Development Instrument’s Learning of Physics Through Scientific Inquiry Model Based Batak Culture to Improve Science Process Skill and Student’s Curiosity

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Abstract. This research aims to: (1) developed a instrument’s learning (lesson plan, worksheet, student’s book, teacher’s guide book, and instrument test) of physics learning through scientific inquiry learning model based Batak culture to achieve skills improvement process of science students and the students’ curiosity; (2) describe the quality of the result of develop instrument’s learning in high school using scientific inquiry learning model based Batak culture (lesson plan, worksheet, student’s book, teacher’s guide book, and instrument test) to achieve the science process skill improvement of students and the student curiosity. This research is research development. This research developed a instrument’s learning of physics by using a development model that is adapted from the development model Thiagarajan, Semmel, and Semmel. The stages are traversed until retrieved a valid physics instrument’s learning, practical, and effective includes : (1) definition phase, (2) the planning phase, and (3) stages of development. Test performed include expert test/validation testing experts, small groups, and test classes is limited. Test classes are limited to do in SMAN 1 Padang Bolak alternating on a class X MIA. This research resulted in: 1) the learning of physics static fluid material specially for high school grade 10th consisted of (lesson plan, worksheet, student’s book, teacher’s guide book, and instrument test) and quality worthy of use in the learning process; 2) each component of the instrument’s learning meet the criteria have valid learning, practical, and effective way to reach the science process skill improvement and curiosity in students.

1. Introduction
The purpose of national education, among others, is a human who has the ability of science and technology with the attitude and behavior in accordance with the values of the Indonesian nation. In the list of laws no.20 of 2003 on the national education system which states that national education serves to develop the ability and build the character and civilization of the nation, the choice for the development of potential learners to be a human being who believes, piety to God Almighty, noble character, healthy, knowledgeable, capable, creative, independent and become a democratic and responsible citizen (Depag RI, 2006).

