Development The Subject Specific Pedagogy (SSP) of Natural Science to Optimize Mastery Knowledge, Attitude, and Skills Junior High School Students in Yogyakarta

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Abstract—Research development in the 1st year aim to develop the Natural Science’s SSP for JHS students that can be used as a reference for natural science learning activities, so can optimize the mastery of knowledge, attitude, and skills students. The design of the study is a developmental research from Borg and Gall with 10-step. In the first year only managed to reach the design stage and instrument SSP. The instruments for collecting data are validity of products; test to measure the achievement aspects of knowledge, observation sheets to measure the aspects of skills and attitudes, as well as a questionnaire to measure the aspects of attitude. The results of the study are generated 8 package Natural Science SSP JHS for materials: 1) change of substance; 2) acid, base, and salt; 3) expansion; 4) the structure and function of the network; 5) photosynthesis; 6) the digestive system of food; 7) survival; 8) dynamic power. The result of the development of instruments includes instrument validation 1) syllabus; 2) RPP; 3) LKS; and 4) assessment. While SSP ratings include 1) aspects of test for knowledge; 2) non-test for aspects of attitude; and 3) test the performance aspect skills.

Keywords: Science SSP, knowledge, attitude, skills

I. INTRODUCTION

The success of science teaching in junior high school (JHS) is strongly influenced by the learning design that conduct in class. Mastery of teacher’s competence in science as a whole will determine the success of science learning. Based on UU No. 14 tahun 2005 Tentang Guru dan Dosen, pasal 10, ayat (1), states that: the teachers’ competency includes: pedagogical, personal, social, and professional competence acquired through professional education. When teacher mastery four of competencies, will create a learning design as expected. The successful learning depending on standard design learning that conducted was the obtaining of the success of learners after participating in learning activities is the form acquisition of knowledge, attitude and skills.

Based on the results of the discussion with colleagues in MGMP of Yogyakarta, there are still a lot of complaints when the science teacher should taught integrated science. A Science teacher that currently exists is the incarnation of specific scientific disciplines such as physics, biology, and chemistry. Science teachers that already exists with diverse disciplines must adapt to science teaching is carried out in an integrated manner. Under these conditions, the ability of a science teacher who is currently on average have not been able to prepare the design of learning science as a whole, so that the implementation cannot be accommodated it well.

Those problems can be overcome with the help of the science teachers SMP Yogyakarta to prepare design of learning is good and right, which is expected to broaden the teachers, thus more capable of learning design, especially the areas of integrated IPA yet secured. Handayani (2014) stated, that the implementation of learning requires a special component known as Subject Specific Pedagogy (SSP). SSP is a result of the teachers’ thoughts contained in the components of learning. SSP components, among others: (1) the syllabus; (2) Learning Implementation Plan (RPP); (3) The student Worksheet (LKS); and (4) assessment.

Based on this background, the researchers will develop SSP required for SMP teachers Yogyakarta so can be used to overcome these problems. As for the development in question is Subject Specific Pedagogy (SSP) IPA for optimizing mastery of Knowledge, Attitude and Skill of Students SMP Yogyakarta. This study aimed to describe the Science’s SSP as a benchmark development activities science teaching junior high school in the city of Yogyakarta in order to optimize the mastery of knowledge, attitude, and skills.
II. THEORETICAL REVIEW

Subject Specific Pedagogy (SSP)

The characters of Subject Specific Pedagogy (SSP) are a packaging of study material into a comprehensive set of learning and educating. SSP consists of five basic components, namely the syllabus, lesson plans, student books, worksheets, and assessment. Has not provided a learning tool as SSP in SHS that integrated with the knowledge, skills and attitudes / values of the characters, so the natural science’s SSP should be developed.

Preparation of natural science teachers that master of the content and methods of delivery (teaching) for students, known as Approach PCK (Pedagogical Content Knowledge). PCK provides a basis to think that the teaching of natural science is not enough with understand content material (knowing science) but also (how to teach). Natural science’s teachers must have knowledge of science learners, curriculum, instructional strategies, and assessment so that can carry out the transformation of natural science knowledge. Some grounding in the underlying need to develop instructions on natural science education based PCK.

