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Planning Model of Physics Learning In Senior High School To Develop Problem Solving Creativity Based On National Standard Of Education

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Abstract. One of the causes of low achievement of student's competence in physics learning in high school is the process which they have not been able to develop student's creativity in problem solving. This is shown that the teacher's learning plan is not accordance with the National Education Standard. This study aims to produce a reconstruction model of physics learning that fulfill the competency standards, content standards, and assessment standards in accordance with applicable curriculum standards. The development process follows: Needs analysis, product design, product development, implementation, and product evaluation. The research process involves 2 peers judgment, 4 experts judgment and two study groups of high school students in Padang. The data obtained, in the form of qualitative and quantitative data that collected through documentation, observation, questionnaires, and tests. The result of this research up to the product development stage that obtained the physics learning plan model that meets the validity of the content and the validity of the construction in terms of the fulfillment of Basic Competence, Content Standards, Process Standards and Assessment Standards..

1. Introduction

The privileges the curriculum 2013 compared to the curriculum 2006 is the completeness of learning content with metacognitive knowledge, and the level of cognitive process that achieved to creative thinking skills. Both of these aspects are the knowledge and skills that needed in the 21st century. A preliminary study has been conducted on the implementation the curriculum 2013 in physics learning in several high schools in Padang with documentation analysis, observation, questionnaires and interviews. The results of the documentation analysis show that: a) Learning plan documents and teaching materials that used by the teachers generally was not included metacognitive knowledge and creative skills, b) Indicators of learning objective formulas, and competency assessment instruments was not included aspects of Higher Order Thinking Skills (HOTS). The results of classroom observations show that: a) the scientific approach has not done well, and b) The learning generally still focuses on the recall aspect dominated by the lecture method. The results of questionnaires and interviews to the teachers reveal that: a) they still have difficulties in presenting metacognitive knowledge, b) assessment of students learning outcomes generally is still focused on fulfillment of Lower Order Thinking Skills (LOTS), and c) they still have difficulties in prepare the planning and implementation of learning in accordance to the curriculum 2013.



The results of the preliminary study indicate that generally the teacher has not been able to arrange the learning plan in accordance with the National Education Standards through the implementation of the curriculum 2013. As a result in implementing the curriculum, the teachers experienced have some difficulties, so the purpose of the curriculum is not achieved. The objectives of the curriculum of the subject, known as "competence" According to article 1 (4) of Government Regulation of the Republic of Indonesia number 32 of 2013 [1], the competencies are: "a set of attitudes, knowledges and skills that must be possessed, and mastered by the students after learning a learning content, completing a program, or completing a particular educational unit ". Attitudes and skills gained through learning are expected as a reflection of the increased knowledge and improvement of cognitive processes of student. The point is the learning process to produce attitudes and skills in accordance with the learning objectives. It is needed to be addressed knowledge and cognitive processes that will be implemented in the learning in accordance with learning plan that arranged by the teachers.

2. Literature Review

Knowledge that learned in school is known as the subject matter or curriculum content. That is the curriculum component of the answer to the question, "what is taught?" The knowledge in question is scientific knowledge obtained as a result of the application of the scientific method [2]. More complex a person's knowledge will be the easier it will be, and many of the problems that can be solved.

What kind of knowledge is needed in learning? Based on this view, the knowledge in question is useful knowledge for life. Anderson and Krathworth (2001) [3] divide the complexity of knowledge over 4 dimensions, ie factual, conceptual, procedural, and metacognitive knowledge. These four dimensions of knowledge are contained in the Ministerial Decree of Education and Culture of the Republic of Indonesia number 20 [4] and 21 [5] in 2016, as reference of National Education Standards in formulating Graduate Competency Standards, Content Standards and learning objectives to be achieved. The weakness that has been happening in the application of the curriculum 2006 is the knowledge learned by students only in the form of conceptual, procedural, factual knowledge, knowledge of facts, concepts, theories, laws and procedures. So this knowledge is only limited to recall not to the stage of implementation.

