Syntax Construct Validity Of Project Based Learning Of Global Warming Material

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Abstract: The aim of this research is to test construct validity in the syntax development model of Project Based Learning (PjBL) based on Physics learning in the Global Warming material at Senior High School. This is a quantitative research used Research and Development (R & D) model. The model development that was used in this research is Borg model and Gall, that is descriptively model, which is showed the steps that should be followed to create product, in this case in form of syntax of PjBL learning model based scientific approach. The first step of this research was collecting data information related to the need analysis in the field related with implementation of Curriculum 2013 in the Physics learning. As it's established in curriculum that through learning process in each subject it is hoped that can direct students to implement the concepts which they are got to solve the problems or natural phenomenon through scientific approach. In the Physics learning at Senior High School, PjBL become a one learning model which applicative to the citizen dynamic, for those it is needed to develop a syntax model of PjBL based on scientific approach that appropriate in learning. Data collection is done by documentation technique, interview, questionnaire, and test. The data collection is in form of qualitative and quantitative data. The datum were considered valid through repetition process (iteration) and the data that often appear the being analyse qualitativel through Miles and Huberman interactive model, that is through data reduction, data display and drawing conclusion in the same time and after data collection process. Data analysis technique that is used was descriptive qualitative analysis. The result of expert validation stated that the product is appropriate to be tested in the school with some revision. The test was done, to each test project threat to the big group of students' amount 32 students. Based on the test result which was conducted it is got the average percentage who achieved passing grade is 84%. So that the product which is created is effective to be implemented in the Physics learning process at Senior High School. The result of this research is in form of syntax model of PjBL in Physics learning in Global Warming material for students of Senior High School with the characteristics below: (1) Learning syntax that is developed is suited with scientific learning approach; (2) Global Warming material divides in two projects that is project of The Cause of Global Warming and Reducing Carbon Track (3) Each project has different time allocation, viewed from the comprehensiveness the material and the project that is developed. Then, it can be concluded that the product which is created in this case is in form of syntax model of PjBL based on scientific approach, lesson plan, and students’ worksheet in the Global Warming material with description of activities cover: 1) Observing and Questionning to the aspect of Basic Question, 2) Experimenting/ Data Collection or Information to the aspect of Designing Project, 3) Associating/ Analysing Data and Information to the aspect of Arranging schedule and Monitoring students' project progress, 4) Connecting to the aspect of Result test and Evaluating experience; suitable to be implemented in Senior High School Physics learning.

Keywords: Syntax, Physics learning, Project Based Learning model, Global Warming

1. INTRODUCTION
At the end of 2015, Indonesia will face new competition situation, that is the implementation of the ASEAN Economic Community (AEC). Education is one of the important things for Indonesia in the facing of MEA 2015, by improving the quality of human resources, but the quality of education in Indonesia still left behind from other countries. Based on the report by the National Human Development Reports in 2011, the Human Development Index of education, Indonesia ranks 119 of 187.
countries and ranks 12th of 21 countries in Asia-Pacific (Menkokesra, 2011: 1).

Improvement of quality of education is continuously done by the government with the hope that the quality of education in Indonesia is not left behind the other countries. One such improvement had taken the changes in the curriculum of the Education Unit Level Curriculum (KTSP) into Curriculum 2013. Through the curriculum design in the organization of the learning process is expected to lead learners achieve the expected competencies. The development of science and technology requires learning pattern is not theoretical, but applicable to any dynamic changes occurring in society. Through the process of learning in each subject is expected to lead students to implement the concepts acquired to solve problems and phenomena that exist in the environment that is tailored to the character of the material in each subject area.

Project Based Learning (PjBL) is one of the learning models which is suggested in the implementation of the curriculum in 2013 to be applied in the learning of Physics at the Senior High School. This learning model aims to develop students’ thinking skills through problem solving together (collaboration). The teacher’s role more placed themselves as mentors or leaders of learning and facilitator of learning. Thus, students are conducting their own or as a group to solve the problem with the guidance of teachers, so that learning will take place in student-centred learning (Sagala, 2009: 196). Copies in Annex Permen-dikbud No. 66 th 2013 on Standards Assessment no assessment of competency skills. Educators assess competency skills through the performance appraisal, the assessments require students to demonstrate a certain competence by using the practice test, project, and portfolio assessment, so using PjBL model of competence skills of students can be measured through a project undertaken students.

Kleijer, Kuiper, De Wit and Wouters-Koster in Kubiatko and Vaculova (2011: 67) states that there are four main characteristics in the model PjBL, they are the responsibility of each student in thinking and learning, awareness of social responsibility, to think and act from scientific perspective but in practical use, connect processes and products to practice as a professional.

