have been many writings about testing validity and estimating reliability for various instruments. Based on classical test theory, this can be seen in the following writings [5];[6];[8];[9] and based on modern test theory can be seen in the following article [7];[10].

#### **4. Conclusion**

Based on the results of the research and discussion it can be concluded the following matters. The thesis research instrument of students of the Mathematics Study Program in the Postgraduate Program of UNNES was used through trials. Proof of validity and reliability estimation is done based on the results of the instrument trial analysis is the item parameters, including item validity, index of difficulty, different power indexes, and estimation of instrument reliability coefficients. Not yet proven the validity of the instrument. The analysis of the grains given is excessive, namely the valence of the items and the different power indexes of the same function.

## References

- [1] Baso Intang Sappaila, (2007). Konsep instrumen penelitian pendidikan. *Jurnal Pendidikan dan Kebudayaan*, 13 (066):1-18.
- [2] Mardapi, D. (2016). Pengukuran penilaian dan evaluasi pendidikan. Yogyakarta: Parama Publishing.
- [3] Azwar, S. (2001). Reliabilitas dan validitas Yogyakarta: Pustaka Pelajar.
- [4] Retnawati, H. (2017). Validitas reliabilitas dan karakteristik butir. Yogyakarta: Parama Publishing.
- [5] Delyanti Azzumario Pulungan. (2014). Pengembangan instrumen tes literasi matematika model PISA. *Journal of Educational Research and Evaluation*, 3(2): 74-78
- [6] M. Ikhwanul Hakim, Kartono, Wahyu Lestari. (2019). Developing assessment instruments of students' critical thinking ability in trigonometry material mathematics subjects. *Journal of Educational Research and Evaluation*. 8 (1): 39 – 47.
- [7] Suraji, Totok Sumaryanto, Muhammad Khumaedi. (2019) The analysis of instrument of the ability to acting and thinking creatively based Rasch model. *Journal of Educational Research and Evaluation*. 8 (1): 48 – 56
- [8] Zaenul Arifin, Kartono, & Supriyadi. (2018). Development of authentic assessment instruments for performance in learning mathematics in linear program. *Journal of Educational Research and Evaluation*. 7 (2): 154-162.
- [9] Vera Wahyuni, Kartono, & Endang Susilaningsih. (2018). Development of assessment instruments to assess mathematical problem solving skill on a project based learning. *Journal of Educational Research and Evaluation*. 7 (2): 147-153.
- [10] Nur Romdlon Maslahul Adi, Kartono, & Endang Susilaningsih. (2019). The development of test instrument TIMSS model to measure mathematics ability VII grade students. *Journal of Educational Research and Evaluation*. 8 (1): 73-83.