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Developing Instrument Assessment of Student's Process Skills in Physics Learning Based on Local Wisdom

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ABSTRACT

The aim of this research is to produce instrument of student process skill assessment on project learning based on local wisdom gasing bamboo. The process skill assessment instrument is an observation sheet. The method used in this study refers to Mardapi development. The research step is to arrange instrument specification, write manuscript, study instrument, instrument test, instrument analysis and instrument revision. The instrument is validated by 10 validators for analysis through Aiken V and uses eduG-6e to calculate its reliability. The conclusion in this research is generated instrument of assessment process with its validity range between 0,73 until 1.00 and its reliability value equal to 1.00.

Keywords:[1]
Assesment instrument, local wisdom, project physics learning.

INTRODUCTION

Currently local wisdom began to be forgotten and replaced by technological advances very rapidly. In fact, local wisdom is a local cultural value that can be utilized to regulate the life of society wisely (Mungmachon, 2012). The lack of integration of local wisdom in learning leads to less contextual and meaningful learning (Pornpimon, C., Wallapha, A., & Prayuth, C , 2014). This is due to a lack of understanding of teachers in utilizing the environment as a medium and a source for the learning process, especially physics (Okland, G. M, 2012; Brooks, Sara., Dobbins, Kerry., Scott, J.A.,2014). Students become less concerned about the local wisdom they have. Local wisdom that has not been much integrated in learning can make learning less contextual and less meaningful, so that learners are less concerned about it (Kanhadilok, P., & Watts, M. Western, 2013). Learning has a function or role to inherit the culture of the nation to the younger generation so that the culture w ill be sustainable and can be passed on to the next generation (Ardiansyah,R., Suharno, Triyanto, 2018). Therefore, a local wisdom-based learning is required. Application of local wisdom in learning can stimulate students' sensitivity. Students can apply science, especially physics into the local culture possessed by their environment (Bowker, R., & Tearle, P, 2007). The local wisdom applied in the study of physics must have characteristics corresponding to the material of physics (Suastra, I. W. & Yasmini, L. P. B., 2013). The suitability of these characteristics facilitates the achievement of physics learning objectives. Indonesian traditional games are very diverse (Cahyono, N., 2011). Traditional games like *gasing*, yoyo, catapults can be made easily. The form of learning can be through games (games), simulations, field work (field work), and projects [(Mungmachon, 2012). The number of types and ease in making this makes local wisdom like the manufacture of gas can be applied in the learning of physics. Project learning focuses on the student process in building concepts, basic principles of materials and process skills through investigation, solving real problems and making carefully designed works (Gulay, B., 2015; Hosnan, 2014). Project learning can train students' process skills (Ergül, N. R., & Keskin, E., 2014; Kettanun, C.,2015; Lasauskiene, J., & Rauduvaite, A., 2015; Zouganeli, E., Tyssø, V., Feng, B., Arnesen, K., & Kapetanovic, N., 2014). Process skills can be measured through observation (Feyzioğlu, B., Demirdağ, B., Akyıldız, M., & Altun, E., 2012). Based on the description, it is necessary to do the learning based on local wisdom *gasing* through the project to measure the student's process skill.

Situation of the Problem

Learning and assessment cannot be separated. The purpose of the assessment is to monitor and evaluate the process, learning progress and improvement of learning outcomes on an ongoing basis. However, current assessments have not been made in accordance with the terms and standards (Subali, B.,

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2010). Most teachers focus more on cognitive assessment at the end of learning (Kulkarni, B.D., & Tendolkar, V.D., 2015; Saputra, D.I., Abdullah, A.G., & Hakim, D.L, 2014; Osadebe, U., 2014). The learning difficulties of students become undetectable quickly. Required assessment instruments to measure process skill. Previous research, produced syntax of outdoor learning model through local wisdom-based project in physics learning. Materials developed about circular motion (Damayanti, Indah Kurnia P., 2017). The assessment instrument has not been the main focus of prior research. Therefore, a study entitled the development of a process skill assessment instrument on project-based learning of local wisdom gasing needs to be done.

