

Pedagogical Content Knowledge Case Studies at Junior High School of First Class Science Teacher, in 2013 Curriculum Implementation.

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Abstract

This study aims to determine the science learning process in terms of pedagogical content knowledge in the implementation of 2013 curriculum and know the obstacles in implementing a science teacher learning in the Curriculum 2013 . This study used a qualitative research case study (qualitative case study) to obtain in-depth information on the implementation of 2013 curriculum. The study was conducted in SMP N 8 Yogyakarta and SMP IT Abu Bakar Yogyakarta . Two schools were selected through purposive sampling technique . Subjects of this study consisted of a science teacher and two students in each school . Instruments that used include science learning process observation sheets, questionnaire for teachers and interview sheets for teacher and students. Data were analyzed using Miles and Huberman analysis techniques which include data reduction , data display and conclusion . The validity of data is done through triangulation of data from observation, interviews and questionnaires. not all aspects of PCK appear in both the curricular knowledge, strategic knowledge, assessment of knowledge and science of nature knowledge .

Keywords: *Pedagogical Content Knowledge, Science Teacher, 2013 Curriculum Implementation.*

INTRODUCTION

Implementation of Curriculum 2013 is a step that is sustainable from the previous curriculum Competency-Based Curriculum and Curriculum Education Unit. Completion of the curriculum as a step towards achieving the National Education. Curriculum change carried out as one of the measures to overcome the various problems of the nation's moral quality, the quality of human resources, and the challenges of the development of Science and Technology.

Implementation of Curriculum 2013 demand the ability of teachers in mastering the essential concepts and pedagogical abilities of teachers. 2013 The curriculum emphasizes the attitude domain (spiritual, social), domain knowledge and domain skills. The fourth aspect of this would then be the basis for the preparation of core competencies (KI) and its formulation into Basic Competency (KD). In the 2013 curriculum, learning guides and textbooks have been defined from the center. However, teachers are required to still be able to package the learning-oriented aspects of the attitudes, knowledge and skills. Guidelines for Curriculum Development in 2013 noted that learning science in junior implemented based alignment. Learning science in junior developed as integrative science subjects rather than as educational disciplines. Both as an applicative oriented education, the development of thinking skills, learning ability, curiosity, and the development of caring and responsible attitude towards the natural and social environment. Integrative science has meaning integrating various aspects of domain attitudes, knowledge, and skills. In substance, the IPA can be used as a tool or tools to develop the attitude domain, existing knowledge and skills.

Curriculum implementation in 2013 is something new for teachers, science teacher was no exception. In general, science teachers must have four competencies, namely pedagogy competency, professional, personal and social. Specific competencies Science teacher also stated in NSTA (2003: 1) which recommended Standards for Science Teacher Preparation [1]. This standard contains a number of standards that must be owned by a science teacher standard includes content, nature of science, inquiry, Issues, general skill of teaching, curriculum, science in the community, assessment, safety and welfare, professional growth. This standard is consistent with the vision of NSES (National Science Education Standards). NSTA (2003: 8) in Insih Wilujeng (2010: 353), also recommended that the science teachers of Primary and Secondary schools should have the capability of interdisciplinary science [9]. This is the underlying need for a science teacher to have competence in teaching in an integrated IPA (integrated),

including integration in the field of science, integration with other fields such as technology, health and integration with penacapaian attitude, scientific processes and skills. In carrying out the science lesson on the curriculum in 2013, required capabilities related to the content (content) materials science and how membelajarkan IPA. This approach is known as approach PCK (Pedagogical Content Knowledge). [2] Shulman (1986) in S.K Abell, D. L. Hanuscin, M. H. Lee, M. J Gagnon, (2008) provides a basis to think that to teach science is not enough to simply understand content Material Science (knowing science) but also how to teach (how to teach). Science teachers must have knowledge of science learners, curriculum, instructional strategies, assessment so that it can carry out the transformation of science knowledge.

The emergence of the curriculum in 2013, requires an adjustment of teachers in accordance with the teaching pack teruang in Curriculum 2013. It is also a reference LPTK in preparing prospective science teachers to be competent in accordance with that stated in 2013. Curriculum science teacher preparation program at the level LPTK need data analysis of the needs of the field. The needs analysis capabilities include pedagogy, content capabilities materials needed in the implementation of Curriculum 2013 and obstacles in implementing a science teacher learning science in the curriculum of 2013. It aims to do a case study to reveal the ability of science teachers in implementing the curriculum learning science in 2013. Broadly speaking, this study has a position that is essential for further research both on the subject of teachers in the field and the preparation of prospective teachers in LPTK environment. The objective of this study was to determine the science learning process in terms of pedagogical content knowledge in the curriculum implementation in 2013, knowing the science teacher obstacles in implementing the learning according to the curriculum in 2013.

