

# Application of Student's Worksheet Based on Local Wisdom in Physics Learning of The Tenth Science-Grade Student of SMA Negeri 1 Sungguminasa

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**Abstract.** This is a pre-experimental research using one-shot case study design that aims to get the description of physics learning outcomes from cognitive, affective and psychomotor aspect of students in Tenth Science-Grade of SMA Negeri 1 Sungguminasa Academic Year 2014/2015 after being taught by using worksheet based on local wisdom. The subject in this research were students in class X MIA 5 that consist of 41 people. Descriptive analysis showed that in the realm of cognitive, about 2.44% of students ranked in the "very understanding" category, while 90,24% of students were in the "understanding" category and the remaining 7.32% were in the "quite understanding" category. In affective aspect, there are about 95.12% of students who were in the "good" category and 2.44% were in the "quite good" category. Meanwhile, in psychomotor aspect, "highly skilled" category occur in 7.32% of students, while 73.17% of students were in the "skilled" category and the remaining 19.51% were in the "skilled enough" category. The result indicated that the physics learning achievement of students in the whole three aspects is good. Thus, it can be concluded that learning physics by applying worksheet based on local wisdom is one of the alternative that can be used to maximize the physics learning outcomes of students.

**Keywords:** *learning outcome, local wisdom, worksheet*

## INTRODUCTION

Formation of nation's high quality generations is determined by the education that took place in that nation. In Indonesia, the quality of the expected generation is eligible as a "perfect man", the man that has strength, insight, action and wisdom to get to know himself as well as his potential. This is suitable with the objectives of Indonesia's national education as stated in Law No. 20 Year 2003 on National Education System that national education aims to develop students' potentials to become a man of faith and fear of God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and become citizens of a democratic and accountable.

The condition of education in Indonesia at this time is not as expected, although it has undergone several changes throughout the curriculum, but the quality of education still lags behind other countries. One factor that might be crucial for the progress of a country is the mastery of science and technology which is increasingly growing. This mastery is required in order to always follow the rapid development of science and technology nowadays.

Physics as one of the subjects that have contributed greatly to the development of science and technology nowadays. Physics is actually an interesting subject to study. It covers all aspects of the physical material that touches the aspects of life, both microscopic and macroscopic. Characteristics of microscopic and macroscopic life can be explored using physics that needs skills in numeracy and understand the meaning of each symbol. This is the key to understand the physics well. Physics would be more meaningful if there is continuity between the subject

matter with the activities of students' daily life in neighborhood which use as a learning tool. It can be obtained through the application of physics' materials associated with local wisdom of the area.

Every region has the identity of its local wisdom. Local wisdom is at the discretion of the local communities that rely on the philosophy of values, ethics, and behavior in ways that traditionally institutionalized. Local wisdom is a cultural identity that need to be introduced to younger generations through education for local young generation that is later able to defend its own country.

One of local wisdom which exist at Makassar is *A'bulu Sibatang*. The meaning of *A'bulu Sibatang* is "strength of unity" (Martawijaya et al, 2014). In connection with that meaning, Anwar Ibrahim (Martawijaya et al, 2014) suggests that there are eight behaviors that must be maintained to realize *A'bulu Sibatang*, some of them are honest with each other, cooperation within the group, and confirming the truth. These characters should be owned by the local young generation so that the value *A'bulu Sibatang* will not fade by the inclusion of other cultures from outside.

One way to instill the values of local wisdom to the younger generation is to integrate it with the classroom learning. This is suitable to research conducted by Herman (2013), which revealed that learning process based on local wisdom will help students to solve problems that will be faced in the community. This integration can be done by applying local wisdom on learning media that is used in the classroom, such as student's worksheet.

The use of student's worksheet in the learning process plays an important role, because students are required to find a conclusion of the existing problems. Worksheet which frequently use by physics teacher in the classroom is a worksheet that already contained in the handbook. This kind of worksheet is indeed able to help students to find the solution of the problems given relating to the material being taught. In addition, this worksheet also able to assist students in terms of cognitive. However, it less contribute in terms of affective, whereas it is more preferred in the implementation of the current 2013 curriculum.