Holubova (2008: 29) explains that students are using the summit projects and products in the form of tangible evidence as proof of what they have learned. Students create videos, artwork, reports, photos, music, construction models, digital stories and website as the model PjBL.

Not all active and engaging learning activities can project called Project Based Learning. According Mihardi, Harahap and Sani (2013: 191) there are five criteria for whether learning project including a Project Based Learning. Five criteria are first centring (centrality), this principle asserts that the project is the core curriculum. The PjBL is a model in the centre of the learning strategy, in which students learn the concepts of knowledge through project work. The second principle is to focus on a question or a problem, the project focused on questions or problems that can encourage students to try to get a concept or principle in a particular field. The third principle is a constructive or design investigation, the investigation may be the decision-making, problem-finding, problem solving, or the development process models. The fourth principle is the principle of autonomy, which can give students the freedom to implement the learning process and free to choose, to work with minimal supervision and responsibility. In this principle, teachers act as facilitators and motivators to encourage the freedom of students. The fifth principle is realism; the project is something tangible and can give a real feeling to the students included in choosing the topics, content projects, group work, products, and product standards.

Stages of learning in the PjBL developed the GeorgeLucas educational foundation (2005) in Nurohman (2007: 10-11), namely: start with the essential question, design a plan for the project, create a schedule, monitor the students and the progress of the project, assess the outcome and
evaluate the experience. These stages are the steps through which the students working on a project that is started of an essential question on which the students in doing the project, followed by project planning then students prepare activity schedule in completing the project. The next stage is the teacher monitor student activity for completing the project. The final stage is a reflection of the activity and results of projects already carried out at the end of the learning process. Further can be illustrated in the diagram Figure 1 as follows.

Figure 1. Steps of implementation PjBl in Physics

The fact that occurred in the field of physics teacher in many high school still do not understand how the implementation of these learning techniques in the classroom. Through the implementation of the model PjBl is expected to support the development of the psychomotor domain of students through their performance in the task of the project. In addition, the student will be embedded in the character of concern for environmental issues related to the life that learned at school. This project is intended to explore the problems that occur in the environment related to the subject matter, which ultimately will have an impact on the development of cognitive and affective domain as the target student competency achievement of students.

The PjBL model application is supported by the character of the material in high school physics learning not only theoretical but also a lot more that is application and applicable. Of material that is applied the teachers can lead students through tasks to be able to solve physics problems related to everyday life. Through these activities are expected to lead learners achieve applicative competence of the dynamics that occur in the reality of life and Shiva become more sensitive to the problems that exist in the surrounding environment.

One material that has the potential to be used as the project is a matter of global warming. This is because the Global Warming material relating to the activities of daily life of students. In addition, many of the problems that can be extracted from this material, so the problem is that students can communicate their creative ideas related to global warming. Related to Global Warming, there are some issues about the causes, attempts to overcome them and their impact on society, which is a matter that needs to be researched, examined and identified students.

2. METHODS

This study included a qualitative study used a model of research and development (Research and Development / R & D). The development model used in this study is a model proposed by Borg and Gall (Nusa Putra, 2012). The descriptive models that show the steps to follow to produce a product, in this case a learning syntax is a plot that illustrates the steps PjBL physics learning model based on the scientific material Global Warming in high school. In one part of the learning path is to describe the stages of the material to be covered to students that leads to the subject of Global Warming. Development steps undertaken in this study include the following phases: a preliminary study, the design of the initial product, the preparation of the product in the form of syntax learning model PjBL, product validation by experts and reviewers Physics teacher, and testing of products in the field, namely in physics learning in high school. Data were obtained through interviews, questionnaires, documentation and testing. In the interview, the instrument used in the form of a list of questions related to the goals and record sheet. While the questionnaire instrument used has a 5 rating scale based selection criteria and is open to expert commentary. The questionnaire contains the syntax development assessment model of
PJBL-based scientific, assessment and appraisal LKS RPP. For the assessment of the development of scientific-based syntax PJBL models include three aspects, namely component PJBL syntax, syntax component of learning and teacher-student activity in learning. Total score of all three of these aspects has a maximum score of 55 and a minimum score of 11, with the mean ideal (Mi) 33 and the standard deviation of the ideal (Sbi) 7.33. Based on these data whether or not the criteria for learning syntax presented in Table 1 using the following procedure (Azwar, S., 2007: 163):

### Table 1. Syntax Validity Criteria

<table>
<thead>
<tr>
<th>Score Assessment Result</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>44 &lt; X</td>
<td>Very good</td>
</tr>
<tr>
<td>36 &lt; X ≤ 44</td>
<td>Good</td>
</tr>
<tr>
<td>29 &lt; X ≤ 36</td>
<td>Quite</td>
</tr>
<tr>
<td>22 &lt; X ≤ 29</td>
<td>Less</td>
</tr>
<tr>
<td>X ≤ 22</td>
<td>Very less</td>
</tr>
</tbody>
</table>