The study is required to determine the characteristics of natural science education with content knowledge, skill and affective. In the PPG curriculum 2014, learning field of study that educate subject-specific pedagogy (SSP) includes the development of learning tools (teaching materials, methods, media, evaluation and RPP) corresponding KI and KD in SHS and according to the level of the class.

According to an article from a university in Illinois, to teach the natural science for students, teachers need Pedagogical Sciences (PS). PS including an understanding of the content of science and inquiry process, knowledge about children, how children learn, and skills to facilitate experiences of children in a way that supports active investigation and conceptual development. Furthermore, a program designed to build PS’s teacher PS is Foundation Science Literacy (FSL). This course combines face-to-face instruction with mentoring and tasks based of performance. FSL incorporate six key elements proved instrumental in supporting teacher learning: (1) approach to science teaching based inquiry well-defined and well structured, (2) the content of the science carefully selected, (3) hands-on, approach learning based the teachers themselves and inquiry, (4) the opportunity to apply new learning through analysis, (5) tasks based on performance, and (6) mentoring.

According to Adela Solis in article of INDRA, Pedagogical Sciences, core of area Pedagogical Content Knowledge Area, PCK describe that make the difficult topic can easy to learn. To teach all of students in accordance with current standards, teachers do need to understand the subject matter deeply and flexibly so they can help students map out their ideas themselves, relate one idea to another, and re-direct their thinking to create a powerful learning. Teachers also need to see how ideas connect across the field and everyday life. It is the building block of pedagogical content knowledge.

This is important, because after all, pedagogical content knowledge has become a special subject. How PCK example in the core subject areas of language, science, mathematics and social sciences. How this knowledge compared with other knowledge of the teachers? Comparative view of teaching standards shows different expectations with regard to teaching content knowledge, pedagogical knowledge of general and pedagogical content knowledge (NBPTS, 1998). Standards are organized in this way is a ready-made guide for practitioners to use in directing specific learning content teachers. Furthermore, these differences in the knowledge base can be used to assess the planning and implementation of professional development of teachers overall content.

Briefly stated that the central content of effective teaching is pedagogical content knowledge of teachers. If we want to improve the quality of teaching and learning in the core content, we need to fight some old tradition in learning. Instead, we must recognize and expand the horizons of experts who develop competencies in teaching the subject matter. We must have a commitment to the development of professional, high quality targeted to develop these skills. When we do this, we support the growth of teachers as a personal and professional experts can lead students to academic success. Simultaneously, we will contribute to the realization of the objectives and priorities of the classroom and the school system as a whole. We need to discuss how the general knowledge of PC juxtaposed with diverse pedagogical knowledge to be applied in a training program that addresses the needs of teachers in the classroom with diverse student populations.

Optimal

According to Indonesian dictionary online, Optimal has the meaning the best, the highest, most profitable. Optimizing have meaning makes the best or highest. Understanding optimization according to the Dictionary of Indonesian Language (Departemen Pendidikan, 1995: 628) is derived from the optimization of the optimal word which means the best, the highest so optimization is a process or optimize elevate or boost.

Based on the above understanding, authors conclude optimize is a process that is done in the best way in a job to earn a profit without decreasing the quality of work. In this case the SSP product could optimize mastery of knowledge, attitude and skills of learners.
**Knowledge, Attitude, dan Skill**

Karmilati (2012) states that knowledge, attitude, and skill have the following definitions: knowledge is a condition/conclusion or information that describing knowledge after receiving information compared with prior knowledge owned. The knowledge of the person can be grouped into three categories: (1) declarative knowledge is factual information on a subject that is stored in one's memory. (2) Procedural Knowledge is one's understanding about how and when to use factual information. (3) Knowledge Strategy is knowledge of the facts and procedures used to plan, monitor and revise the direction of the planned objectives.