LITERATURE VIEW

Curriculum 2013

Curriculum development in Indonesia occurred from 1947, 1964, 1968, 1973, 1975, 1984, 1994, 1997, 2004, 2006 and until 2013. Curriculum curriculum sustainable development based a variety of factors. This is corroborated by the opinion Oliva (1992: 29) [3], "The curriculum is a product of its time, curriculum responds to and is changed by social forces, philosophical positions, psychological principles, accumulating knowledge, and educational leadership at its moments in history". Of that argument, it can be summarized that the development of the curriculum meet the challenges that changes in social, philosophical aspects, science and technology development.

Guidelines for Curriculum Development in 2013 noted that learning science in junior implemented based alignment. Learning science in junior developed as integrative science subjects rather than as educational disciplines. Both as an applicative oriented education, the development of thinking skills, learning ability, curiosity, and the development of caring and responsible attitude towards the natural and social environment. Integrative science has meaning integrating various aspects of domain attitudes, knowledge, and skills. This is consistent with the understanding of science is integrated by Hewitt, Paul G and etc (2007: xvi), that integrates science presents aspects of physics, chemistry, biology, earth science, astronomy and other aspects of Natural Sciences [4]. In his book Conceptual Integrated Science, Integrated IPA is presented based contextual approach is to connect science to everyday life, personal and direct, put one of the main ideas, contains troubleshooting. In the presentation, IPA presented with unity concept to develop the realm of knowledge, attitudes and skills.

PCK (Pedagogical Content Knowledge)

Shulman (1986) in S.K Abell, D. L. Hanuscin, M. H. Lee, M. J Gagnon, (2008: 79) gives the concept of thinking about the PCK as follows:

"... knowing Science is a Necessary but not sufficient condition for teaching. Science teacher Also must have knowledge about science learner, curriculum, instructional strategies, and assessment through the which they transform Reviews their knowledge in science to effective teaching and learning ". [11]

The concept of thinking gives the sense that the PCK for teaching science is not enough just to understand the science of matter content (knowing science) but also how to teach (how to teach). Science teachers must have knowledge of science learners, curriculum, instructional strategies, assessment so that it can carry out the transformation of science knowledge.

Shulman (1986: 9), defines the content knowledge into three categories of subject matter content knowledge, pedagogical content knowledge, curricular knowledge.

Learning Science

Koballa and Chiappetta (2010: 105), defines science as a way of thinking, a way of Investigating, a body of knowledge, and interactions with technology and society [5]. IPA can be summarized that there is a dimension in the way of thinking, a way of investigation, building science and its relation to technology and society. This becomes the substance of the fundamental importance of learning science who developed the scientific process for the formation of the mindset of learners. According to Sund & Trowbridge (1973: 2), the word science as "both a body of knowledge and a process" [6]. According Trefil, James and Robert Hazen (2007: xii), integrated approach (An integrated approach) involves a scientific process, organizing principle, organizing the natural integration of scientific knowledge and its application in everyday life [7]. In addition, in an integrated approach is also expected to be able to link students in other fields include physics, astronomy, chemistry, geology, biology, technology, environmental, health and safety.

RESEARCH METHODS

This study used a qualitative research with case studies (qualitative case study) to obtain in-depth information on the implementation of Curriculum 2013.

Case study research is a qualitative approach in the which the investigator explores a bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in depth of data collection, involving multiple sources of information (eg, observation, interviews, audiovisual materials, and documents and reports) and reports a case description and case-based themes. (Creswell, 1998: 73) [8].

Schools that used in this study will be determined through purposive sampling on the basis of the junior high school in the city of Yogyakarta that SMP N 8 Yogyakarta and junior IT Abu Bakar Yogyakarta. This research subject is a science teacher and second grade VII students of class VII in SMP N 8 Yogyakarta and junior IT Abu Bakar Yogyakarta.