Meanwhile, Indonesia is a country with a diversity of ethnic cultures and religions, where indigenous Indonesians consist of more than 300 ethnic groups with unique cultural identity and language and when viewed from the geographical conditions of Indonesia as an archipelagic country, the population is scattered in the mountains, coastal areas or in mainland with diverse environmental characteristics.
(Danoebroto, 2012). This shows that Indonesia is a country with a very multicultural population.
However, the dynamics of plurality due to the current era of globalization have a negative impact on
the culture of the Indonesian nation with the erosion of regional cultural values and the spirit of
nationalism caused by the impact of cultural values adopted by Indonesian society with the values of
culture from outside, the Indonesian nation to lose its identity (Danoebroto, 2012).
One of the efforts that can be done is through the school environment that takes into account the local
culture to know each other and understand the cultural diversity so as to cause mutual respect for the
same or different ethnic identity. The classroom is considered quite effective as a place to recognize
and re-understand the traditions and cultures that exist in Indonesia. It is also in line with the purpose
of national education, it is necessary components that must be considered by the teacher as a
preparation of the need for the learning process in the classroom such as learning approaches, learning
models, student characteristics, environment as a source of learning to the traditional culture of society
so expected learning process able to give birth to intellectual students and appreciate local cultures.
Therefore, it is necessary to arrange learning tools that contain these components so that it can be used
to direct the learning process that will take place in the
Science is an approach to studying nature (McLelland, 2003). Science as an academic discipline
involves learning concepts as well as processes (Guevara & Almario, 2015). Physics subjects become
very important position in society because physics is always around us in everyday life. Physics is not
taught simply by providing an understanding of the notions, facts, concepts, principles but also
discovery through the process of searching by real action. Based on the characteristics of physics,
physics learning at this time is not only emphasized on the product but also on the process. Scientific
process skills are the thinking skills used to build conceptual knowledge so as to solve problems and
formulate results (Ozgelen, 2012). The development of understanding in science depends on the
ability to perform process skills in scientific behavior (Harlen, 1999). In line with that, in the process
of physics learning itself there are characters that can be implanted to students so that after the
learning of the students not only have the skills but also the formation of student characters. One of the
characters that can arise from science learning especially physics is curiosity.
Observation of the authors of the observation of learning in the classroom and interviews of teachers
and students in SMA N 1 Padang Bolak show the fact in the field that the learning instrumentss used
by teachers more dominant using the book package obtained without any modification and adjustment
of the teacher so it looks no the process of developing student knowledge. In addition, learning tools
used by teachers in the classroom are still less attention to the environment as a source of learning
where the local culture in the community and the environment can be used as a learning material that
is associated with physics itself so that students have a meaningful science process skills because of
observing and build their knowledge through the cultural facts that exist in the vicinity as well as
students’ understanding of local socio-cultural values that can provide a positive influence on the
formation of student characters.
The scientific inquiry learning model, students are guided by the teacher to understand physics.
Furthermore, scientific inquiry based learning can improve the science process skills and students’
attitudes toward science (Ergul et al. 2011; Turpin 2004). The core of the scientific inquiry learning
model involves students in investigating the real problem by confronting them in the investigation,
helping them identify methodological or conceptual problems in addressing the problem. The
instructional effect of the scientific inquiry learning model is the research process (Joyce, 2009). In
addition, the learning process using scientific inquiry model based on Batak culture is expected to help
students in the process of physics learning itself. This is in line with the results of research that
explains the importance of science curriculum based on local culture can facilitate students in learning
by linking aspects of culture in science learning (Hardoyono, 2007).
Stages in scientific inquiry learning is an inquiry activity that can foster students’ curiosity. This is in
accordance with the opinion of Pluck and Johnson (2011) which states that inquiry learning has an
advantage in generating student curiosity that is part of intrinsic motivation. The indicators of curiosity
used in this study are according to Harlen (2000) modified with indicators according to Kemendiknas
(2010).
Scientific process skills are a process whereby exploring and obtaining the evidence used to develop ideas (Harlen & Elstgeest, 1992). The science process skill indicators used are observing, asking questions, formulating hypotheses, predicting, finding patterns and relationships, communicating effectively, designing and creating, designing and planning inquiry, manipulating materials and tools effectively, and measuring and counting. The purpose of this research is to 1) describe the quality of learning instruments using scientific inquiry model based on Batak culture on static fluid material in terms of validity, practicality, and effectiveness, 2) to know whether the science process skill of students taught by learning instruments of scientific inquiry model based on Batak culture can increase, and 3) to know whether the curiosity of students taught by learning tools using scientific inquiry model based on Batak culture can increase.

2. Method
The population in this study is all students X SMA Negeri 1 Padang Bolak. The sample technique is done by purposive sampling. The subjects of small group development of learning instruments are X class MIA students with 10 students and the subjects of limited class trial are 32 students of X MIA SMA Negeri 1 Padang Bolak.

The variables in this study are: independent variables in this study is scientific inquiry model inquiry based on Batak culture, and the dependent variable in this research is science process skill and student's curiosity.

This research includes the type of development research by using Thiagarajan, Semmel and Semmel development model that is modified 4-D model (define, design, develop, disseminate). Learning tools developed consist of Lesson Plan (LP), Student Work Sheet (SWS), Student Book (SB), Teacher Book (TB).

Research instrument consisting of student science skill test activity, student's curiosity observation sheet, student activity observation sheet, learning management observation sheet, student response sheet, and instructional instruments validation sheet.

The experimental design used in this study is one-group pretest-posttest design that can be shown in Table 1.

| Table 1. Research Design of One-Group Pretest-Posttest |
|------------------------------------------------------|
| Pretest | Treatment | Posttest |
| O1 | X | O2 |

(Sugiyono, 2010)

Note:
O1 : Prettest of Scientific Process Skill
X : Treatment with learning instruments with model scientific inquiry based batak culture
O2 : Posttest Scientific Process Skill

3. Result
Based on the results of the analysis and discussion in this study, presented the results of research learning instrumentst that have been developed and have been tested otherwise valid, praktis, and effective. This is because the learning tools that have been developed meet the criteria of validity, practicality, and effectiveness based on the criteria:

a. The four validators concluded that the LP, SWS, Student Books and Master Books, student's curiosity observation sheets, and science process skill tests can be used with minor revisions and these revisions have been corrected in accordance with the validator streaks.

