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Teaching science through shared model of science curriculum integration

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Abstract
Science is one of subject that using curriculum integrated theory, combining physics, biology, chemistry, eart and space. There are some ways to integrate science curriculum that is fragmented model, connected model, nested model, sequence model, shared model, webbed model, threaded model, integrated model, immerse model and networked model (Fogarty: 1991). This paper only discuss about science curriculum integrated of shared model for light and human vision process unit, that taught using inquary, scientific approch, experiment and discuss method. To know how student reach the study goals using formative assessment that is process and product of performance assessments.

Keywords: science curriculum integrated of shared model, inquary, light, human vision process

1. Introduction
Science education is hoping of student for study about herself, environment and our universe, also for applying in daily life. Regarding on the regulation ofthe Education Ministry of Indonesia, Number 22 of 2006 about content standards for elementary school and secondary school said that in curriculum structure for science at secondary school is integrated science. This integration can be done in various ways to achieve the goals of science learning itself.

Teaching and learning of integrated science in school is reffering on the science education syllabus from Indonesia education ministry. Based on basic competency in syllabus, several topic of science (physics, chemistry, biology) have been integrated. But in practice, teachers still tend to separate the material, so students should be find their own integration after studying the subject. For example, the unit of light, the teacher will teach the physics material first by teaching the concept of light and optic and after that the teacher will teach the biology material about the vission of human and insects. This kind of learning makes the students see that science isn't integrated. This happen because the educational background of science teachers in Indonesia are still largely different, some of them come from physics, from chemistry and biology.

The national curriculum of Indonesia changed the science education framework in junior high school that was originally separated into an integrated make some teachers confused to teach science. The science lesson in the national curriculum formulates that science teaching should be conducted in integrated between physics, chemistry, and biology. This becomes important for students to apply one concept of science to other science concept, so that learning becomes meaningfully.

Integrated curriculum can be done in various ways. According to Fogarty (1991) [2] there are ten models in integrating curriculum that are fragmented, connected, nested, sequenced, shared, webbed, threaded, integrated, immersed, and networked. This paper will focus on one science curriculum integration model that can be applied in integrated science learning that is shared integration model.

2. Science Stucture
The scope of science materials of junior high school based on the national curriculum is divided into some sections: (1) Formulating problems, predicting, conducting experiments, collecting data accurately, systematically processing data, making conclusions, communicating experimental results in verbally and writing; (2) Natural phenomena, environment and their changes, plants, animals, and humans in micro;(3) Motion and force, work and simple aircraft, pressure, wave and optic, electricity and magnetism, friendly environmental technology; (4) Classification and material changes of additive substances and matter addictive substances; (5) The layers of the earth and the solar system; (6) global warming, friendly environmental technology, and soil.

In this paper the integrated science scope discussed will be limited in wave and optic materials. Wave can be divided by the propagation medium and its direction of vibration. Based on the propagation medium the wave is divided into mechanical waves and electromagnetic waves. Where a mechanical wave is a wave that requires a medium for propagation, while the electromagnetic wave is a wave that does not require a medium to propagate. Based on the direction of vibration the wave is divided into transersal and longitudinal waves. Longitudinal wave is wave that the oscillation direction is unidirectional to the propagation wave, while the transverse wave is a wave that the oscillation direction is vertical to the propagation course (Hewitt, 1993) [3]. For the junior high school level the wave material is simplified into the sound waves and light as waves. The material to be discussed in this paper is the about light as

electromagnetic waves and one of the optic toolsis eye.
The eye as one of the optic tools has a convex lens which is used to collect the income light to the eye and cause the shadows will fall into the retina. If there is a change of focus point on the eye lens due to improper eye organ maintenance then the shadow will not fall in the retina. This is referred to as an eye disorder or an eye defect such as miopi, hypermetrophy, presbyter, and astigmatism. If there is a aye disorder, it's need a eye glass lens to normalize the focus point of the lens so that the shadow can fall right into the retina again.