One of the schools that could be a test site is SMA Negeri 1 Sungguminasa. This school is a school that is located in the center of Sungguminasa, where the society is surrounded by the value of *A'bulu Sibatang*. In addition, the majority of students who attend this school are coming from Makassar cultural backgrounds. Hence, the school is considerably able to host this research.

Based on the results of preliminary observations conducted at that schools, it was found that the value of local wisdom *A'bulu iSbatang* has declined, resulting in frequent irregularities committed by the student, such as dishonesty in the exam, disrespect to the teacher who was giving an explanation, and the difficulty of cooperation among fellow to produce an agreement in the learning process, as well as other deviations values of local wisdom local *A'bulu Sibatang* committed by the students. The result indicates that there are a number of students' characters that need to be fixed, such as honesty, curiosity, cooperation, and agreements. Otherwise, it is concerned that the younger generation will lose their cultural identity and the character which develop in themselves will be more likely to imitate the foreign culture.

Looking back at the past, improvements in character and learning outcomes of the young generation was a major problem which attempt to be solved by researchers. One of them was the research conducted by Martawijaya (2014) that aims to improve the character and completeness of students' learning outcome in one of junior high school at Barrang Lompo Island. Solutions conducted by researchers was to develop learning model and media based on local wisdom of Barrang Lompo Island's community, namely *A'bulu Sibatang*. The result showed that the physics learning model based on local wisdom was eligible a valid, practical and effective criteria so that it can improve the students' character and learning outcome.

Based on what has been outlined above, seeing that indigenous of Sungguminasa also rely on *A'bulu Sibatang* as their local wisdom, researchers are offering solutions to overcome the above mentioned problems by doing the adaptation and modification of Martawijaya's research and applying worksheet based on local wisdom of *A'bulu Sibatang* in the learning process. By applying this worksheet in school located in the downtown, the expected results will not be much different from previous research that has been done in the school which is located on the Barrang Lompo Island.

Therefore, researchers interested in conducting research titled "Application of Student's Worksheet Based on Local Wisdom in Physics Learning of The Tenth Science-Grade Student of SMA Negeri 1 Sungguminasa"

## RESEARCH METHOD

### Type of Research

This research is a Pre-Experimental with a one-shot case study design. The research design can be described as follow:

X O

(Sugiyono, 2008)

Information:

- X : Treatment in each physics learning process by applying students' worksheet based on local wisdom for students who are the focus of research, yet keep engaging the other students.
- O : Measurement of learning outcome in term of cognitive after completing the whole learning process using local-wisdom-based worksheet for students who become the focus of research by keep engaging the other students, while the measurement of learning outcomes in the affective domain (character) and psychomotor (skills) conducted in every meeting.

This research was conducted at SMA Negeri 1 Sungguminasa, Gowa Regency, and South Sulawesi Province. The research was conducted in the second semester of 2014/2015 academic year precisely on April 16 until May 21 2015

### Research Variables

- Independent Variable  
In this study, the independent variable is local-wisdom-based worksheet, which defined as group investigation worksheets relying on *A'bulo Sibatang* to achieve the expected learning outcomes
- Dependent Variables  
The dependent variables in this study are the result of learning physics outcomes in terms of cognitive, affective and skills
  - Physics learning outcomes in the realm of cognitive is the total score obtained by the students based on the results of the written test in the form of evaluation questions which is given after the whole process of learning ends.
  - Physics learning outcomes in the realm of affective is the total score obtained by the students based on affective-assessment sheets aiming to assess the students' character of an honest, curious, cooperation, and an agreement. The assessment was performed every learning process.
  - Physics learning outcomes in the realm of skills is the total score obtained by the students based on skill-assessment sheets aiming to assess the ability of students in preparing equipment and materials, stringing experimental tools, doing lab work, recording observations, and presenting the results of lab work. The assessment was performed every learning process

### Subject Research

Subjects in this study were students of class X MIA 5 SMA Negeri 1 Sungguminasa in 2014/2015 academic year, consisting of 41 students, 11 men and 30 women, who have Makassar-cultural background. This study focused on 3 students whose characters are deviated which aim to see their learning outcomes after applying students worksheet based on local wisdom in the learning process