For lesson plan (RPP) assessment questionnaires covers: aspects of the format, clarity component aspects and aspects of language. The total score of the third aspect has the ideal maximum score 185 and a minimum score of 37 is ideal, with the ideal mean (Mi) 111 and the standard deviation of the ideal (Sbi) 24.7. This data is based on the criteria of whether or not the RPP are presented in Table 2 by using the following procedure (Anwar, S., 2007: 163)

### Table 2. RPP Validity Criteria

<table>
<thead>
<tr>
<th>Score Assessment Result</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>148 &lt; X</td>
<td>Very good</td>
</tr>
<tr>
<td>123 &lt; X ≤ 148</td>
<td>Good</td>
</tr>
<tr>
<td>99 &lt; X ≤ 123</td>
<td>Quite</td>
</tr>
<tr>
<td>74 &lt; X ≤ 99</td>
<td>Less</td>
</tr>
<tr>
<td>X ≤ 74</td>
<td>Very less</td>
</tr>
</tbody>
</table>

For LKS assessment questionnaires include: aspects of the display, the formal aspects, material aspects and aspects of language. The total score of the fourth aspect has the ideal maximum score of 130 and a minimum score of 26 is ideal, with the ideal mean (Mi) 78 and the standard deviation of the ideal (Sbi) 17.33. This data is based on the criteria of whether or not the LKS are presented in Table 3 by using the following procedure (Anwar, S., 2007: 163)

### Table 3. LKS Validity Criteria

<table>
<thead>
<tr>
<th>Score Assessment Result</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>104 &lt; X</td>
<td>Very good</td>
</tr>
<tr>
<td>87 &lt; X ≤ 104</td>
<td>Good</td>
</tr>
<tr>
<td>69 &lt; X ≤ 87</td>
<td>Quite</td>
</tr>
<tr>
<td>52 &lt; X ≤ 69</td>
<td>Less</td>
</tr>
<tr>
<td>X ≤ 52</td>
<td>Very less</td>
</tr>
</tbody>
</table>

The data collected in this study is an assessment of data quality and the product of validator expert reviewer of physics ‘teachers of senior high school. In this case, include: syntax PJBL learning, lesson plans and worksheets. The data were considered valid is obtained through a process of repetition (iteration) and data that often appear later analysed qualitatively by using an interactive model of Miles Huberman, which implement data reduction, data presentation and conclusion together during and after the data collection process (Sugiyono, 2014: 246). The data analysis technique used is descriptive and qualitative analysis, which is supported by quantitative data on the results of the product assessment that syntax PJBL model learning, lesson plans and worksheets along with the study of the learning path that has been drawn up.

### 3. Research Result and Explanation

Based on the results of the validation by experts and reviewers obtained data of the product assessment syntax PJBL-based learning model of scientific approach as presented in Table 4 below:

### Table 4. Syntax Score Validation Result Model PJBL

<table>
<thead>
<tr>
<th>Assessor</th>
<th>Score</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert</td>
<td>54</td>
<td>Very Good</td>
</tr>
<tr>
<td>Reviewer</td>
<td>53</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

Based on the results of the validation by experts and reviewers obtained data from RPP product assessment and LKS PJBL models...
based scientific approach as presented in Table 5 below:

Table 5. Score of RPP and LKS Validation Result

<table>
<thead>
<tr>
<th>Assessor</th>
<th>Score RPP</th>
<th>Score LKS</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert</td>
<td>168</td>
<td>116</td>
<td>Very good</td>
</tr>
<tr>
<td>Reviewer</td>
<td>170</td>
<td>118</td>
<td>Very good</td>
</tr>
</tbody>
</table>

Results of the validation by experts and a review of the data in Table 3, 4 and 5 stated that the resulting product that includes syntax and its PJBL model learning lesson plans and worksheets meet the criteria very well. In the learning path laid out in the RPP and worksheets for material Global Warming terdeskripsi as follows:

1. RPP 1 material covering Symptoms and Causes of Global Warming. The material systematically in accordance learning stage model of PJBL-based aspects of the scientific approach which includes:
   a. Observing and Asking Stages: Fundamental Questions for Determination aspect (Start With the Essential Question)
      Learning begins with the essential questions, ie questions that can give assignments learners in an activity. This stage is equivalent to the process to question the scientific learning. Teachers provide the prerequisite concepts question: Name the layers of the atmosphere? What is the ozone layer? And motivation that begins with a video showing the impact of global warming, then asked: Do you feel the Earth is getting hotter every year?
   b. Trying Stages / Collecting Data or Information: Designing for aspects of Project Management (Design a Plan for the Project)
      Planning is done collaboratively between teachers and students. Thus the students are expected to be felt "had" on the project. At this stage the students are trying to collect information held by each member of the group related projects to be undertaken. Project tasks that must be done on this matter is the task of observation about the causes of global warming. From the observation that in addition to structured report also compiled a poster containing an invitation to the public about efforts to reduce the causes of global warming.
   c. Associating Stages / Analyzing data or information: to schedule Prepare aspect (Create a Schedule)
      Teachers and students collaboratively draw up a schedule in completing the project activity based on information obtained from each of the group members.
   d. Associating Stages / Analyzing data or information: for aspects of Students and Project Progress Monitor (Monitor the Students and the Progress of the Project)
      Teachers provide opportunities for each group of students to present their projects in class discussions about the symptoms and causes of Global Warming Global Warming
   e. Shaping Stages the Network: to aspects of Test Results (Assess the Outcome)
      Teacher asks students' understanding of the material and rectify if there are less true concepts about the symptoms and causes of Global Warming Global Warming
   f. Forming Stages Networks: for Evaluating aspects of experience (Evaluate the Experience)
      At this stage the students were asked to express their feelings and experiences for completing the project. Teachers and students develop the discussion in order to improve performance during the learning process.
2. RPP 2 material covering Impact and How to Reduce Global Warming. The material terjabar systematically in accordance learning stages covering aspects of the model PJBL
   a. Stages Observe and ask: Fundamental Questions for Determination aspect (Start With the Essential Question)
      Learning begins with the essential questions, ie questions that can give assignments learners in an activity. Teachers provide the prerequisite concepts questions: What is global warming? And motivation that begins with a video showing the impact of global warming, then asked: What can we do to reduce their impact?
   b. Trying Stages / Collecting Data or Information: Designing for aspects of Project Management (Design a Plan for the Project)
Planning is done collaboratively between teachers and students. Thus the students are expected to be felt “had” on the project. Project tasks that must be done on this matter is the task of observation on how to tackle global warming in particular reduced carbon footprint. From the results of these observations in addition to prepared a report also drafted suatun video that contains an invitation to the public aimed at instilling perialku community effort to reduce its carbon footprint, including voting behavior consume foods that support the reduction of carbon footprint.

c. Stages associate / Analyzing Data or Information: Prepare for a aspect of Schedule (Create a Schedule)

Teachers and students collaboratively draw up activity schedule in completing the project.

d. Stages associate / Analyzing data or information: for aspects of Students and Project Progress Monitor (Monitor the Students and the Progress of the Project)

Teachers provide opportunities for each group of students to present their projects in class discussions about the symptoms and causes of Global Warming Global Warming

e. Shaping the NetworkStages: to aspects of Test Results (Assess the Outcome)

Teacher asks students’ understanding of the material and rectify if there are less true concept of the Impacts of Global Warming and How to Tackle Global Warming

f. Forming Networks Stages: for Evaluating aspects of experience (Evaluate the Experience)

At this stage the students were asked to express their feelings and experiences for completing the project. Teachers and students develop the discussion in order to improve performance during the learning process.

Thoroughly stating that the products deserves to be tested at school by doing some revision. After the revision stage next stage is to test the product. Based on the test results the product can be obtained that the average value of the percentage of students achieving 84% completeness. This shows that the resulting product has a good level of keoptimalan in the learning process. Results of interviews to a number of students also showed that the number of students showed a positive response, the students more enthusiastic in learning and interested in the task of the project is done and increasingly understand the importance of the role of learning materials physics in solving environmental problems.

4. CONCLUSIONS

From the results of this study, it is concluded that the products produced in this case in the form of syntax model of PJBL-based approach to scientific, lesson plans, and worksheets on the material Global Warming with the description of the flow of activities that include: 1) Phase Observe and ask for aspects Determination of Questions Fundamental, 2) Phase try / Collecting Data or Information for Design aspects of Project Management, 3) Phase associate / Analyze Data and Information for aspects Develop and Monitor Student Schedule - Advancement Project, 4) Phase Forming Network for aspects Evaluating Test Results and Experience; worthy applied in teaching high school physics.

Results of this study can be used as a basis for further research and can be used as a joint effort between teachers, parents, students and schools in improving the quality of teaching physics in high school to make it more meaningful. In the development of this project-based research should be considered in addition to the availability of facilities in schools, given the tasks that need to adjust to the environment in which the student resides. Thus the learning process will be more meaningful for students.

5. ACKNOWLEDGEMENTS

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6. REFERENCES


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