In implementing these four dimensions of knowledge in high school physics learning, which referred to factual knowledge is knowledge related to facts, circumstances and phenomena experienced by the students. That is the knowledge gained from the activity of seeing, observing and feeling of the various circumstances and phenomena that occur in the surrounding environment. Conceptual knowledge is concepts, principles, laws, theories, meanings and rules that apply in explaining situation and natural phenomena. Procedural knowledge can be working procedures, tips, steps, or algorithms that taken to achieve or produce something in concrete and abstract sphere.

The curriculum 2013 innovation with respect to learning content is complemented by metacognitive knowledge. That is knowledge that often termed as "thinking about thinking" [6] [7], namely the ability of the students to control cognitive aspects they had when solve the problems encountered. This metacognitive knowledge is influenced by declarative knowledge, procedural knowledge, conditional knowledge, and self-knowledge. With this metacognitive knowledge that students seek to control their cognitive, guiding the knowledges they had when solve the relevant problems to their knowledge creatively. Metacognitive knowledge in learning physics will grow and develop in students through the interaction process with objects and natural phenomena which poured on the teacher learning plan in the form of student learning materials.

Each learning must ensure the acquisition of knowledge (content) and improvement of student's thinking ability. Eggen and Kauchak (2012) state that, every strategy and model applied in learning is in order to "teach content and thinking skills". Anderson and Krathwohl (2001) [8] have encountered the complexity of this cognitive (thinking) process on 6 levels include abilities: remembering, understanding, applying, analyzing, evaluating, and creating. These six levels of cognitive processes are combined with the four dimensions of knowledge as described above. The result of this

combination is a refinement of Bloom's taxonomy that was conducted by Anderson and Krathwohl (2001), known as Bloom's revised taxonomy.

In relation to the levels of cognitive processes, innovations in the curriculum 2013 are to replace the knowledge aspect at the lowest level of cognitive process with the ability to remember, and place the creative ability aspect as the highest level of thought process to achieved through learning with the ability to create i.e the ability to produce something new, in the form of abstract thought or a real object as a result of the ability of creative thinking. This creative ability is influenced predominantly by the metacognitive knowledge they have.

In Permendikbud No. 22 of 2016 [9] on Standards The process of implementing learning in primary and secondary education, explained that the six levels of cognitive processes are used as students activities to obtain the four dimensions of knowledge in teacher-created learning activities. The learning process in question is: "The learning process is held interactively, inspiration, fun, challenging, motivate the students to participate actively, and provide enough space for initiative, creativity, and independence according to talents, interests, and physical and psychological development of students ". It is also in the mandate that the learning is done to ensure the implementation of a scientific approach that contains at least 5 activities that are observing, asking, trying, reasoning, and communicating. Strategies and learning models applied are research-based learning (discovery/inquiry learning), as well as learning that produces contextual work with problem-based learning.

In Natural Sciences, including physics, the application of a scientific approach begins with observing activities. This is activity of studying or observing the studied phenomena. If the observation is done critically and analysis will bring up the students curiosity in the form of the question that they want to know the answer (questioning activity). To find the answers, the students will compile a hypothesis as a prediction or a temporary answer. The hypothesis is the basis of the students to trying (find out) the truth. The results of investigation is data that are described in the form of tables and graphs. These data are discussed and interpreted (reasoning activity) resulting in conclusions for reporting or presenting (communicating activity) [10] in the form of student conceptions. Furthermore with teacher confirmation, the student's conception will be refined into a scientific concept that becomes student knowledge as a result of learning.

Based on the description can be concluded that the purpose of learning for the students is to demand the knowledge and improve ability of thinking. The complexity of the content (knowledge) and the level of cognitive processes of the students in learning is a combination of the four dimensions of knowledge and the six levels of cognitive processes. As the output of these two aspects is the mastery of knowledge and improvement of cognitive processes that are packaged as the achievement of knowledge competence. Reflection of the intensity of knowledge competence is dominated by students that expected to change their attitudes and improve the skills as the outcome of the learning process. This argument is recommended to develop physics learning model in high school oriented to competency standards, content standards, process standards, and assessment standards. The lesson is carried out by scientific approach as mandated by the Curriculum 2013, so that the implementation of the educational process is accordance with the National Education Standards.

