



Diagnostics of Self-Efficacy Assessment Instruments in The Form of Problem Gain Test Based on Science Education Material

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ARTICLE INFO

ABSTRACT

Keywords:

Assessment instruments,
items test, self-efficacy,
science material

This study investigated to produce an instrument product that discusses the problem of science. This study was adapted from the instrument. How to determine the questionnaire by looking at the compatibility of self-efficacy indicators. The effectiveness of the instrument assesses the test of consideration between the instrument and the self-efficacy questionnaire on each indicator and its suitability with the Natural Sciences material. The collected data was analyzed descriptively quantitative and qualitative. The results of the correlation in each indicator are positive and negative, but the whole shows a positive correlation. Based on the test results, the instrument was developed for use.

INTRODUCTION

Along with the times, education has become a very important factor to be used as provisions in living life in the future. In the world of education there are several components that can support the smooth and successful education process, one of which is in the form of assessment instruments. The assessment instrument is a tool used to determine how much learning objectives undertaken by students are achieved. For example, by conducting tests or questionnaires the skills and attitudes of students in their success in achieving learning goals that have been set (Amirono & Daryanto, 2016). Assessment instruments consist of tests and non-tests. Tests consist of several types, one of which is multiple choice tests. Multiple choice tests are questions that have provided possible answers and students just need to choose them. Multiple choice tests consist of the problem being asked and choice of possible answers (Amirono & Daryanto, 2016). Based on the psychological aspects of a person, tests can be divided into, intelligence tests, ability tests, aptitude tests, and personality tests. The education that we are experiencing now has entered 21st century education, which focuses on the ability of participated students in solving a problem, so students are required to have a creativity or skill (Fadly, 2017). Students are required to have self-confidence (self-efficacy) which is quite high so that they can easily develop their skills. The development of a student's creative spirit can begin by preparing

students' mentality and attitudes in dealing with a problem (Wulandari, 2019). Subjects that cause problems in daily life must be solved by students, one of them is a science subject. In this 21st century, science places great emphasis on learning to improve student skills.

Science learning in education can be categorized as primary learning. Which in every level of formal education including, Primary School, Secondary School, and High School. Higher Education there are always science subjects, except at the High School level and Higher Education depending on the concentration or majors taken (Fadly, 2020). Of the several levels of education, of course each time will enter the level of education, students must prepare themselves both physically and mentally. One of them, students must prepare and increase self-confidence (self-efficacy) which is very influential when students begin to adapt to the new environment. Self-efficacy is something that is contained in humans in the form of a belief that considers itself capable of doing ways or activities to achieve a desired goal and able to measure the strength of levels in these activities. According to Sartawi (Paranginangin, 2019), self-efficacy is related to social cognitive theory, where in carrying out social interactions a person really needs trust self. In addition, in social interaction we must also have cognitive abilities. So, it can be concluded that in social cognitive theory of each person (Kurniawati & Tatag, 2014) is caused by three dimensions of self-efficacy, namely the dimensions of the degree of task

difficulty (magnitude), the dimension of strength (strength), and the dimension of generalization (generality). The indicators of self-efficacy according to Brown, et al (Hasanah, et al, 2019), are determined from the dimensions of self-efficacy. As for these indicators, namely confidence could complete tasks, confidence is able to motivate yourself in achieving targets, confidence is able do business earnestly, work hard, be diligent, be responsible for achieving targets, be confident of being able to face any challenges or obstacles, and be confident of being able to complete tasks without regard to the breadth of the scope of work.

Science learning at several levels of education, indeed requires students to adjust to their environment. According to Klassen (Mahmudi & Suroso, 2014), in adjusting to a new learning environment is influenced by the level of confidence and ability to complete tasks and carry out roles be a student. In addition to adapting to the environment, students must also prepare their confidence (self-efficacy) when they encounter subjects that they find difficult, such as mathematics and science. Natural science subjects in Secondary included in integrated science. Learning can be said to be integrated if in the delivery of concepts or themes seen from several fields of study (Asyhari & Helda, 2016). In natural science subjects are covered in the fields of biology, physics, and chemistry. it is expected that the level of science subjects can be studied and understood by students in high school, because it can be said to be the basis for

understanding concepts for further education levels. The nature of science learning is oriented to the ability to think, produce products, and develop attitudes, all of which are interrelated (Pratiwi & Eka, 2015). Science learning is a learning process to know more about Natural Sciences. Science subjects discuss the universe and everything in it.