b. Student positive response for 32 students reach 90.97% that is included in the category of positive response.

c. The overall average score on the assessment of the implementation of teaching materials component is in the practical criteria of 3.62 including the high category.
d. Student activities in each meeting during the learning process using learning tools based on scientific inquiry model based on Batak culture in the trial of limited classes has increased.

e. The level of completeness of the students' science process skills in the classroom trial is limited to 87.5%. Improving students' science process skills using learning tools based on scientific inquiry model based on Batak culture on static fluid material with normalized gain of 0.66 with medium category.

f. Increasing students' curiosity using learning tools based on scientific inquiry model based on Batak culture on static fluid material is experiencing an increase in some indicators of curiosity viewed from the increase of graph in each meeting that is on the following indicators: 1) enthusiastic to seek answers each questions, 2) attention to the observed object, 3) enthusiastic on the science process, 4) putting on every step of the activity.

4. Discussion

4.1. Instruments Development Product Valid through Scientific Inquiry Model Based on Batak Culture

Learning instruments development products are said to be valid if the assessment of the four validators on the whole learning instruments is in the "quite valid" category. The validation results of the overall learning tools developed are presented in table 2 below:

| Developed Instruments          | Category |
|-------------------------------|----------|
| Lesson Plan                   | Valid    |
| SWS                           | Valid    |
| Students Book                 | Valid    |
| Teacher Book                  | Valid    |
| Science Process Skill Test    | Valid    |
| Observation Sheet of Students | Valid    |
| Student Curiosity             | Valid    |

4.2. Practical Instruments Development Products through Scientific Inquiry Model Based on Batak Culture

Learning instruments development products are said to be practical if they meet the criteria in terms of: 1) expert assessment / practitioners of developed learning tools can be used with little revision; 2) in terms of the average total component of teaching materials is 3.62 including high category.

4.3. Effective Instruments Development Products through Scientific Inquiry Model Based on Batak Culture

The effectiveness of learning tools developed through scientific inquiry model based on Batak culture has fulfilled the effective criteria in terms of: 1) students' learning completeness in the classical that is at least 80% of students who follow the learning able to achieve score ≥ 75, where students' learning completeness in classical reach 87.5% with learning tools developed; (2) students' positive response reaches 90.97%; (3) student activity in every learning meeting has increased. Based on posttest analysis result of limited class test, it is found that science process skill has fulfilled classical mastery criteria. This is due to the material and the problems that exist in the student book and student activity sheets developed in accordance with the condition of student learning environment and refers to the study of scientific inquiry model based on Batak culture. The learning process that takes place can be understood more easily by the students because the material taught relates to the culture and environment of everyday students so that students can learn concepts in concrete and real. Based on the results of research Hardoyono (2007) also obtained that the curriculum should pay attention and care about the socio-cultural system that develops and applies in a society. Similarly, the development
of IPA curriculum needs to integrate the traditional science load so that the learning process becomes meaningful and contextual. In addition, the results of the research from Hussain et al. (2011) explained that there is a significant difference between scientific inquiry and combination scientific inquiry method with conventional learning toward student learning result, which is characterized by students’ ability in applying physics concepts in real life.

4.4. Improving Student Science Process Skills
Based on data of pretest and posttest score of science process skill Student obtained got minimum score (Xmin), maximum score (Xmax), average value (\( \bar{X} \)) and gain as follows:

| Test  | \( \bar{X} \) | Gain | \( \frac{\text{Gain}}{\text{Max}} \) | Category |
|-------|--------------|------|-----------------|----------|
| Pretest | 18.03 | 14.56 | 0.66 | Moderate |
| Posttest | 32.59 | | | |

**Figure 1.** Improved science process skills on a Limited Classroom Trial.

Based on table 3 and figure 1 it can be seen that after using teaching materials of scientific inquiry model based on Batak culture, the result of students' science skill test is increased which is indicated by posttest average value which is bigger than pretest. Based on the average of pretest and posttest score, obtained normalized gain and gain. The normalized gains can show that in general the skills of the science process have increased by a value of 0.66 and belong to the moderate category. Based on the above description it can be said that the science process skills of students increased in the medium category after learning by using learning tools using scientific inquiry model based on Batak culture.