The assessment standard applied to the curriculum 2013 is poured in the Regulation of the Minister of Education and Culture of the Republic of Indonesia number 23 of 2016. [11] The assessment is the process of collecting and processing information to measure the achievement of learning outcomes of students including attitude aspects (behavior), mastery of knowledge and skills of students to applying that knowledge. The purpose of the assessment is to monitoring and evaluating, process, learning progress and improvement of student's learning outcomes. Assessment of learning outcomes can be done in the form of repetition, observation, assignment, or in other forms if required by using the relevant instruments in the form of tests, observation format, fortfolio and so forth. Operationally to organize the implementation of the assessment of learning in accordance with the assessment standards, Kemdikbud has published the Guidance Assessment for Junior and Senior High Schools. According to the guidelines, the assessment is an authentic assessment. Indirect and ongoing attitude

assessment and responsibility of all subjects based on positive and negative attitudes that arise during schooling both within and outside of learning. Assessment of attitudes in the context of subjects is done by teachers using observation sheets or journals. Assessment of skills in learning can also be used in observation sheets for each skill indicator. While the knowledge competency assessment can be used in the form of multiple choice test or essay test with scoring rubric.

The curriculum 2013 has adapted competency standards, content standards, process standards, and assessment standards, to the National Education Standards as set in article 3 of the RI Law No.20 of 2003 [12] on the National Education System (Sisdiknas) that aim to directing the entire education activities in Indonesia to make the students always develop their potential to become a nation that is intelligent, knowledgeable, capable, creative, independent, and become a citizen who is democratic and responsible and dignified to build theirself, society and nation. Therefore all these standards should be poured in the planning and implemented in the learning activities in the classroom to achieve the intended educational objectives.

Some previous researches on the physics learning plan include: Siti Chodijah et al (2012) developed a guided discovery learning model equipped with a portfolio assessment format to be applied in high school physics learning, especially for the concept of circular motion. The result of the development by using the instrument through expert test and field trial obtain learning media with very valid category and can be used in high school physics learning. After the effectiveness test, the overall research concludes that the result of learning media is very valid, very practical and effective in improving the competence of the students. The second research is Nuris Septa Pratama et al (2015), conducted a study of physics-based Higher Order Thinking (HOTS) learning in class X high school in Yogyakarta. This study aims to find out how the planning and implementation of physics-based higher order thinking skills (HOTS) learning in class X high school, in the form of survey research with the state of high school population in Yogyakarta. There are 10 samples that was determined by census technique. The source of information consists of 10 physics teachers of class X and 281 students. The instruments used in this study are RPP document analysis, observation guidelines, teacher questionnaires and students and documentation. Data were analyzed by qualitative descriptive technique and supported by quantitative data. The results showed that the implementation of HOTS-based physics learning planning compiled by physics teacher of class X at the state of Senior High School in Yogyakarta was in moderate category (TS). Implementation of HOTS-based physics learning conducted by physics teacher of class X at state Senior High School in Yogyakarta was in medium executed category (TS).

Based on the results obtained from the studies that have been conducted, it concludes that the existence of subjects in school must be dynamic, in the sense always up to date in accordance with policy changes, modernization and field demands, so it becomes valuable and effective in order to improve the quality of education as a whole.

3. Research Methods and Finding

To generate the model product of the planning, the selected development procedure follows the ADDIE model, an acronym of Analyze, Design, Develop, Implement, and Evaluate [13]. These five words in the acronym are the stages of model development being pursued. The reported research is up to the develop stage. The steps of each stage and the results obtained at each stage are described as follows:

a. Needs Analysis Stage (analyze).

At this stage have been done some analysis, which are curriculum analysis, characteristic and needs of student's analysis, instructional analysis, and related theories and concepts analysis through a review of literature. The results of the curriculum 2006 analysis and the curriculum 2013 derive fundamental differences in competency standards, content standards, process standards, and assessment standards, as a basis for the reconstruction of lesson plan, can be described in Table 1. [14]

Table 1. Differences in the elaboration of the National Education Standards in the curriculum 2006 and the curriculum 2013 [15][16][17][18]