## DATA ANALYSIS TECHNIQUES

Data analysis techniques that are used in this research is descriptive analysis. Descriptive analysis is shown in the form of average, standard deviation, maximum score, minimum score and variance

- Average  
The average score was obtained using the following equation:

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i} \quad (1)$$

Where the data compiled in the frequency distribution list:

$\bar{x}$  = The average score

$x_i$  = Class mark interval

$f_i$  = Frequency corresponding to the class mark  $x_i$

- Variance

Variance was obtained using the following equation:

$$S^2 = \frac{n \sum f_i x_i^2 - (\sum f_i x_i)^2}{n(n-1)} \quad (2)$$

- Standard Deviation

Standard deviation was obtained using the following equation:

$$S = \sqrt{\frac{n \sum f_i x_i^2 - (\sum f_i x_i)^2}{n(n-1)}} \quad (3)$$

Where:

S = standard deviation

$x_i$  = class mark interval

$f_i$  = Frequency corresponding to the class mark  $x_i$

N = number of samples ( $n = \sum f_i x_i^2$ )

Physics learning outcomes of will be converted into the value of competence and predicate according to following table in accordance with Regulation of the Minister of Education and Culture No. 104 Year 2014 on the Assessment of Learning Outcomes by Educators on Primary and Secondary Education.

**TABLE 1.** Learning Outcomes Assessment Criteria

Predicate	Competence Score		
	Cognitive	Psychomotor	Affective
A	3.85 – 4.00	3.85 – 4.00	Very Good
A <sup>-</sup>	3.51 – 3.84	3.51 – 3.84	
B <sup>+</sup>	3.18 – 3.50	3.18 – 3.50	
B	2.85 – 3.17	2.85 – 3.17	Good
B <sup>-</sup>	2.51 – 2.84	2.51 – 2.84	
C <sup>+</sup>	2.18 – 2.50	2.18 – 2.50	Quite Good
C	1.85 – 2.17	1.85 – 2.17	
C <sup>-</sup>	1.51 – 1.84	1.51 – 1.84	
D <sup>+</sup>	1.18 – 1.50	1.18 – 1.50	Less good
D	1.00 – 1.17	1.00 – 1.17	

In addition, the assessment results in the realm of affective will be divided into criteria based on the table below

**TABLE 2.** Affective Domain Assessment Criteria

Score	Information
3.6 – 4.0	Been Entrenched
2.6 – 3.5	Start Growing
1.6 – 2.5	Start Seen
1.0 – 1.5	Not Seen

## RESULT AND DISCUSSION

The descriptive analysis presented in this section is descriptive analysis for students' physics learning outcomes score at class X MIA 5 SMA Negeri 1 Sungguminasa in realm of cognitive, affective and skills. The description in cognitive domain can be described as follows.

**TABLE 3.** Descriptive-Statistic Score of Physics Learning Outcomes in Cognitive Domain

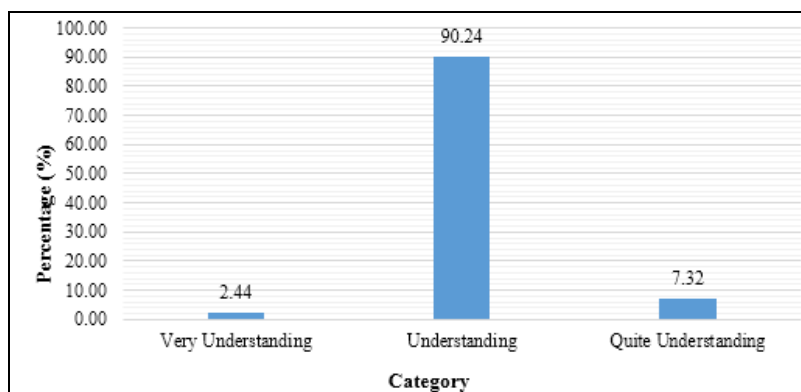
Statistic	Statistic Score
Number of Sample	41.00
Maximum Score	27.00
Minimum Score	16.00
Maximum Ideal Score	30.00
Average Score	22.26
Standard Deviation	2.46
Variance	6.06

Table 3 shows the number of samples, the maximum score, minimum score, the maximum ideal score, the average score, standard deviation and variance. This score was obtained by giving a written test in the form of 30-numbers multiple choice after all the learning process ends. The test results showed that of a maximum score of 30, the highest score that can be achieved by the students was 27 while the lowest score was 16. These numbers revealed that the average score is 22.26 with a variance of 6.06 and a standard deviation of 2.46. If the score results of this study were analyzed by using percentage in the frequency distribution, it can be presented in tabular form as follows.