3. Science Integrated of Shared Model

The design of an integrated Science model that can be used to find the slices of the merging of two subject that is physics and biology, or chemistry and biology, or chemistry and physics is integration of shared model. The shared model according to Fogarty (1991) [2] is defined as shared planing and teaching take place in two disciplines in which overlapping concepts or ideas as organizing elements. The main focus of this type is the intercepts of the same concepts, skills and attitudes that can be assessed by studying the two mutually-charged disciplines.
The shared learning type is like as binocular shorts. Both binocular lenses are considered as two disciplines that see an object. If the object is seen with only one lens it will look less and not clear but if viewed using two lenses, the object will be clearly visible with a wider range. The slices of concepts, skills, and attitudes are the objects of this type that will be seen from two different subject so that it will appear to be a link between the two fields of science. Here is a description of integrated learning of shared model:

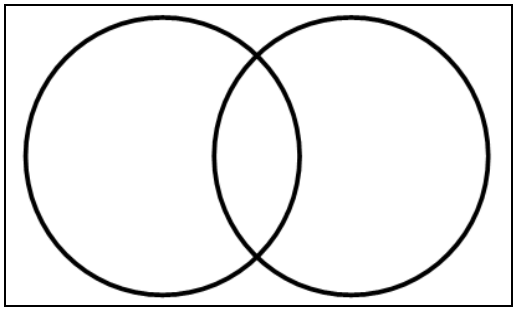

Fig 1: The framework of integrated subject of shared model

4. Example and Application: Light and Human Vision Unit

Integrated learning model of shared type can be applied in integrated science. In this paper we will discussone example of unit in science at VIII grade student in basic competence no. 3.12 that is analyzing the characteristic of light, shadow formation on plane and curve, and its application to explain the process of human vision, insect eye, and the working principle of optic tools. This topic comes from two different subject that is physics and biology. Physics topic about light can be applied in biologic topic about the process of human vision and aye disorder. The merger of these two materials can be obtained by a concept of integration that is the formation of shadows on the lens of the eye, and students can use their analytical ability to find the relationship between the characteristic of shadow of the lens and the shadow formed on the retina. After studying this topic, students are expected to be able to cultivate a caring attitude towards the health of their eye organs. For more details, the following will be illustrated on the design of integrated science learning unit of shared model on light unit:

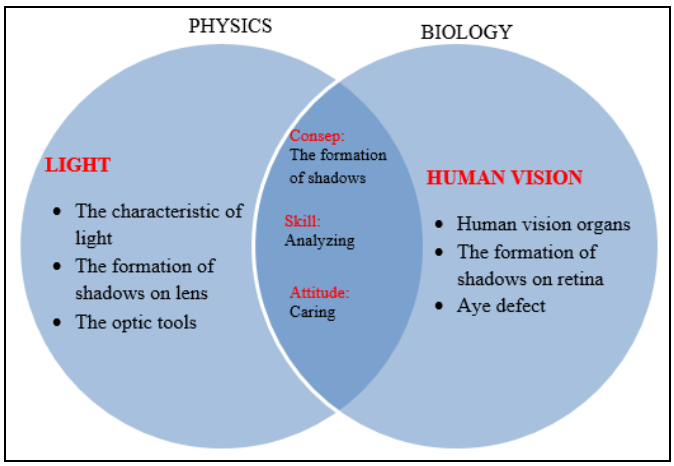

Fig 2

The use of share- type integration model has several advantages and disadvantages. The advantage of this type is that it is able to demonstrate the integration of science in concept, skill, and attitude aspects, this type involves two teachers in a team making it easier to create collaboration in designing and implementing learning, and this type makes the subject matter more contextual. While some of the disadvantages of this type require a long time in development, require compromise and cooperation and trust in the team, in the early stages of integration requires commitment from partners, and to obtain the concept of overlap required dialogue and conversation first (Fogarty, 1991) [2].

5. Teaching and Learning Strategy

Learning strategies that can be used to teach integrated science lesson will be presented in the models, approaches, and methods to be used. Based on basic competence no. 3.12 is analyzing the characteristic of light, the formation of shadows on the plane and curve, and its application to explain the process of human vision, insect eyes, and the working principle of optic tools and no. 4.12 that presents experimental results about the formation of shadows on the mirror and lenses can be formulated some learning Objective: (1) The student be able to determine the characteristic of light based on the phenomenon that occurs; (2) The Student be able to describe the formation of shadows that occur in the lens; (3) The Student are able to explain the mechanism of human vision and the organs that play a role in vision; (4) The Student are able to explain the working principle of optic tools that is eyes and and disorder that occur in eye.
The learning indicators are (1) Explain the characteristic of light; (2) Explain that light is an electromagnetic wave; (3) Describes the shadow formation of the lens; (4) Analyzing the relationship between the focus point, the distance of the

object, and the distance of the shadow on the convex lens; (5) Measuring the focus distance of the convex lens; (6) Explain the location of the image through the general equations of the lens; (7) Taking the formation of the shadow on the human eye; (8) Mention the structure and function of the eye; (9) Analyzing change of pupil diameter; (10) Associate changes in pupil diameter with pupil function; (11) Describes eye disorders