Data collection techniques used in this study include observational techniques non partisipants, documentation, and semi-structured interview. Observation techniques used to see the implementation of science teaching in class VII implementing Curriculum 2013. Interview techniques used to obtain information readiness, barriers to learning science teachers in implementing the curriculum in accordance 2013. Instruments and grating instrument contained in the annex. The qualitative data obtained from observation, interviews and documentation were then analyzed using qualitative analysis techniques Miles and Huberman, namely data reduction, data display and conclusion. [10]

RESULT AND DISCUSSION

1. *Curricular knowledge*

Table 1. Description of curricular knowledge

Indicator	Result of research	
	SMP IT Abu Bakar Yogyakarta	SMP 8 Yogyakarta
Planning a scientific approach based science learning (observation, questioning, reasoning, experimental)	Teachers formulate their own lesson plans through discussion forums science teachers in one school. - Each teacher makes RPP then shares and discuss with friends the other science teachers.	Some already planned scientific but some have not. -Teacher uses a collection of lesson plans when socialization training curriculum in 2013
Formulating objectives and indicators of learning	Learning objectives statement in RPP includes the processes and results - Formulation of learning objectives contain a affective, knowledge, skills aspects - Indicator of knowledge aspect was formulated in C1-C3	- Formulation of learning objectives already includes the processes and result - Formulation of learning objectives contain a affective , knowledge, skills aspects. - Indicator knowledge was formulated C1-C3.
Develop techniques and instruments are thoroughly	instruments in the RPP include scientific behavioral observation sheet instruments,	teachers use the ready-made lesson plans from the curriculum 2013 training.

	observation skills sheet and essay questions.	- Instrument in the RPP include attitude observation sheets, sheets observation skills, essay test questions.
learning in the lesson plan that integrates KI I, II, III, IV.	-In the RPP are KI I, II, III, IV - Indicators are formulated into the attitudes, knowledge, skills	teachers use the ready-made lesson plans result of socialization curriculum in 2013 - In the RPP were referred to, there are KI 1, II, III, IV.

2. Knowledge of instructional strategies

Table 2. Description of knowledge in instructional strategies

Indicator	SMP IT Abu Bakar Yogyakarta	SMP N 8 Yogyakarta
The learning process is to develop creativity - Generating idea: generating ideas in the discussion - Relating: able to make a connection to a specific situation - Inference - Predicting - Make generalization - Visualization - Synthesizing - Hypothesis - Making analogies - Inventing	When the material is standard unit of measurement, students are asked to specify the type of the measuring instrument, which uses no shoes, inch, ruler, eraser, fathoms- Based on the observation, students confusion when working on a discussion question after taking measurements to make generalizations. The question is "based on the comparison, the important thing is to be formulated"	Students make origami (paper form colored) to show the classification dichotomy
Scientific learning activities (observing, questioning, reasoning, experimental)	Students take measurements of classrooms, desks and other objects using the span, fathoms, ruler. When making measurements, the students ask questions related to who they do not know. Teachers are not directly answer but give pertanyaan to lead students to answer questions.	Students are invited to observe the torso When the material of cells, tissues, organs, students make fresh preparations of plant rhododiscolor and membranes in the onions then observed under a microscope.
Guiding students to find out, will not be notified of (discovery learning) includes the stimulation, discussion tasks and problem identification, observation, data collection, data processing and analysis, verification, generalization)	Based on the observation of the process, teachers lead students to find out through the investigation .When the student asked, the teacher directed by asking questions again At the beginning before the investigation, the teacher showed pictures of various gauges, outlines the objectives and provides worksheets . In the beginning was not emphasized students are invited to identify the problem.generalization	Based on observations, the teacher comes in, the teacher gave the introductory material of cells, tissue organs and then the students observe the cells by making fresh preparations and preparations preserved. Teachers do not make and give worksheet again. Students carry out surveillance activities using students' books. At the beginning, the students have not been invited to identify the problem and the teacher did not give the problem first.
Applying the learning model of problem-based learning, project based learning and discovery-inquiry-based learning and other approaches constructivism	Based on the observation, identify the problem does not arise, and the students have not been able to do lesson plans and processes. Lesson plan compiled using the model of discovery learning Teachers have not tried using project based learning and problem based learning.	Based on the observation of the process, which appears observation. Based on observation, the students are not being led to relate the observed data of cell for was generalized
Learning science is done with coherence (integrated science)	Based on the observation process, associate professor with the material aspects of the attitude, for example, when asking the lamp inventor Thomas Edison, the teachers stressed that the IPA invention involves various religions. This leads to tolerance and respect. When measuring the material, students are asked to look at pictures of leaves on paper mm. students are asked to calculate its area. Students are not asked to measure directly the leaves. To motivate and reduce boredom during activities, teachers often play the short video example of a disabled child that persistent struggle and songs of encouragement more. When the teacher asked reviewing IPA object, after students answer the teacher gives confirmation that God's grace provides an opportunity to look at objects and microscopic living creatures. When the teacher asks the distance between	It does not appear either its integration with aspects of the attitude or in the content material.