**TABLE 4.** Frequency Distribution and Percentage Score of Cognitive-Learning Outcome

Score	Predicate	Information	Frequency	Percentage (%)
3.85 – 4.00	A		0	0.00
3.51 – 3.84	A <sup>-</sup>	Very Understanding	1	2.44
3.18 – 3.50	B <sup>+</sup>		14	34.15
2.85 – 3.17	B	Understanding	12	29.27
2.51 – 2.84	B <sup>-</sup>		11	26.83
2.18 – 2.50	C <sup>+</sup>		2	4.88
1.85 – 2.17	C	Quite Understanding	1	2.44

Apart from Table 4, the description of students' learning outcomes can be explained using the following figure.



**FIGURE 1.** Graph of Students' Learning Outcomes Percentage Distribution in the Realm of Cognitive

Physics learning outcomes of students were also measured at the affective aspect. Those scores can be described as following table

**TABLE 5.** Frequency Distribution and Percentage Score of Affective-Learning Outcome

Score	Predicate	Information	Frequency	Percentage (%)
3.85 – 4.00	A		0	0.00
3.51 – 3.84	A <sup>-</sup>	Very Good	0	0.00
3.18 – 3.50	B <sup>+</sup>		32	73.17
2.85 – 3.17	B	Good	8	19.51
2.51 – 2.84	B <sup>-</sup>		0	0.00
2.18 – 2.50	C <sup>+</sup>		1	2.44
1.85 – 2.17	C	Quite Good	0	0.00

Table 5 shows that from 41 respondents, there are no students rank predicate A or A<sup>-</sup>, however, there are 32 students on the predicate B<sup>+</sup> with a percentage of 78.05%, 8 people on the predicate B at 19.51%, and one person on the predicate C<sup>+</sup> at 2.44%. In this aspect, some assessed characters are honest, curious, cooperation, and agreed. The percentage of students' achievement for each of these characters is as follows.

**TABLE 6.** Characters' Percentage Assessed in Affective Aspects

Characters	Average Score	Percentage (%)
Honest	2.9	72.5
Curious	3.0	75.0
Cooperation	4.0	100.0
Agreed	3.0	75.0

Table 6 shows the average percentage score obtained by the students. Based on the assessment criteria in Table 2, it appears that honest, curious and agreed mark on the category "start growing" with the percentage respectively 72.5%; 75.0% and 75.0%, while the character of cooperation is in the category "been entrenched" with a percentage of 100%. This description can be seen in the following figure.

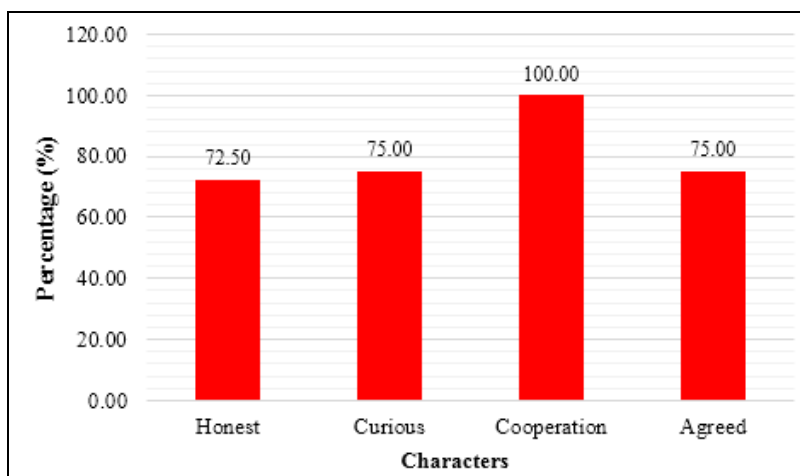


FIGURE 2. Graph of Assessed Characters in the Realm of Affective

In addition to cognitive and affective aspects, measurement of learning outcomes was also conducted on the skill aspect. The scores can be describes as follows.