In learning science, there are several skills that students must possess. In addition, science learning is expected to be able to encourage students in the process of discovery to be able to develop students' scientific process and attitude skills (Fatimah, 2017). Science learning is divided into three concentrations of material, namely physics, chemistry, and biology (Jasin, 1992). The students' self-Assessment using tests can directly relate to the material that has been submitted because the test is a reinforcement for students about the truth of knowledge that has been obtained. In addition, the test is also a diagnostic tool for the material that has been obtained by students so that it can be known material that is still difficult (Prasetyawan, 2018). Based on this it can be interpreted that the test assessment instrument has relevance to the material that has been delivered and is expected to the test can determine students' self-efficacy.

METHODS

Development style

The development model of the self-efficacy assessment instrument in the form of a science-based item test on the development and research uses a

model developed by Borg and Gall with ten stages. However, in this study the authors considered time so that the study was carried out in only five stages, namely the preliminary study stage, and the development stage (product draft, validation, prototype, limited trial, and final product).

Research and Development Procedure

The first stage, which is a preliminary study by analysing needs, studying relevant theories, observing and conducting research on self-efficacy instruments that are already in the field. Student self-efficacy assessment instruments in the form of item test are expected to be able to measure the level of student self-efficacy in science learning that has relevance to the material that has been delivered and makes students more focused on the material. Next, the development stage goes through several stages, namely: a) the product draft, by determining the material and the test grid which will be adjusted to the self-efficacy indicators. The material used is natural science material class VII Secondary School KD 3.7 about the interaction of living things with their environment. b) validation, both content validation and product constructs by expert validators. c) prototype, revised product results after validation. d) limited trials, conducted on sample classes, namely three classes VII which have been selected by cluster random sampling. e) the final product, produced after a limited trial and

assessed through the scores that have been obtained.

Product Trial Design

The design of the trial run is to validate the product both in content and construct. Validation was carried out for two expert validators, namely one lecturer in Psychology at Faculty of Education and Teacher Training of STATE Institute of Islamic Studies Ponorogo and one expert lecturer in Faculty of Education and Teacher Training of State Institute Of Islamic Studies Ponorogo. After validation and revision, the product was tested on first-class sample classes. Tests were carried out by distributing test items and questionnaire instruments. self-efficacy to students in one sample class to work alternately between item test and questionnaire.

Data Types, Research Instruments, Data Collection Techniques and Data Analysis Techniques

The type of data obtained in the form of quantitative and qualitative data, namely in the form of results and scores from the validation and trials that have been carried out as well as comments and suggestions from expert validators. The instrument data collection in the form of instrument test items about self-efficacy and self-efficacy questionnaire. The data that has been obtained are collected using tests and questionnaires, which are then carried out an analysis of the data by means of quantitative descriptive and descriptive qualitative which compiles

the data in a structured manner, grouping the data according to its type, selecting which data is important and used, and making conclusion so that others can understand the data easily (Sugiyono, 2015: 333). These data were tested for correlation and analysis of their relevance to the science material before conclusions were determined. Correlation tests in this study were used to determine the relationship between self-efficacy assessment instruments in the form of item test tests with self-efficacy questionnaire instruments both in general and each indicator. performed using the SPSS version 17.0 program in the form of Correlate Bivariate. Pearson correlation value has the smallest value -1 and the largest 1. If the Pearson correlation is negative then the two instruments have a non-directional relationship, but if the Pearson correlation value is positive then the two instruments are in the same direction.

RESULTS AND DISCUSSION

Results

Student self-efficacy assessment instrument developed by the author in the form of item test developed from student self-efficacy assessment instrument in the form of a questionnaire. It is expected that the student's self This is a multiple-choice question designed with theories of self-efficacy by linking it to the identity of the material science. There are three multiple choice components, namely 1) Basic questions (stimulus), which are designed by using five types of questions, namely a) rational