	the sun and the earth with SA, teacher linking with the distance of the field maksar, "then we should do?"	
Integrating between concepts within major theme carried out with the model connected, webbed	The material of measurement associated with the measurement of leaf It uses a connected model.	Not seen its integration
Awarded the project to solve authentic problems (related to everyday life related science objects)	Given projects unit of measurement of the standard unit and not standard unit.	project-based learning yet

3. Knowledge of understanding of science

Table 5. Result of knowledge in understanding science

Indicator	SMP IT Abu Bakar Yogyakarta	SMP N 8 Yogyakarta
Mastering the science concepts being taught and follow the development of science.	Based on the observation, when the material differences in monocots and dicots, student confusion when discussing types whose roots are in the worksheet. The content of science, associated with the inventor of the light and the inventor flasdisk.	When observation, observation material of cells, tissues, organs. Teachers do not associate with the issue of development of the science.
Content of science was presented integrated not separated in groups of physics, chemistry, biology	Based on observation, teacher associate the measurement with the size of bacteria. Linking measurement to measure the leaf area.	There was no integration
Materials and activities are enriched with the needs of students to think critically and analytically	In worksheet, yet bring all aspects of critical thinking. It can be seen from the discussion questions after the data collection.	There was no appears during learning.

4. Knowledge of assesment.

Table 4. Result of Knowledge in Assesment.

Indicator	SMP IT Abu Bakar Yogyakarta	SMP N 8 Yogyakarta
Measuring behavior (KD of KI and KI II), knowledge (KD at KI III) and skills (KD at KI IV)	In the RPP, the teacher has drawn up an assessment rubric of attitudes, and cognitive skills. When learning, teachers are overwhelmed in assessing various aspects and have not memorized the names of students	The teacher asks the students to collect the product in the form of images of cells observed students. Teachers around watching each group but did not use the assessment sheet Students when the interviewee feels judged for teachers around
Measuring KD at KI I and KI II and II through behavioral observation, measuring KD at KI III through a written test, measure at KI KD IV with the product assessment, performance, project and portfolio.	Based on the observation of the process, teachers around watching each group Do not look the teacher brought sheets to assess the behavior Based on the interviews, teachers find it difficult to assess many aspects and have not memorized the names of their children. Students did not do the activities when the teacher not observed the group Written test is done with a quiz about converting the size of bacteria	Teachers are not visible to assess the behavior and attitudes. Based on the interviews, the teacher has not memorized the names of the students. Teachers are overwhelmed with many kind of assesment rubric.
Measuring the level of thinking of students ranging from low to high	Based on observations of the mid test, the shape of the essay test develop the ability to observe symptoms, determine the amount using a measuring instrument (balance two arms, stopwatch, ruler), the ability of prediction.	Teachers are not visible to assess their attitudes and behavior. Based on the interviews, the teacher has not memorized the names of the students. Teachers are overwhelmed with the number of rubrics.
Stressing on questions requiring deep thought C3-C6 (critical thinking):	When the learning process, after all the groups to write the data, the teacher leads to the question:	Based on observations, the teacher is less led to the students find their own answers.
Measuring student work process, not just the student's concept.	Teachers arounded give attention working each group of students. But the teacher did not bring paper assessment rubric. Based on interviews, the teacher is judging process when students do activities but the weakness of the teacher is not able to learn the names of all students.	Teachers around, but did not bring the assessment sheet. Based on the interviews, teachers difficulty judging process because of the large rubric, has not memorized the name of students and the time is short.
Using a portfolio of student learning	Do not appear	Students write down the results of the images of cells and tissues in a special task book, and then a teacher check the result.