No	Distinguishing Aspect	Curriculum 2006	Curriculum 2013
1	Graduate competence standard	Described on Competency Standards and Basic Competencies Standards of competence are distinguished into 3 aspects namely the competence of cognitive, affective and psychomotor aspects	Described on Core Competencies and Basic Competencies Core competence is divided into four parts: spiritual attitudes, social attitudes, knowledge and skills
2	Content Standards	Refers to Bloom's taxonomy (1956) that separates the learning objectives of the knowledge aspect with the cognitive level aspects of the process Knowledge that is used as learning objectives, divided into 3 dimensions, namely: knowledge of facts, concepts and procedures. The level of cognitive process as the learning objective refers to Bloom's taxonomy (1956) consists of six levels of adjectives: yes, knowledge, understanding, application, analysis, synthesis, and evaluation	Refers to Bloom Bloom's taxonomy (2001), by combining the learning objectives of the knowledge aspect with aspects of the cognitive process. The competence of the knowledge aspect used as the learning objectives is divided into 4 dimensions, namely: factual, conceptual, procedural, and metacognitive knowledge. The level of cognitive process as a learning objective refers to Bloom's taxonomy Revision (2001) consists of 6 levels of verbs: remember, understand, apply, analyze, evaluate and be creative.
3	Standard Process	Learning is oriented towards mastering the concept of science Learning is still centered on teacher activity The process implanted in students in learning focuses on exploration, elaboration and confirmation activities	Learning is oriented towards achieving the competence of knowledge, skills and attitudes in a balanced way. Learning-oriented student activities The process implanted in students is oriented towards the application of a scientific approach through the process of observing, questioning, trying, reasoning and

		communicating
4 Assessment Standards	More dominant judgments on mastery of knowledge and tend to ignore attitude and skill judgments	Assessment is holistic, covering the mastery of knowledge, attitude and skill changes

The results of the analysis show that the developed Physics learning model is oriented towards the fulfillment of 4 dimensions of knowledge and 6 levels of cognitive process as stated in the regulation of the Minister of Education and Culture of Republic of Indonesia number 20, 21 and 22 of 2016 as reference of the improvement of curriculum 2013

The analysis of the characteristics and needs of the students is based on the age and level of student's development as well as test results, documentation analysis and field observations, to develop the content complexity and level of cognitive processes required in the learning. For this purpose, a preliminary study involving four high schools that implemented the curriculum 2013 in Padang. Instruments for reviewing students' knowledge competencies are based on 4 dimensions of knowledge and 6 levels of cognitive processes, totally 24 items. Competence test is done to 12 students of class X which are in the ranking category 1, 2, and 3. Data collection about teacher learning process is done by questionnaire, interview and observation. The result of preliminary study concludes that the quality of student's knowledge competence achievement in physics lesson in State of Senior High School in Padang is still low, in terms of content complexity, and the level of cognitive processes shown by the majority based on evaluation results, cognitive process level is still dominated by the ability of Low Order Thinking Skills (LOTS) level. The majority of the ability to remember is followed by the ability to understand and the ability to apply. As for the level of High Order Thinking Skills (HOTS) for the ability to analyze is still measily. The ability to evaluate and create tend not to show up. Preliminary research results concluded that from the aspect of the complexity of content need to increase the intensity. Especially on procedural knowledge and the development of metacognitive knowledge. In terms of the complexity of the level of cognitive processes achieved more developed capabilities at the HOTS level, including the ability to analyze, evaluate, and be creative.

Instructional analysis is conducted to formulate the necessary instructional design forms as part of the development of learning models to achieve learning objectives, content complexity, cognitive process complexity, learning evaluation instruments and developed syntax model. The results of the analysis conclude that all the instrumental aspects developed poured in the Syllabus, Learning Implementation Plan (RPP), self study materials and student activity sheets.

The analysis of theory, related concepts and rules, focused on the application of Minister of Education and Culture of Republic of Indonesia Regulation No. 20, 21, 22, 23 and 24 of 2016 as reference, Bloom's taxonomy revised, model of study-based learning model and information-processing learning theory, development theory ADDIE model, and supporting statistical theory for data processing and analysis. Analysis of this theory is made as the basis that supports the development of learning models

b. Designing Model Stage (design)

The aspects of design at this stage is concerning the formulation of learning objectives, the design of the complexity of learning content and its relation to the complexity of the cognitive process level trained, the design of the learning evaluation instrument, and the syntax design of the learning model so as to obtain the complete learning model design that consisting of:

The design of learning objectives formulation, conducted based on KI and KD analysis describe in the form of indicators of KD achievement, and then poured in the form of learning objectives. Learning objectives are formulated based on indicators of achievement of competencies that embrace elements ABCD + K (A = Audience/student, B = Behavior, C = learning conditions, D = Degree/ level

of achievement, and K = Knowledge). For example, the formulation of learning objectives: "With LKS workmanship and teacher confirmation, students can identify 4 characteristic styles and their effect precisely" (Description: student = Audience, can identify = Behavior, 4 characteristic style and influence on the object = Knowledge, with LKS workmanship and teacher confirmation = Condition, with exact = Degree).