statements, in which the type of questions is related to science. Science is a science in which there are facts about nature that are obtained scientifically so that the findings in science must be empirical and discuss facts. So, it cannot be denied that there are theories found in science in science through scientific processes so that they can be accepted by reason (Retno & Wachidatul, 2016). Making questions with this type refers to theoretical science material. b) table or graph, has relevance to. Observation activity aims to find knowledge that is empirical (Rustaman, 2003). After the observation activity will get the data which is then processed. Data retrieval can be done in three ways, namely in the form of description, chart, and table (Rustaman, 2003). The graph functions to summarize, process and analyze or interpret complex data (Subali, et al, 2015). Making questions with this type can be used in natural science material related to data. C) pictures, has a role in natural science material. Image is one type of representation in physics, which is a form that can describe, represent, or symbolize an object or process of an event. The function of the picture is to help visualize abstract material that becomes concrete to understand it (Subali, et al, 2015). Making questions with this type can be done on materials that are abstract from abstract to concrete. d) case illustrations or analysis, still related to science material. Illustration encourages a person to carry out an identification activity. According to the OECD (in Asyhari & Risa, 2015), the ability to identify problems using

individual scientific knowledge can be said to be scientific literacy. Making questions with this type can be done on natural science material that can be illustrated, such as an example discussion relating to daily activities so that identification can be done. e) decision making or analysis of relationships between things, this type is related to learning science. In the learning process, decision making or problem-solving skills have become a unity, especially in learning science. Problem solving is one way to develop new ideas in science effectively (Mauke, et al, 2013). This type refers to natural science material which contains several problems in daily life which are used as examples in a discussion of theory.

2) The subject matter (steam), using Operational Verbs in the affective domain which is at the level of value (valuing), which is settled on each indicator, i.e., a) indicator 1, using operational verbs reporting or its equivalent. Science tends to be based on the process of finding knowledge by conducting experiments and observations (Rustaman, 2003). This type of subject matter can be used in natural science material relating to observational activities that can be carried out by students so that they can be reported or equivalent. b) indicator 2, using operational verbs to explain or its equivalent. the basic skills of the science process, there is the ability to inference, namely the ability to bring up ideas that are used to explain an observation (Wilujeng, et al, 2010). The subject matter of this type can be used in natural

science material related to observations that require illumination or its equivalent. Information activities or their equivalent to natural phenomena are very helpful in science activities (education expert in Iskandar, 2014). c) indicator 3, using the proposed operational verbs or its equivalent. Proposal activities can be interpreted as prediction activities. Predicting is a skill that is very important in science, because basically science is related to several opinions or beliefs about nature, such as opinions about the causes and consequences of a natural event (Rustaman, 2003). Problems with this type can be used in natural science material related to phenomena or problems that require proposals or opinions. d) indicator 4, using the complete operational verbs or its equivalent. the ability of scientific processes in learning science, one of which is by making observations. Observations made repeatedly can complement the evidence or data to understand the existing problems (Rustaman, 2003). The subject matter of this type can be used in natural science materials relating to observations or data or information that requires completeness. e) indicator 5, using the operational verbs described or its equivalent. According to PISA (in Nofiana and Teguh, 2017), scientific literacy is the ability to describe evidence relating to conclusions about natural changes due to human activity. The subject matter of this type can be used in natural science materials

relating to natural events or others the depiction needed.

3) Choice of answers (options), designed with several models, namely using homogeneous answer choices or answer choices that are all correct and almost the same, but have different scores and the existing deception also works. The choice of answers is designed like this so that can lead to a meticulous attitude. Research is one of the scientific attitudes that underlies some of the findings in the Natural Sciences (Retno and Wachidatul, 2016). Choice of answers with this type, can be used on all-natural science material that can be made equivalent in the choice of the answer., the choice of answers used has a high level of accuracy and completeness so that the ability to read is needed. The ability to read and write related to science and technology is a scientific literacy activity (Miller in Permanasari, 2016). Choice of answers with types like this, can be used on all-natural science material. However, in making the choice of this answer is needed and the skills and creativity so that the desired choice of answers can be understood by respondents, despite having a high level of completeness and research.

Expert Validation Results

The results of product validation both in content and construct by expert validators are as follows.

Table 1. Content Validation Results

Validity Level	Frequency	P (%)
Valid	39	100%

Based on Table 1, the percentage of product validity reaches 100% because all aspects validated have valid conclusions. However, not all aspects validated produce a perfect score so the product must be revised. Meanwhile, construct validation produces several suggestions, comments or assessments made by expert validators on the constructs of the product, which can be said that most constructs on the product are suitable for use as an instrument of self-efficacy assessment. The choice of answer constructs that are developed can facilitate respondents in generating behaviors that can be measured. But the main construct of the problem still needs to be improved in the use of operational verbs that is appropriate and in accordance with the stimulus questions so that the questions are easily understood by students. In addition, the stimulus construct of a problem is still too long even though it is intended as a question in the form of analysis or contextual, so it is necessary to summarize the stimulus of the problem, so that the respondent or student does not think twice, namely thinking material and thinking to understand the meaning of the sentence in the problem. Writing the choice of answers is also still not in accordance with the rules, such as repetition of sentences in the choice of answers and gradation of the choice of answers that are still not in order. So, from that, it is necessary to revise adjusted to the rules of writing the correct test instrument. Based on these results, it can be said that

the product is valid or suitable for use with minimal revisions.

assessment instruments in the form of item test and self-efficacy questionnaire instruments are as follows.