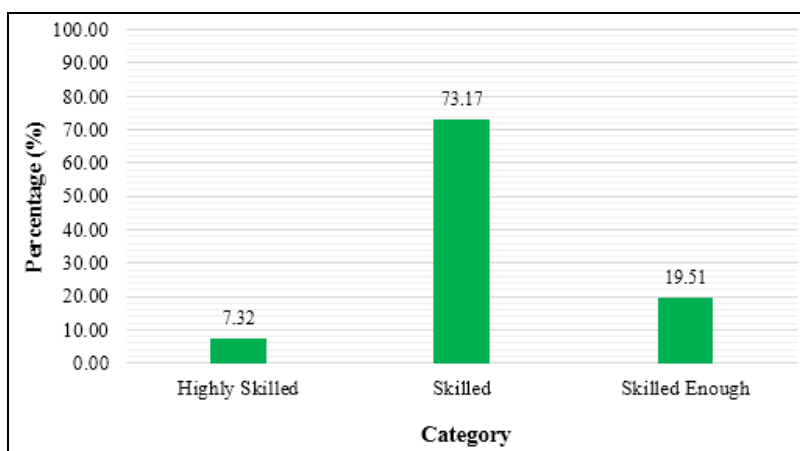


FIGURE 3. Graph of Students' Learning Outcomes Percentage Distribution in the Realm of Psychomotor

The above figure indicates that there are 7.32% or 3 students rank the predicate A- while 24.39% or 10 students appear in predicate B+, other 15 student or 36.59% and 5 students or 12.20% happens in predicate B and B- respectively. The remain 19.51% occur in predicate C which divided into 7.32% (3 students), 9.76% (4 students), 2.44% (1 student) rank the predicate C+, C, and C- respectively.

Furthermore, the results of this aspect is the calculation of the acquisition scores obtained based on several indicators which are preparing equipment and materials, stringing experimental tools, conducting practicum, recording observations, and presenting the results of practicum. The percentage can be described as following table.

**TABLE 8.** Targeted Students' Recapitulation Learning Outcomes

Respondent Number	Cognitive	Affective	Psychomotor
16	B	C+	C-
34	B-	B+	C
35	C	B+	C

Based on Table 8, in terms of cognitive and affective, there is 1 student who is in the category of "quite understanding", while 2 other students have been able to achieve the category of "understanding". But in terms of skills, all of them are only able to reach the category of "quite understanding".

This research is a Pre Experiment with a one-shot case study design. This study aims to determine the description of physics learning outcomes of students after being taught using students' worksheet based on local wisdom. In this case, the intended learning outcome is the result of learning in the cognitive, affective and skills. This research was conducted by taking a class as a research subject to be taught using students' worksheet based on local wisdom.

This research was conducted as many as five meetings (excluding the posttest). However, researchers have done three times habituation meetings previously. The purpose of this habituation is to minimize the possibility of error when teaching the material, in this case it is static fluid. Hence, the learning process using local-wisdom based worksheet can be maximized.

The results of this study indicate that the application of students' worksheet based on local wisdom in the process of learning can help students to maximize their cognitive. In addition to the cognitive, physics-learning outcomes are also evaluated from the affective aspect. Some assessed characters in this aspect are honest, curious, cooperation and agreed. Overall, the percentage of physics affective learning outcomes showed good results as described earlier. Furthermore, the most prominent character on the students is cooperation. One of the factors that support this achievement is the given explanations by researchers at the beginning of learning process about the importance of working in an *A'bulu Sibatang* atmosphere during the learning process, as well the majority of the students already understand the value of *A'bulu Sibatang* itself. As a result, researchers do not find difficulties in her explanation.

Apart from cognitive and affective, students' learning outcomes also assessed in skill aspect. Some assessed indicators are preparing equipment and materials, stringing tool experiment, conducting practicum, recording observations and presenting practicum's result. Of the five evaluated indicators this aspect, "recording observations" skill obtained the lowest percentage. This was because most of the students were not capable at writing observations result in accordance with the rules of significant numbers, even though they have learned this chapter in the previous semester.