Learning model that can be used to teach the topic one of them is the inquiry learning model. Learning model aims to make the learning process becomes systematic. Inquiry learning model is one of the learning model that developed from the theory of constructivism. According to the National Education Standards (in Wenning, 2005) [6] inquiry is a student activity in which students can develop knowledge and understanding of scientific ideas as scientists study science. Inquiry learning steps according to Wenning (2005) [6] are: asking questions, planning and experimenting, gathering information, thinking critically and logically about the relationship between evidence and theory, and communicating the argument of learning outcomes.

The learning approach is a philosophical point of view for thinking-based learning on the "essence of learning". The learning approach aims to direct the learning process in order to achieve the desired learning objectives (Firman, 2017) [1]. The scientific approach is a pattern in integrated science learning described in the contents of the 2013 curriculum standard, this approach can be integrated with the inquiri learning model to study material about light and the mechanism of vision in humans. This approach conducted by integrating scientific and occupational work which includes observing activities, formulating problems, formulating hypotheses, designing experiments, collecting data, analyzing, finally concluding and providing recommendations, and roral presentation result and written experimental results (Kemendikbud, 2016) [4].

Some of the learning mothod that can be used to teach this material are experiment, discussion, and question and answer. Learning methods are ways teachers facilitate students to learn a subject matter so that students achieve learning objectives that have been set. Learning method is a way to implement the design (model and approach) for the purpose of learning can be achieved (Firman, 2017) [1].

Based on these descriptions, the steps of integrated science learning on light and human vision are described in the following table.

Table 1: Integrated science learning steps of *shared* types of light and human vision

xLearning steps	Student Activity
Observing	Group discussion 1. The students observe the phenomenon of the properties of light that is the event of light propagating straight, light-monitoring events and refraction events 2. The teacher explains the nature of light as an electromagnetic wave 3. The teacher introduces the types of lenses to the students 4. The students are asked to discuss to find information about the nature of light that concerns convex and concave lenses
Asking	5. The teachers encourage students to be able to ask scientific questions by introducing that in the human eye there is a lens 6. The students are expected to ask questions such as: a. How can people see? b. What is the nature of the shadows formed in the human eye? c. Why should the eye have thickened and flattened when looking at objects that are near or far? d. What organs play a role in the process of human vision ? e. Why do humans use glasses as a visual aid?
Gathering Information	Practice 7. To find answers to these questions students are asked to conduct an investigation with a practicum about the formation of shadows on the lens
Associating	Group Discussion 8. Students conduct group discussions to evaluate some ideas that emerge from practicum activities to find the right answers
Communicating	Class Discussion 9. Students conduct class discussions by presenting the results of their discussions and giving students an opportunity to respond to each other's answers.

6. Formative Assessment

Formative assessment is an assessment conducted throughout the learning that aims to determine the achievement of learning objectives or assessments used by teachers to improve the quality of learning without using the test. According to Popham (2011) [5] Formative assessment is defined as an assessment plan whereby the assessment results are obtained from students used by teachers to evaluate ongoing learning or use by students to improve their current learning tactics.

To achieve the learning objectives that have been formulated, it is important to carry out the formative assessment as a way to know the achievement of the objectives. This assessment is undertaken throughout the lesson by looking at activities and improving students' skills during learning. The type of formative assessment that can be done for the above learning design is the performance assessment of process and product. Performance assessment of process is done when students carry out discussion and practicum, while product performance assessment is assessment to student product such as of conclusion of discussion result and student's answer on *worksheet* practice. This assessment can be developed

based on the material, for the performance assessment of process on experiment activities in the form performance assessment of task and analytic rubric, while for discussion activities can use holistic performance assessments.

7. Conclusion

Teaching of Integrated Science in junior high school level is one of the subjects that should be taught by combining several concepts of physics, chemistry, and biology. This is contained in the standard of national curriculum. One theory that can be used to integrate the concepts between subject is using the theory of integration curriculum initiated by Fogarty. One of integration model is share integration model. This integration model can be adopted by science teachers in designing the learning process in classroom.

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