The application of learning with scientific inquiry model can improve the skill of science process, this is in accordance with research conducted by Nasution (2015) stating that with science inquiry learning can improve students' science process skill. The results of a study by Ergul&Remziye (2011) suggest that inquiry-based learning provides a significant improvement in the students' science skill score in the experimental class. This is supported by Simsek and Kabapinar (2010) stating that inquiry based learning can have a positive influence on students’ science process skills. This is possible because students are trained to conduct a scientific investigation, finding the solution of the problem so as to practice their skills.

4.5. Increasing Students' Want to Know
The increase of students' curiosity was obtained by using the observation format of student's curiosity observer during the learning activity. The activities of the students studied include 5 indicators of students' curiosity, enthusiastic searching for answers, attention to observed objects, enthusiastic in the science process, asking every step of the activity, and asking or reading various sources related to static fluid material. Based on observation data of students' curiosity observed during three meetings when applied scientifically speaking inquiry model based on Batak culture, it can be analyzed from 5 indicators of curiosity of students each meeting as follows:
a. Enthusiastic Looking for Answers

Figure 2. Enthusiastic Percentage Bar Diagram Seeking Answers to Each Meeting.

b. Attention to the Object being Observed

Figure 3. Stage Percentage Attribute Chart of Observed Objects at Each Meeting.

c. Enthusiastic on the Science Process

Figure 4. Enthusiastic Bars Chart on the Science Process at Each Meeting.

d. Asking Every Step of Activity

Figure 5. The Bar Diagram Asks Each Activity Step at Each Meeting
Questioning or Reading several Relevant Source with Static Fluid

Figure 3. Asking Bar Diagrams or Reading Various Sources Related to Static Fluid Materials at Each Meeting

Based on the five indicators of students' curiosity, it can be concluded that the application of scientific inquiry model based on Batak culture can increase students' curiosity, although there are some visible indicators that do not experience positive change. However, more curiosity indicators of students are experiencing positive changes from each meeting. Based on the five indicators of students' curiosity, it can be concluded that the application of scientific inquiry model based on Batak culture can increase students' curiosity, although there are some visible indicators that do not experience positive change. However, more curiosity indicators of students are experiencing positive changes from each meeting. Fun learning activities can increase students' curiosity. Learning that is integrated with the culture can make students interested in the subject matter. Litman & Spierlberger cited in Mega, et al (2010) stated that students' curiosity can be stimulated by providing visual information. Student curiosity can be improved by providing interesting visual information. Binson (2009) expressed curiosity can foster internal motivation to learn and understand something so that curiosity can be developed in the learning process of science.

5. Conclusion
Based on the results of analysis and discussion in this study, presented several conclusions as follows:

The validity of learning tools developed included in the valid category with the average value of total validity of LP of 3.88 with the category is quite valid, the book students of 4.32 valid categories, teacher books for 4.19 valid categories, and SWS of 4.10 with valid category. The effectiveness of learning tools developed through scientifically speaking inquiry model based on Batak culture has met the effective criteria in terms of: (1) students' learning completeness in the classical that is at least 80% of students who follow the learning able to achieve score ≥ 75, where student learning completeness in classical reached 87.5% with developed learning tools; (2) students' positive response reaches 90.97%; (3) student activity in every learning meeting has increased. The practicality of learning tools developed through scientifically based inquiry model based on Batak culture has met the criteria in terms of: (1) expert assessment / practitioners of developed learning tools can be used with little revision; (2) in terms of the total component of teaching materials is 3.62 including high category. Improving students' science process skills using learning tools based on scientific inquiry model based on Batak culture on static fluid material with normalized gain of 0.66 with medium category. Increasing the curiosity of students using learning tools of scientific inquiry model based on Batak culture on static fluid material is experiencing an increase in some curiosity indicator that is viewed from the increase of graph in every meeting, that is on the following indicators: (1) enthusiastic looking answer each question, (2) attention to the object being observed, (3) enthusiastic on the science process, (4) ask every step of the activity.
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