Design model of learning content complexity, compiled for Force and motion of objects on class X physics lessons semester 2 in high school. The designed model of learning content complexity is referred to the fulfillment of the four dimensions of knowledge as proposed by Anderson and Krathworth (2001). Learning content is arranged in the form of a declarative statement or phrase containing statements for conceptual, procedural or metacognitive factual knowledge. Learning content is often also called as essential material, built on learning objectives wrapped by theme or learning topics. Design model of cognitive process complexity to be trained to learners.

The design model of the complexity of the cognitive process level is rested on the fulfillment of 6 levels of cognitive processes. The hierarchy consists of abilities: remembering (C-1), understanding (C-2), applying (C-3), analyzing (C-4), evaluating (C-5) and creativity (C-6). The order of C-1 to C-6, is the order of ability to be reached from the lowest to the highest order level. The high ability includes the ability level below.

Design model of output evaluation and outcome of learning outcomes. Evaluation of output is done to know the achievement of students knowledge competence. The model design of this output evaluation instrument is in the form of an essay and objective test completed with an answer key and a scoring column. The contents or answers of the developed instrument can be scored 1, 2, 3, or 4. Outcome evaluation is done to know the attitude change and skill improvement as the reflection (impact) of knowledge competence achieved. The developed outcome evaluation instruments tend to be observation sheets, and student activity sheets. The instrument for these two aspects, developed by using an instrument grid that refers to the competency aspects contained in the curriculum that contained in KI and KD.

The syntax design of the developed learning model. The syntax of the designed learning model is the achievement of student competence, oriented to 3 aspects, namely: a) the complexity of the content (the fulfillment of 4 dimensions of knowledge), b) the complexity of the cognitive process level (trained 6 levels of cognitive processes including LOTS and HOTS), and c) carried out with a scientific approach (containing elements: observing, asking, trying, reasoning and communicating). The results of the orientation of these 3 aspects resulted in a syntax model consisting of 5 stages of activities implemented on the student activity sheet as follows:

Stage 1: Identify physical symptoms as reference learning and observation objects