Aim of the Study

This research develops a valid and reliable instrument of students' process skill assessment. Instrument validity based on Aiken V coefficient analysis, while reliability is based on the G relative coefficient which is the edu_G program analyzes. Assessment instruments are used to measure students' process skills in participating in learning local wisdom-based projects, *gasing* bamboo from Central Java-Indonesia. Assessment instruments are in the form of observation sheets and assessment grids. The material of rotational dynamics and equilibrium of rigid bodies is integrated in bamboo *gasing*..

METHOD

This research method is an instrument development model developed by Mardapi (Mardapi, D., 2012). The model is presented in figure 1.

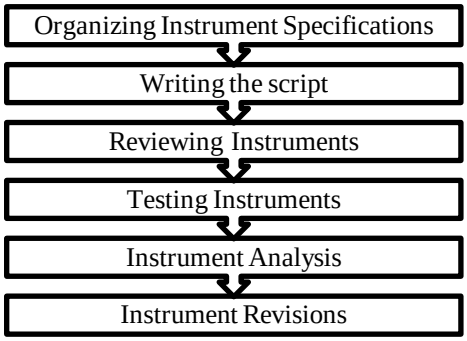

Figure 1. Research Method

In organizing instrument specification phase, the process skill assessment instrument consists of 7 aspects of process skills, each of which is described by several indicators. The number of assessment indicators is 19 which are stated in the statement on the grid of the assessment. And then, writing the script is doing by scriptwriting based on the grading grid. The scoring text is an observation sheet containing the assessment statement. Each of these statements has 4 score criteria. Instrument is reviewed by validators. The validity test involves 10 validators. The validation result is in the form of criticism and suggestion and score of each item. Criticism and suggestion use to the revision guidelines. The validator scores were analyzed to determine the validity of the instrument. The last, the instrument was piloted on 5 of 36 high school students of Muhammadiyah Muntilan 1 on testing phase. This activity involves 5 raters. 36 students undertook project studies based on local wisdom *gasing*. Scores of assessment results were analyzed to determine the value of the instrument's reliability.

Material

The instrument used to collect data is in the form of grids, rubrics and process skill observation sheets. Instrument data is validation scores which which are analyzed for validity using the Aiken V coeficient. Test data is student scores which are tested limited for reliability. The reliability analyse use the edu_G program.

Data Analyses

The analysis includes validity test and instrument reliability. Validity test was performed using *Aiken V* analysis. Reliability test using *eduG-6e.* To calculate *Aiken's V* index using formula 1.

$$V = \frac{\sum s}{(n(c-1))} \quad (1)$$

V is Aiken's V index, $\sum s$ is the number s of n raters, $s = r - l_0$, r is the score given by rater, l_0 is the lowest validity score, c is the highest validity score. The minimum limit of *Aiken's V* Index for the instrument is said to be valid in accordance with the Table of validity coefficients of the item, which is ≥ 0.73 with 10 validators (R, Aiken, 1985). *EduG* is a program developed based on Analysis of Variance (ANOVA) and Generalizability Theory (Hadi, S.,2018). G Theory is a "grand theory" of the dependability or reliability of behavioral measurement (Cardinet, Jean, Sandra Johnson, Gianreto Pini, 2010). The item is said to be reliable if the reliability value is more than 0.85 (Retnawati, 2016: 86). Instrument revision is done based on test result of validity and reliability.

FINDINGS

The specification of the process skills assessment instrument is presented in the form of a grading grid. This initial instrument consists of 19 items, which shows by Table 1.