The level of competence of a person is determined by its attitude, which will determine how to behave in a certain way on an object events. Experts argue that human is not born with attitude, they obtained attitude from the series process of lessons from childhood to adulthood. Attitude involves the evaluation of the issues over the object or event that is perceived and observed, and put the person in a particular behavior.

Many experts argue that individual knowledge should not be as a result of their skill, but skill is evidence of the knowledge. Skill is the result of apply their knowledge and abilities. Skill is a talent and learned person to do a job. Skill will change with training or experienced. Skill divided into three: (1) a Cognitive skill are the ability to view and analyze the events and observe the important truth, critical thinking skills to analyze future events and is able to be proactive. (2) Psychomotor skills are skills that involve the ability to perform physical tasks or technical. (3) Interpersonal skills are personal interaction skills involves the ability to cooperate with others.

### III. METHODOLOGY

This study will be conducted in SMP Yogyakarta that will be determined randomly from 8 schools (SMP Pangudi Luhur 1 Yogyakarta, SMPN 10, SMPN 4, SMP 12, SMP Imaculata Yogyakarta, SMP Muhammadiyah 1 Yogyakarta, SMP Negeri 7, and MTs Mualimin Yogyakarta) and the time of the research carried out at the end of the 1st semester 2015 (1 June 2015 - 31 November 2015). This research will develop SSP of natural science JHS to optimize mastery of knowledge, attitude and skills of learners in Yogyakarta.

**Types of research**

The design of the study is a developmental research. According to Borg and Gall, Educational research and development (R & D) or educational research and development is a process used to develop and validate a product of education. This research shaped cycle of repetition of steps to produce and test the effectiveness of the products through the validation and testing.

The study design used for field testing of product is randomized pretest-posttest control group design and can be seen in the Figure 1.

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest</th>
<th>Treatment</th>
<th>Postest</th>
</tr>
</thead>
<tbody>
<tr>
<td>KE</td>
<td>O1</td>
<td>X</td>
<td>O2</td>
</tr>
<tr>
<td>KK</td>
<td>O3</td>
<td>-</td>
<td>O4</td>
</tr>
</tbody>
</table>

**FIGURE 1. DESIGN FIELD TESTING OF PRODUCT**

**Subject of the Research**

Subject of the research were students of class VII, VIII, IX SMP city of Yogyakarta in the academic year 2015/2016. While the study sample was taken 6 class at random from the population as experimental class and control class in the field tests of the products developed.

**Model and Research Procedure**

According to Borg and Gall, there are 10 steps in the procedure development, that is:

a. Research and information collecting (research and data collection)

b. Planning

c. Develop a preliminary form of the product (draft product development / product early)

d. Preliminary field testing (field trials beginning)

e. Main product revision (revising the test results)

f. Main field testing (field trials)

g. Operational product revision (improvement of products, field test results)

h. Operational field testing (test field implementation)

i. Final product revision (improvement of the final product)

j. Dissemination and implementation (dissemination and implementation)

Model and procedures development in this study modified into 5 steps as follows: The first year

a. Preliminary study: analysis of materials science class VII, VIII, IX and analysis of the results of the 1st half of the space research observation and condition / situation.
b. Design: syllabus, lesson plans, teaching materials, and models of CNS.

The second year

c. Stage of development: expert validation, revision, peers assessment, friends teachers, revision

d. The implementation stage: limited trial, revisi expanded, field testing, revision, final product.

The third years

e. Dissemination of product

Design evaluation and assessment products: using instruments for validator and instrument for assessors.

Subject validation and assessors: Experts/evaluator, student friends/other teachers of the school, a school teacher friend. Design test: product trials conducted twice, limited testing and field tests using the experimental group and the control group. Instrument: validation instrument, and the instrument for which data is collected.

Data were collected with:

1. Pretest and average pretest results are used to determine the grade used as an experimental class and control class.

2. From the class samples, performed treatment using the SSP that had been prepared for learning material that has been determined based on the time of data collection.

3. During treatment and after treatment is given taken the assessment data that includes knowledge, attitude, and skills to students who are in the experimental class and control class.