Data analysis

Furthermore, the results of the correlation test between self-efficacy

Table 2. Correlation Test Results Between Self-Efficacy Assessment Instruments in the Form of Test Items with Self-Efficacy Questionnaire

No.	Correlation Type	Sig. (2-tailed)	<i>Pearson Correlation</i>	Conclusion
1	Overall results	0.434	.154	Positively correlated
2	Between indicators 1	0.434	0.566	Positively correlated
3	Between indicators 2	.293	-0,707	Negatively correlated
4	Between indicators 3	.136	-0,864	Negatively correlated
5	Between indicators 4	.648	0.532	Positively correlated
6	Between indicators 5	.168	0.832	Positively correlated

Based on Table 2, both overall and indicators are positively correlated. There are only two indicators that are negatively correlated, namely indicators 4 and indicator 5.

Relationships in each indicator have different types of relationships or correlations. Indicators 1, 4, and 5 show a positive correlation so that the increase in each of the indicators in the two instruments has a direct increase. Each indicator 1, 4 and 5 has its own peculiarities in terms of instrument design.

Discussion

Correlation test aims to find out whether the self-efficacy assessment instrument in the form of a test item is related to the self-efficacy questionnaire instrument. The results as a whole both have a positive relationship. This positive relationship can certainly be used as an added value for self-efficacy assessment instruments in the form of item tests that have been developed because it has a positive relationship with the self-efficacy questionnaire instrument that has been recognized for its validity in measuring self-efficacy. These two instruments are not only seen in general or calculated from the overall score, but are also seen from each indicator on each instrument.

Indicator 1, namely confidence can complete tasks, in the design of making multiple choice questions, this indicator is characterized by using operational verbs reporting and operational verbs matching. The use of this report refers to the meaning of the reporting itself which is an activity carried out after completing other activities or after making observations (Triwiyanto, 2015). Meanwhile, in the self-efficacy questionnaire, indicator 1 contains statements that point to efforts in getting things done.

Indicator 4, namely confidence can face any challenges or obstacles. In the self-efficacy assessment instrument in the

form of a test item, this indicator uses a complementary operational verbs as well as a matching operational verbs. The use of this complement refers to the meaning of the completeness itself which is interpreted as a challenge or challenging activity that must be passed or done, trying to make something that has not been perfect becomes more perfect. Someone who has the confidence to be able to face any challenges or obstacles can be said to have self-efficacy (Hasanah, et al, 2019). Meanwhile, in the self-efficacy questionnaire, this indicator contains a statement relating to the challenges faced by students in learning.

Indicator 5, namely the confidence to be able to complete the task without regard to the breadth of the scope of the task. In the self-efficacy assessment instrument in the form of a test item, this indicator uses the operational verbs describing as well as its equivalent operational verbs. The use of this depiction refers to the meaning of the depiction activity itself, which is an activity that describes all forms of things whether they have broad or narrow scope, but will still be clarified by drawing. In addition, this description can be interpreted as a process of thinking in making a pattern. This is based on the opinion of Bandura (in Arifin, et al, 2017), which states that self-efficacy is a determining factor for someone in developing thinking patterns. Meanwhile, in the self-efficacy questionnaire, this indicator contains a statement of effort in dealing with the

level of difficulty of the problem and the scope of the material.