Stage 2: Conceptualization exercise, based on factual knowledge

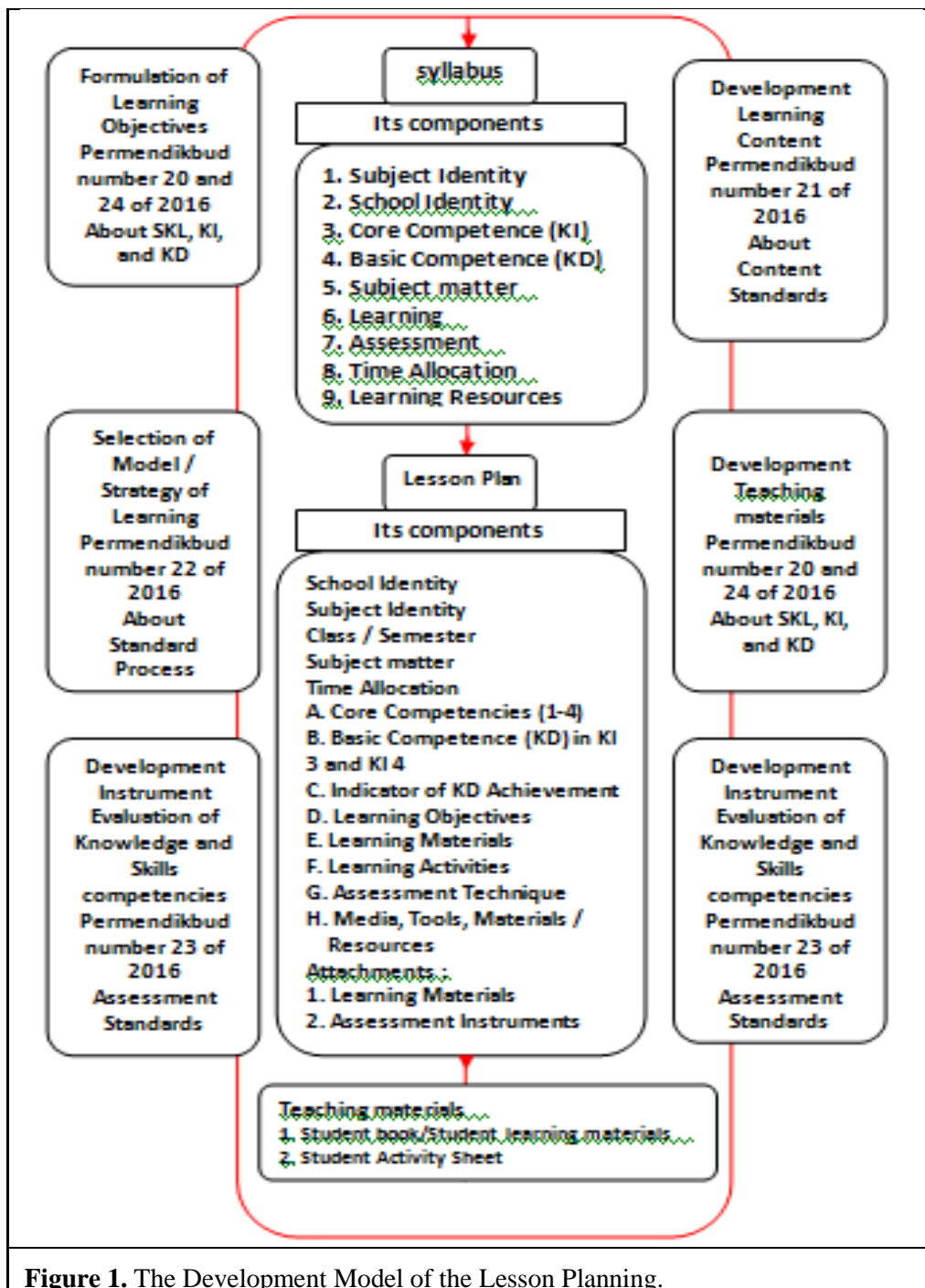
Stage 3: Build tips and strategies for designing activities

Stage 4: Develop creativity to solve problems

Stage 5: The exercise concludes and communicates the results of the learning activities

c. Model Development Stage (develop)

Learning lesson planning products are grouped into 2 kinds, namely: 1) Learning Implementation Plan (RPP), and 2) Teaching Materials. RPP is developed based on syllabus. The components of RPP developed consist of: a) formulation of learning objectives, b) content development, c) process development, and d) development of evaluation instruments. Development of RPP refers to the Process Standards contained in the Regulation of the Minister of Education and Culture of the Republic of Indonesia number 22 of 2016. Learning planning components developed are expressed by the flow chart in Figure 1



The developed teaching materials consist of 2 kinds, namely Student Self Study Material and Student Activity Sheet. Good teaching materials are prepared based on indicators of achievement of learning objectives. In preparing the printed materials should pay attention to some conditions that must be met, that are didactic requirements, construction requirements and technical requirements. Didactic requirements pertain to effective learning principles. Construction requirements regarding the use of language, sentences, vocabulary levels of difficulty and clarity of information. Technical requirements is relating to the writing of drawings and the appearance of teaching materials. The

requirements of good teaching materials can be evaluated by using an evaluation instrument format in the form of a Likert scale[19]

With teaching materials oriented to the complexity of content and cognitive processes, students are expected to learn physics through interaction with various natural objects that poured in teaching materials. Interaction results are described, analyzed, and applied to solve various relevant physical problems through the application of the scientific method. Thus it will be embedded and mastered students to the four dimensions of knowledge into learning content, in line with the increase of LOTS into HOTS which can be actualized in the form of the ability to solve the relevant physics problems[20]. The aspects of complexity are contained in the developed materials, presented by the diagram in Figure 2.