Table 1. The grid Assessment of Process Skills

Aspect	Item Indicator	Statement	Item Code
1. Observing	a. Delivering observations	Student's skill in delivering observation result.	1a
	b. Collecting reference	The student's ability to collect references in learning	1b
	c. Observing with sensory devices	Student skills to use the sense apparatus in learning.	1c
2. Measuring	a. Using tools during project learning	The accuracy of students in operating measuring tools	2a
	b. Using a tool during an experiment.	The accuracy of students in operating the measuring tools.	2b
3. Experiment	a. Preparing for experiment	Readiness of students in conducting experiments	3a
	b. Designing product	Students skills in designing products	3b
	c. Experiment implementation.	The ability of students to carry out the work steps according to project procedures.	3c
4. Inference	a. Using data information in arranging inference	Ability to use data information in arranging inference.	4a
	b. Collecting data information	Ability to use data information.	4b
5. Predict	a. Developing experimental hypotheses	The ability of students in preparing experimental hypotheses.	5a
	b. Identifying variables	Students' ability to identify experiment variables	5b
	c. Identify relationships between variables	Students' ability to identify variable relations.	5c
6. Comunications	a. Submission of observation results	Skills of students in delivering observations	6a
	b. Presenting the product	The ability of students in presenting the product.	6b
	c. Grouping discussion	Students' ability to discuss in groups.	6c
7. Giving Conclusion	a. Developing ideas to explain the observations	Students' ability to devise ideas to explain observations	7a
	b. Stating a fact-based conclusion.	Ability of students to conclude based on facts.	7b
	c. Expressing the conclusions during the	The ability of students to conclude the discussion.	7c

Aspect	Item Indicator	Statement	Item Code
	discussion		

Each assessment statement is integrated into 4 categories of scores on observation sheet. One form of assessment show by Table 2.

Table 2. Rubric Assessment of Process Skills

Item Code	Statement	Criteria	Score
1a	Student's skill in delivering observation result.	1. Convey the observation result to the student group. 2. Delivering observations to other groups orally (presentation). 3. Delivering the results of observation in writing. 4. Delivering observations clearly.	

Rater writes a score based on the number of criteria met. A score 1 for 1 criterion accepted, a score of 2 to 2 criteria accepted and so on.

Instrument is then validated by 10 validators. Validation analysis shows that 16 of 19 items are valid, while 3 items are declared invalid. Details of content validation analysis show by Table 3.

Table 3. Results of Instrument Validation Item Analysis

Item Code	Aiken V	Decision	Information
1b	1.00	valid	No revision
1c	0.93	valid	Revision
2a	0.93	valid	Revision
2b	0.93	valid	Revision
3a	0.73	valid	Revision
3b	1.00	valid	No revision
3c	0.99	valid	No revision
4a	0.93	valid	Revision
4b	0.97	valid	No revision
5a	0.87	valid	Revision
5b	0.93	valid	Revision
5c	0.70	invalid	-
6a	1.00	valid	No revision
6b	0.99	valid	No revision
6c	0.60	invalid	-
7a	0.77	valid	Revision
7b	1.00	valid	No revision
7c	0.67	invalid	-

There are some valid items revised or without revisions. 7 items are valid without revision and 9 items are revisions based on validator records. Items which need to be revised are show by Table 4.

Table 4. Validator Suggestions

Item Code	Revision
1a	Among the scoring criteria clarified, there are spelling errors on the criteria.
1c	Among the scoring criteria clarified
2a	Criteria adapted to learning activities.
2b	There are spelling errors on the criteria.
3a	There are spelling errors on the criteria, aspects of the statement are tailored to the criteria

Item Code	Revision
4a	there are spelling errors on the criteria,
5a	aspects of the statement are tailored to the criteria
5b	There are similarity criteria on point 1 and 3
5c	**Aspects, indicators and assessment criteria are less appropriate, among assessment criteria is clarified.**
6c	**Aspects, indicators and assessment criteria are not appropriate**
7a	there are spelling errors on the criteria,
7c	Aspects, indicators, assessment criteria and lesson activities are less appropriate.

After the revision, instrument was tested limited. A limited trial was conducted on 5 of 36 students of grade X SMA 1 Muhammadiyah Muntilan, Jawa Tengah. 5 raters assessed 5 students in one group during project learning based on local wisdom *gasing*.