Furthermore, the correlations on indicators 2 and 3 have a negative correlation. This can be interpreted that the relationship of the two instruments on the indicator is the opposite. If both indicators on the self-efficacy assessment instrument have increased, then the self-efficacy questionnaire instrument has decreased value or vice versa. This can result from scores generated when testing both instruments. This result has the possibility of changing if testing of both instruments is carried out on different samples. Although, the correlation on indicators 1 and 2 in both instruments is negative, but respectively each has its own peculiarities. Indicator 2, namely confidence is able to motivate oneself to achieve the target, in the self-efficacy assessment instrument in the form of item test, this indicator uses the operational verbs to explain and the equivalent operational verbs. The use of operational verbs is based on explaining activities that can encourage a person's motivation to apply their ability to explain something. This is related to self. Meanwhile, in the self-efficacy questionnaire, this indicator contains statements about efforts that can encourage student motivation as well as negative statements related to laziness. Indicator 3, namely confidence in being able to do business seriously, working hard, diligently, being responsible in achieving the target. In the self-efficacy assessment instrument in the form of a test item, this indicator uses the

operational verbs proposes. The use of this proposal refers to the meaning of the proposal itself which is an activity carried out to express an opinion or view as a form of business that is responsible. with self-efficacy affects the strength of a person in predicting his efforts to achieve targets (Anwar, 2009).

The self-efficacy assessment instrument in the form of a multiple choice item test that has been developed has several advantages compared to the self-efficacy questionnaire instrument. The self-efficacy assessment instrument in the form of a multiple choice test has more relevance to the material that has been delivered in particular the Natural Science material than self-efficacy questionnaire instrument. Test according to Anastasi (Hanifah, 2014) is a measuring tool whose use is broad but has certain objectivity standards and its success in measuring a psychological ability and affective is quite high. The self-efficacy assessment instrument in the form of a multiple choice test has clearer goals or objects so that this instrument can be used on target. This is based on making instruments that are tailored to the subject matter that has been received by students. In addition, the self-efficacy assessment instrument in the form of multiple choices in giving scores is adjusted to the answer key and scoring guidelines that already exist, so the results show the objectivity of the answers of the respondents or students. One of the benefits of multiple choice is its ownership of objectivity (Nizam, 2017). Meanwhile, the questionnaire instrument tends to be a personal

assessment so that the results of completing the questionnaire have an objectivity level of results that is still lacking because most respondents will give good answers to improve their own score.

The development of self-efficacy assessment instruments in the form of item test later is expected to be used to measure two abilities at once, namely cognitive of students' mastery of the material delivered by the teacher and affective abilities in the form of self-efficacy from the scoring guidelines that have been made and with the design of questions based on on self-efficacy theories associated with science material. If viewed from the cognitive side, the multiple choice questions developed were included in C5 because the questions were in the form of questions that needed analysis in solving them. However, if viewed from the affective side they were included in the A3 (valuing), which is the level of belief in a value that is in accordance with self-efficacy itself as a belief in its ability. Between cognitive and affective aspects (self-efficacy) have a relationship. This is in accordance with Wood's opinion (in Hasanah, et al: 5) which states that someone who can move their cognitive, motivation and solutions they face can be said to have high self.

The self-efficacy assessment instrument in the form of a test item is expected to be developed further so that it can be used to measure both the abilities of students in different domains. Self-efficacy is very important

to have in the world of education because it greatly influences student achievement. Additionally, when facing century education 21 students must be active so they need self-efficacy. Self-efficacy as measured using multiple choice is expected in the future to be used by educators in making multiple choice questions by looking at the guidebook. Multiple choice questions clearly have a relatively high level of relevance to the material, because the material from making self-efficacy in the form of material that has been submitted. Diagnosis on self-efficacy assessment instruments in the form of test items is also easier to do with intermediaries. The instrument in the form of a test is interpreted as a measuring instrument in which the diagnostic process is carried out by material intermediaries, so that it can be known which material is not yet understood (Amirano and Daryanto, 2016). Some of the advantages possessed by the self-efficacy assessment instrument in the form of item tests are expected to encourage someone, especially educators to use this self-efficacy assessment instrument in the world of education. Based on the product explanation in the results chapter above, it can be said that the self-efficacy assessment instrument in the form of a test the items that have been developed have links with science or science both in nature, the learning process and materially. It is hoped that the product can be used by educators, especially science educators, easily in

making evaluation instruments in learning.

CONCLUSION

Based on the results and discussion above it can be concluded that the product developed in the form of self-efficacy assessment instruments in the form of a test item based on science material, is suitable for use with minor revisions. The relationship between test items on self-efficacy items with self-efficacy questionnaire in general was positively correlated with Pearson correlation value of 0.154. The item test instrument was recognized to have more relevance to the natural science material than the self-efficacy questionnaire with the design of questions that had been developed based on self-efficacy theories that were linked to natural science theories.

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