The instruments are needed in data collection that is: Validation of early product SSP; Instruments of the result preliminary fiels testing; Revised Instrument of Products; Instrument of field testing; Pretest; Data recap pretest; Instrument assessment aspect attitude; Posttest; Data recap posttest.

IV. RESULTS AND DISCUSSION

Results from the design stage which includes a variety of materials, models, products, and dimensions of learning outcomes are presented Table 1.
<table>
<thead>
<tr>
<th>Number</th>
<th>Materials</th>
<th>Model</th>
<th>Product</th>
<th>Knowledge</th>
<th>Attitude</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Photosynthesis</td>
<td>Contextual Teaching and Learning</td>
<td>Syllabus, lesson plans, worksheets, assessment</td>
<td>Learning achievement</td>
<td>Discipline</td>
<td>Observation skills</td>
</tr>
<tr>
<td>2</td>
<td>Structure and Function of Plants Network</td>
<td>Guided Discovery</td>
<td>Syllabus, lesson plans, worksheets, assessment</td>
<td>Cognitive competence</td>
<td>conscientious</td>
<td>psychomotor</td>
</tr>
<tr>
<td>3</td>
<td>Substance Changes</td>
<td>Discovery Learning</td>
<td>Syllabus, lesson plans, worksheets, assessment</td>
<td>Learning achievement</td>
<td>environment respect</td>
<td>Problem solving</td>
</tr>
<tr>
<td>4</td>
<td>Acids, bases and salts</td>
<td>Guided Inquiry</td>
<td>Syllabus, lesson plans, worksheets, assessment</td>
<td>Comprehension</td>
<td>curiosity</td>
<td>Science process skills</td>
</tr>
<tr>
<td>5</td>
<td>Digestive system</td>
<td>Discovery Learning</td>
<td>Syllabus, lesson plans, worksheets, assessment</td>
<td>Cognitive competence</td>
<td>curiosity</td>
<td>Scientific Methods</td>
</tr>
<tr>
<td>6</td>
<td>Survival (Adaptation)</td>
<td>Problem Based Learning</td>
<td>Syllabus, lesson plans, worksheets, assessment</td>
<td>Cognitive product</td>
<td>environment respect</td>
<td>Problem solving</td>
</tr>
<tr>
<td>7</td>
<td>Expansion</td>
<td>Lab Work</td>
<td>Syllabus, lesson plans, worksheets, assessment</td>
<td>Cognitive product</td>
<td>creative</td>
<td>Practical Skills</td>
</tr>
<tr>
<td>8</td>
<td>Dynamic electricity</td>
<td>Lab Work</td>
<td>Syllabus, lesson plans, worksheets, assessment</td>
<td>Learning achievement</td>
<td>curiosity</td>
<td>Science process skills</td>
</tr>
</tbody>
</table>
TABLE 2. DESCRIPTION OF MULTIPLE REVISIONS BASED FGD PRODUCT SSP SSP 1 AND 2

<table>
<thead>
<tr>
<th>SSP 1</th>
<th>Syllabus</th>
<th>Signing components on the syllabus of learning activities, indicators, assessment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Plan</td>
<td>:</td>
<td>Revise the words operational work more precisely</td>
</tr>
<tr>
<td></td>
<td>:</td>
<td>Add the image number numbering equation On learning activities need to be specified stages of lab work</td>
</tr>
<tr>
<td>Student Worksheet assessment</td>
<td>:</td>
<td>On the tools and materials need to be specified using the numbering.</td>
</tr>
<tr>
<td></td>
<td>:</td>
<td>In the multiple choice test is still there such as &quot;look at the picture above, was revised to look at the picture on the side. Writing items that contain elements symbol in italics Between the attitude and curiosity should be detailed Need to explain every aspect of the lab work.</td>
</tr>
</tbody>
</table>