Table 5. Results of Instrument Reliabilty Analysis

Source of variance	Differentiation variance	Source of variance	Relative error variance	% relative	Absolute error variance	% absolute
S	0.04192		.....		.....	
	.....	B	.....		(0.00000)	0.0
	.....	R:B	.....		(0.00000)	0.0
	.....	SB	(0.00000)	0.0	(0.00000)	0.0
	.....	SR:B	(0.00000)	0.0	(0.00000)	0.0
Sum of variances	0.04192		0.00000	100%	0.00000	100%
Standard deviation	0.20475		Relative SE: 0.00000		Absolute SE: 0.00000	
Coef_G relative			1.00			
Coef_G absolute			1.00			

A test is conducted to measure the reliability of the item. Reliability test performed on 16 items that have been declared valid. Using eduG-6e analysis, the reliability of the instrument is shown by Coef_G relative which is 1.00, shown by table 5. The process skills assessment instrument is considered to be reliable.

RESULT, DISCUSSION, AND SUGGESTIONS

The development of process skill instruments is adjusted to the construction of non-test instruments. This research follows the steps developed by Mardapi, composed by organizing instrument specifications, writing the script, reviewing instruments, testing, analysis and revisions (Mardapi, 2008). The instrument of the process skills developed is the observation sheet. Instrument process skills are used to assess students' process skills. Process skill instruments consist of grids, process skills assessment rubrics and observation sheets.

A good instrument must has three characteristics, validity, reliability and reusability (Miller, Linn & Grondund. 2009: 70). Therefore, the validity and reliability in this study is a benchmark for quality of assessment instrument. The purpose of the assessment must be clearly and decisively formulated and determined from the start (Mardapi, 2012; Istiyono, 2014, 99). Assessment instruments are used to measure students' process skills during learning projects based on local wisdom. The appropriate way to measure the process skills is through practicum, oral presentation and observation (Feyzioğlu, Demirdağ, Akyıldız, & Altun, 2012). The assessment instrument is in the form of assessment grids, observation sheets and assessment rubrics. The grid in the form of test questions and non-test mapping format that serves to describe the distribution and specifications of items in various topics or topics (Mardapi, 2012; Istiyono, 2014: 101). The preparation of instrument skills assessment processes is based on aspects of process skills. The

aspects of process skills developed are translated into several indicators, namely observing, measuring, experiment, inference, predict, communications, and giving a conclusion. The indicator is translated into 16 items on the observation sheet. Each indicator has 4 assessment criteria. Instruments are said to be good if they meet the standards of validity and reliability (Miller, Linn & Grondund. 2009: 70). In the validity test, the minimum limit of Aiken's V Index for the instrument is validity of the items, which is ≥ 0.73 with 10 validators (R. Aiken,1985). The item is said to be reliable if the reliability value is more than 0.85 (Retnawati, 2016: 86).

Assessment in learning requires thinking about learning experiences (Asysyifa, D.S., Jumadi, Wilujeng.I. & Kuswanto, H., 2019). One learning experience is students doing project learning. The instrument for assessing process skills can only be used in project learning. Students make gasing in groups during project learning. *Gasing* is one type of traditional Indonesian game. It is maked by bamboo with cilynder form. *Gasing* is played by turning it using a rope. The rope is wrapped around the top shaft. When the rope is pulled the top bamboo, gasing will spin quickly. The phenomenon of rotational dynamics and rigid equilibrium can be observed by students through top movements of *gasing.*

Based on the results of research and discussion can be concluded that the overall grain instrument assessment of the process skills of students on project-based learning local wisdom *gasing* is valid with a range of 0.73 to 1.00 and reliable with reliability value of 1.00. The assessment instrument developed in the project learning was more focused on making local wisdom *gasing* bamboo. For further research, it is necessary to develop learning assessment instruments that are focused on other types of local wisdom.

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