Another thing that also hinder the achievement of students in the skills aspect is the limited tools and materials provided by the school causing the students are not too familiar with the laboratory equipment. Therefore, when dealing with the provided tools and materials, some students are less able to operate them properly.

Sudjana (2002) revealed that the learning outcomes are changes in behavior which covers the areas of cognitive, affective and skills possessed by students after receiving a learning experience. Overall, the changes in behavior of students in these three aspects show the similarity. If the learning outcomes on cognitive aspects stand in the category of "very understanding", the affective and psychomotor also in the category that is not much different. Likewise the students who are in the category of "understanding" and "quite understanding".

Moreover, there are 3 students who were targeted to see the changes after being taught using worksheet based on local wisdom. Based on the results of preliminary observations before the research was conducted, there was information that students often showed a negative attitude toward some subjects, including physics. One of the negative attitude shown was ignorance attitude towards physics which seen from their frequent truant during school hours. However, during the research process, they never miss a single meeting, even based on the results of observations made during the learning process, students show a good attitude during the learning process, even though they came late in several meetings.

In addition, other information obtained before the research was conducted showed that these 3 students were a difficult person to work with. They were lazy to collect their assignment and most often cheating in exam. However, based on observations made during the learning process, they were able to mingle with their peers to cooperate for solving the given problems. In terms of performing tasks, they are beginning to show a more positive attitude, as do the tasks given by the researchers, although they submitted them lately. However, the attitude of cheating when a test is in progress still appear on these three students.

The changes that have not been satisfied which obtain from these 3 students is due to the application of learning is only performed at several meetings only. Consequently, the result was not maximal. In addition, the application of *A'bulu Sibatang* local wisdom only acquired when students learn physics. Thus, it will be difficult for them to continuously implement the characters which tried to be improved by researchers. Regardless of these shortcomings, the achievement which they had obtained showed that the learning process by applying local wisdom-based worksheet was able to help students to be more positive towards physics.

The overall results of this study indicate that the achievement of learning outcomes of physics in the three aspects showed good results. However, that does not mean that obstacles were not appear during the research. One of them is the arrangement of group members. Initially, the researcher asked the students to choose their own members of the group in order to make it easier for them to cooperate. Apparently, there is one group whose majority members are students who are ignorant to learning process. As a result, researcher decided to spread them



to other groups. Another obstacle faced by researcher is that when conducting assessments during the practicum where there are large number of students causing difficulties in assessing them. Hence, researcher have to find two other observers for helping assessing students.

Habituation conducted by researchers before teaching the subject also could not guarantee that the learning will not encounter any obstacles, since researcher also considered the availability of experiment equipment which only could use by several groups, causing the researchers had to cover the shortage. In addition, members of the group in this study is s relatively large, which are 5 students, which require well classroom management and good feedback in order that the practicum conducted by students can be more effectively. Nevertheless, the outcome of physics learning in aspects of cognitive, affective, and skill shown good results, as seen in the results of the data analysis.

The above discussion provides information about the physics-learning outcomes of students obtained both during the learning process and after all the learning activities has ended. Thus, it can be said that learning physics by applying local wisdom-based worksheet is one alternative that can be used to maximize the learning outcomes of physics among students of tenth science grade at SMA Negeri 1 Sungguminasa

## CONCLUSION

Based on what has been outlined above, it can be concluded that after being taught by applying local-wisdom based worksheet, physics-learning outcomes in the realm of cognitive of students in class X MIA 5 at SMA Negeri 1 Sungguminasa on 2014/2015 Academic Year obtain 2.44% in the "very understanding" category, while 90.24% of students are in the "understanding" category and the remaining 7.32% were in the "quite understanding" category. In affective aspect, there are about 95.12% of students who were in the "good" category and 2.44% were in the "quite good" category. Meanwhile, in psychomotor aspect, "highly skilled" category occur in 7.32% of students, while 73.17% of students were in the "skilled" category and the remaining 19.51% were in the "skilled enough" category

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