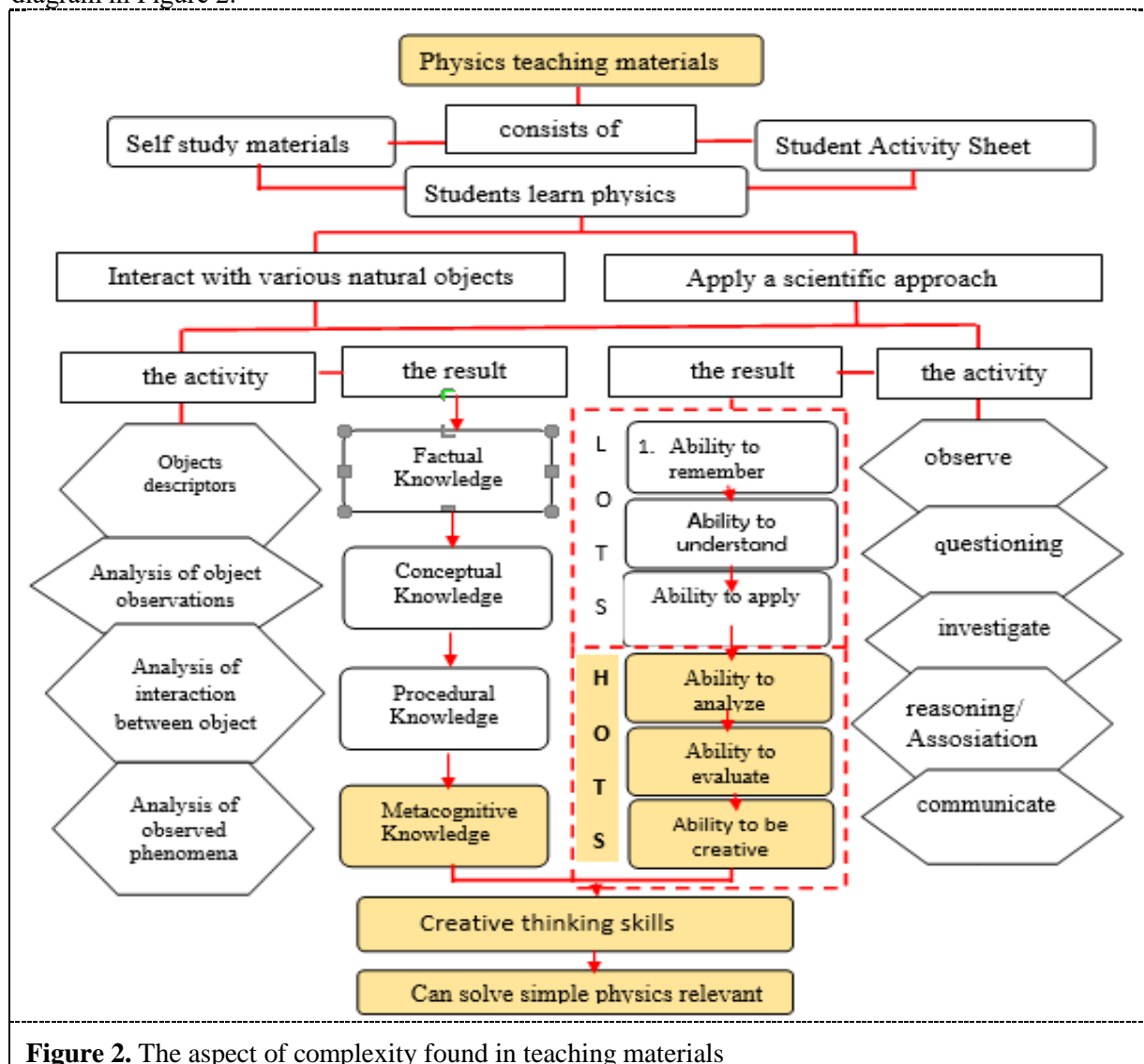


Figure 2. The aspect of complexity found in teaching materials

To find out the validity of construction, product planning and learning materials are discussed with 2 peers of judgment to get input. The product is refined based on the input obtained so that the resulting prototime is ready to be validated. Product validation activities conducted by 4 experts judgment. Recapitulation of validation results from all aspects of physics learning planning is presented in Table 2.