Based on the formulation of the problem, this study aims to determine the learning process on the implementation of the curriculum in 2013 and knowing the obstacles of learning science curriculum mlealui 2013. Data collection was conducted classroom observations, interviews, questionnaires, and observation of RPP and LKS. Classroom observations conducted in each school four times. Presentation of data in the learning process in terms of (1) curricular knowledge; (2) knowledge of instructional Strategies for teaching science; (3) knowing of understanding of science and science teaching; (4) knowledge of assessment. Complete data research results are presented in the appendix. The following are the results of the data reduction process of learning in the curriculum implementation in 2013. Curriculum 2013 first piloted in 2013. In Yogyakarta there are 29 junior high schools as a pilot curriculum implementation, 2013. In a research school that is used as an object of research is a junior IT Abu Bakar Yogyakarta and SMPN 8 Yogyakarta. Research focuses on knowing the process of learning science and science teacher obstacles in the implementation of the curriculum in 2013. Review of aspects of curricular knowledge, the process of learning science in 2013 has been planned curriculum-based scientific. In planning the study, there is a science teacher who uses the result of socialization training curriculum lesson plan 2013. In addition, there is also a science teacher who developed more tailored to schools and learners. Based on the judgment of the lesson plan, the formulation of objectives already contain processes and products that will be achieved. Assessment instrument that was used includes, attitudes, cognitive and skills. Indicators are formulated C1 until C3. Viewed from the aspect of knowledge of instructional strategics, the teachers have been working to develop creativity. Creativity indicator that not yet was developed consists of ; make generalization, relating, inventing, making analogy, hypothesis, synthesis, generating ideas. Creativity aspects that arise include visualization, inference and predicting. Lesson activities already based scientific. Students are directed to do observation and measure. However, students have difficulties to make reasoning to the formulation of the conclusion . Questioning ability of children have emerged but have not describe the level of critical thinking. The type of questioning that emerged in the C1 until C3 level. To develop the children ability must be stimulated by the teacher by first asking questions. The question was brought from issues that make curiosity of students. Lesson activities has led students to seek out (discovery learning). Based on observation, problem identification phase has not been raised and the students have not been able to generalize. Teachers do in the beginning is to provide introductory material is not a problem to be solved. Presentation function in stimulating learning problems. This stage is important in the early stages of the discovery learning. Lesson plan compiled using the model of discovery learning. Teachers have not vary with the model of problem based learning, project based learning and other constructivistC approach. In its application in the classroom, the model has not been all phases of discovery learning is raised. A phase which has not been raised is the stage invites students to identify problems. The integration of the science content has been raised but still constrained by a factor of mastery of knowledge in accordance with the scientific background of teachers. With reference to the book of teachers and students, the teacher should be able to bring its integration. The integration can be seen from the integration of science and attitudes, and the integration of materials science (physics, chemistry, biology, earth space). One teacher has been integrated with the realm of attitudes (religious and social). However, teachers in other schools may not be able to create a better alignment with the realm of attitudes, knowledge, skills and integration of own material. In this case requires the ability of teachers to develop the material and enrich the material to be able to integrate. Based on the observation of student books, teacher books and learning process in the classroom, integrating model use of science concept using a connected model. In lessons, teachers are giving the project examples; observing microorganisms in various water samples. Teachers need to have the ability to relate the concept with the development of science. Science teacher at SMP Abu Bakar follow the development of science by linking the inventor of the light, the inventor flasdisk. In SMP N 8 Yogyakarta, has not been associated with the development of science and technology. In the aspect of integration, a teacher in Abu Bakar link the material of measuring the size of bacteria and leaf area. In SMP N 8 Yogyakarta, has not raised its integration. The ability to package and develop materials to other areas needed to be able to present a unified science of matter. Teachers need to continuously enrich the sources of information related to concepts or materials in order to overcome obstacles scientific background factor. Review of critical thinking aspects, science teacher at SMP Abu Bakar not bring all the components of critical thinking. It is seen in worksheet, where the questions were designed in the level of C1 until C3. While science teacher at SMP N 8 Yogyakarta, has not led to all aspects of critical thinking. In the aspect of assessment, teachers difficulties in assessing the attitude and the process because there was many rubrics. For cognitive assessment, teachers are able to perform well through quizzes, midterms and final exams. Product assessment has been done by teachers.

CONCLUSION

In this case study, there are some important things that related with to the curriculum 2013 implementation (a). Difficulty getting students to reason(b). Difficulty assessing authentic(c). Difficulties in step to direct scientific reasoning(d). Students having trouble reading the observed data to be formulated into a conclusion(e). Fears of teachers with national test pattern given product-oriented mindset and learn science activities with scientific emphasis on the process.(f). The limited ability of teachers in combining materials science (chemistry, physics, biology) because of factors mastery of teachers who are not relevant to the scientific background.(g). Limitations children get information from sources other book when the book more students invites students to observe, think, analyze the (scientific).(h). The difficulty in assessing the attitudes and processes with many rubric (i). Difficulty developing the creative aspect(j). Difficulties in developing critical thinking.

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