SSP 2

| Syllabus | : | Writing SK, KD straightened |
| Lesson Plan | : | The learning activities in accordance with contextual learning Competence achievement indicator is assigned a value SK 2, KD: 2.2 Indicators: 2.2.1, and so on. |
| Student Worksheet | : | Writing SK and KD. |
| Assessment | : | 2. Understand system in the plant life. 2.2. Describe transformation process of acquiring nutrients and energy in green plants Competence achievement indicator is assigned a value SK 2, KD: 2.2 Indicators: 2.2.1, and so on. Revision of the typing learning materials (no.i-4) Learning preliminary steps there is motivation, apperception.e. Core activities appropriate contextual learning |
|          | : | Layout LKS made interesting |
|          | : | Remove the statement questionnaire no 19-21 Observation skills performed on process pick-test learning the work of LKS |

TABLE 3. DESCRIPTION OF SEVERAL REVISIONS BASED FGD PRODUCT SSP 3 AND 4

SSP 3

| Syllabus | : | On learning activity comes with a description of integration of spiritual and social attitudes |
| Lesson Plan | : | The core activity describe the scientific approach and discovery learning |
| Student Worksheet | : | Student worksheet shows activity in stage 5M |
| Assessment | : | Revision of test cognitive competence For instruments scientific competence improved method to be equipped with pick-test assessment scores work according to the stages in LKPD. |

SSP 4

| Syllabus | : | Systematics characteristics lab work sorted logically |
| Lesson Plan | : | Sentence created a line fot KD, subject matter, learning activities, indicator, and instruments Written sources such as a bibliography Indicators are sorted according to the characteristics of systematic lab work |
| Student Worksheet | : | Core activities adjusted for lab work Methodsof learning just lab work Writing source in accordance with the guidelines |
| Assessment | : | Sentences on the work steps create a short, not too long The variable is replaced by a factor The identification of problems |
|          | : | Problem corrected to conform to the lab work Instrument repaired on the score Instruments be adapted to the practical skills |

TABEL 4. DESKRIPSI BEBERAPA REVISI PRODUK SSP BERDASAR FGD SSP 5 DAN 6

SSP 5

| Syllabus | : | Instrument Validation: On Teaching and Learning, the instrument should focus on Guided Discovery Model, described syntax. Product Syllabus: |
| Lesson Plan | : | At the Learning Activities are explicit guided discovery |
| Student Worksheet | : | Instrument Validation: learning activities refer syntax of guided discovery |
| Assessment | : | Guided Discovery components are described as on lesson plan: Stimulus Problem statement Data Collection Data Processing |
TABLE 5. DESCRIPTION OF SOME REVISIONS BASED FGD PRODUCTS SSP 7 AND 8

SSP 7

| Syllabus                  | Learning activities refers syntax PBL  
|                          | 1) Determine the Problem  
|                          | 2) Analysis of Learning Problems and Issues  
|                          | 3) Meetings and Reports  
|                          | 4) Presentation Solutions and Reflection  
|                          | 5) Conclusion, Integration, Evaluation  
| Lesson Plan              | Teacher and Student Activity clarified  
|                          | Map concept of the material survival equipped  
| Student Worksheet        | Made more attractive, font changed  
|                          | The verb shortened  
| Assessment               | Problem Formulation 1, 4, and 23 repaired  
|                          | Distractor question no 2 and 3 fixed  
|                          | Formulation of about 2, 3 and 4 rep

Results of FGD used as input material revisions or improvements SSP, in order to obtain a revised SSP. Revised SSP will be validated on experts and practitioners, as well as tested in the study in 2nd year.

V. CONCLUSIONS AND FOLLOW UP

Based on the results of the 1st year of the research in the first year, it can be concluded as follows. The design phase is based on preliminary studies, it produced 8 SSP package IPA for class VII, VIII, and IX. Components of SSP include syllabi, lesson plans, worksheets, and assessments. 8 package that has been designed SSP presented in a focus group discussion, so get input for the revision material of SSP natural science SSP. As a follow-up to the design stage, it will proceed the 2nd year study in the second form of validation experts and practitioners IPA SSP design and limited test results

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SE-59