Table 2. Results Validation of Physics Learning Planning Components

I. VALIDITY OF LEARNING OBJECTIVES		VALIDATORS				RESULTS	
A	BASIC FORMULATION OF LEARNING OBJECTIVES	V1	V2	V3	V4	3,38	V
B	COMPONENT OF LEARNING OBJECTIVES	V1	V2	V3	V4	3,35	V
C	REQUIREMENTS OF LEARNING OBJECTIVES COMPONENTS	V1	V2	V3	V4	3,29	V
AVERAGE		3,3	3,5	3,47	3,1	3,33	V
II.CONTENT VALIDITY OF ESSENTIAL MATERIALS		VALIDATORS				RESULTS	
A	LEARNING CONTENT REQUIREMENTS	V1	V2	V3	V4	3,4	V
B	COMPLETENESS OF LEARNING CONTENT	V1	V2	V3	V4	3,38	V
C	COMPONEN REQUIREMENTS OF LEARNING OBJECTIVES	V1	V2	V3	V4	3,38	V
AVERAGE		3,3	3,5	3,4	3,3	3,38	V
III. VALIDITY OF STRATEGY / LEARNING MODEL		VALIDATORS				RESULTS	
		V1	V2	V3	V4	3,38	V
AVERAGE		3,2	3,2	3,47	3,7	3,38	V
IV. VALIDITY OF LEARNING MATERIALS		VALIDATOR				RESULTS	
A	FEASIBILITY OF STUDENT ACTIVITIES	V1	V2	V3	V4	3,33	V
B	FULFILLMENT OF 4 KNOWLEDGE DIMENSIONS	V1	V2	V3	V4	3,31	V
C	TRAINING 6 LEVEL OF COGNITIVE PROCESSES	V1	V2	V3	V4	3,38	V
D	DEVELOPING ATTITUDES AND SKILLS	V1	V2	V3	V4	3,54	V
AVERAGE		4,8	4,6	4,15	4,2	3,41	V
V. VALIDITY OF INSTRUMENTS EVALUATION		VALIDATORS				RESULTS	
A	COMPLETENESS TYPES OF EVALUATION	V1	V2	V3	V4	3,31	V
B	ASSESSMENT OF 4 KNOWLEDGE DIMENSIONS	V1	V2	V3	V4	3,31	V
C	ASSESSMENT 6 LEVELS OF COGNITIVE PROCESSES	V1	V2	V3	V4	3,50	V
D	ASSESSMENT OF ATTITUDE AND SKILLS	V1	V2	V3	V4	3,50	V
AVERAGE		3,7	3,6	3,0	3,5	3,43	V
VI. VALIDITY OF LESSON PLAN		VALIDATORS				RESULTS	
		V1	V2	V3	V4	3,65	V
AVERAGE		3,6	3,8	3,47	3,7	3,65	SV
VI. VALIDITY OF PHYSICS LEARNING PLANNING		VALIDATORS				RESULTS	
		V1	V2	V3	V4	3,43	V
TOTAL AVERAGE		3,5	3,5	3,33	3,4	3,43	V

Note: V1, V2, V3, V4 = The first, second, third and fourth of validators

4. Discussion

The learning at school will work in the best way when it comes to achieving the objectives of the curriculum, and has been planned in advance. The experience shows that learning without a plan, tend not directed, and spend a lot of time and the purpose of learning is not achieved. A lesson planning based on experience and some benefits of good learning planning predict the results to be gained, the learning will be implemented systematically as a guideline of activities, the content of learning can be well done, can streamline the use of time and so forth.

In designing the learning plan, the aspect of objectives, content, process and assessment are arranged in such a way to achieve the learning objectives. Physical learning planning model that has been compiled refers to the National Standards of Education, especially with regard to graduate competency standards, core competencies, basic competencies, content standards, process standards and assessment standards set forth in permendikbud no 20, 21, 22, 23 and 24 of 2016. The result of the trial is limited to 4 experts judgment, concluding that the planning model is in valid category. It is expected that the actual implementation of the classroom will be effective in improving students' competence in physics learning, especially with regard to solving problem creativity

5. Conclusions

Conclusions obtained until the development of products, has been generated learning planning to meet the validity of the content and validity of the construction that ready to proceed with testing on the real class to know the effectiveness and practicality.

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