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PHILOSOPHY OF INTEGRATED NATURAL SCIENCE LEARNING

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ABSTRACT

Philosophically, natural sciences as a building of knowledge can study ontology (what you want to know), epistemology (how to acquire knowledge), and axiology (what is the value of knowledge). Natural Science as a building of science has properties that are closely related to natural objects. The problems that occur with natural objects are holistic. This holistic problem requires problem-solving from various disciplines, especially in the natural sciences. Based on the scope of the research above, this article aims to investigate integrated natural science learning in a philosophical review (ontology, epistemology, axiology). The qualitative method is applied in this study. Studies conducted to solve problems based on a critical and in-depth analysis of pertinent library materials are known as library research. Overviews of ontology, epistemology, and axiology state that integrated natural science learning, students are expected to be able to relate to other disciplines such as physics, astronomy, chemistry, geology, biology, technology, environment, and health and safety. This type of instruction uses natural science to present natural phenomena and events holistically and to develop students' problem-solving skills. The recommendation given is that teachers should tend to the interdisciplinary study of the natural sciences.

Keywords: ***Ontology, Epistemology, Axiology, Integrated Natural Science Learning***

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Introduction

Natural Sciences can be seen as a body of knowledge, a way of thinking, and a method of inquiry. Science as a scientific building consists of facts, concepts, principles, laws, and theories. The development of this science is unity and supports for each other. The pattern of knowledge development that develops from facts to theory provides direction to inductive and deductive thinking patterns. The direction of scientific thinking patterns has created a stage in the scientific process that creates the method of inquiry.

Natural Sciences is a field of natural sciences and life sciences. The Physical Sciences group includes astronomy, chemistry, geology, mineralogy, meteorology, and physics. The Life Sciences group is Biology (Anatomy, Physiology, Zoology). Science is rational and objective knowledge about the universe and everything (Samatowa, 2010). Science is the knowledge generally accepted as a product of science (scientific product), its discoveries are made through a series of structured research (scientific process), and the success of doing that research is a scientific attitude (Chiappetta & Koballa, 2010).

Philosophically, Natural Sciences as a building of knowledge can study ontology (what you want to know), epistemology (how to acquire knowledge), and axiology (what is the value of knowledge) (Khoiri & Sunarno, 2018). Natural Science as a building of science has properties that are closely related to natural objects. The problems that occur with natural objects are holistic. This holistic problem requires problem-solving from various disciplines, especially in the natural sciences. Natural Science subjects are a means of training students' thinking to understand nature and solve various problems related to scientific objects (Barry & Born, 2013). The curriculum obligation requires Natural Science subjects to be taught in an integrated manner in schools, which is called "Integrated Natural Sciences". However, the content of the material in the integrated Natural Sciences curriculum is still different. The new integration can only be seen in the layer-by-layer combination of physics, chemistry, and biology. The overall integration perspective is not mentioned (Michie, 2019; Wicaksono & Sayekti, 2020). This is in line with science which studies comprehensively objects from phenomena and natural phenomena. Natural phenomena and phenomena in the subject of scientific problems are a collection of concepts that are intact and inseparable (DeBoer, 2019; Duit, 2012). Therefore, science must be taught in its entirety in the form of an integrated Natural Science. It aims to shape students' thinking as a whole. This student's holistic idea is used as a life skill to solve life's problems (Khagram et al., 2010).

NSTA (The National Science Teaching Association) recommends that elementary and junior high school natural science teachers have interdisciplinary tendencies in natural sciences (NSTA, 2003; Rahardini et al., 2017). To meet these demands, elementary and junior high school natural science teachers must have competencies in the fields of biology, chemistry, physics, earth and space, and other disciplines. Currently, teachers who teach natural sciences in schools do not have a bachelor's degree in natural science education but come from the fields of biology, chemistry, and physics. Future teachers of natural science education can deliver natural science education content in an integrated manner. However, teachers in this area have barriers from different backgrounds (Wilujeng et al., 2019). In addition, the structure of the natural science curriculum which is still packaged individually will be reviewed. Therefore, scientific learning needs to be packaged attractively through the presentation of topics. This topic describes a natural science problem or a problem that is intended to be solved through a series of natural science lessons. Hopefully, the topics presented are interesting and contextual to convey to students (Michie, 2019). This topic can be presented through scientific learning using the connected model, webbed model, and integrated model. These subjects cover appropriate physics, chemistry, and biology skills and these assignments are explained in a concept map (Nugroho, 2016; Sinambela, 2017). Based on the scope of the research above, this article aims to investigate integrated natural science learning in a philosophical review (ontology, epistemology, axiology).

Research Methods

The qualitative method is applied in this study. An approach to research known as qualitative research generates descriptive data from subjects in the form of spoken or written words and observed behavior (Taylor et al., 2015). Books and other literature, including scientific journals and articles, served as the main object of this qualitative study, which was conducted in a library. Studies conducted to solve problems based on a critical and in-depth analysis of pertinent library materials are known as library research specifically the collection of library data (Danandjaja, 2014). The following were the library research techniques used in this study: (1) choosing a topic, (2) looking into information, (3) deciding on a research focus, (4) gathering data

sources, (5) reading data sources, (6) taking research notes, (7) processing research notes, and (8) compiling a report.

The primary and secondary data sources for this study were the ontology, epistemology, and axiology overview of integrated natural science learning. One technique for gathering data is to use primary and secondary data documentation in the form of scientific references. A combination of primary and secondary sources was used in triangulation to ensure the accuracy of the data. This qualitative data analysis is inductive, which means that a hypothesis is first created or developed based on the information gathered. The technique used for analysis is descriptive analysis. The ontology, epistemology, and axiology overview of integrated natural science learning are described objectively, methodically, analytically, and critically by the descriptive analysis technique.

Result and Discussion

Ontology Overview of Integrated Natural Science Learning

Delivering knowledge to students is the process of learning, which is done by inundating them with information (Hamalik, 2020). If learning is viewed as a process, then efforts made by teachers to help students learn are considered learning. Planning the annual teaching program, the semester, creating the lesson plan, and assembling the necessary tools, such as teaching aids and evaluation tools, are the first steps in the process (Zaini, 2017). Based on some of the aforementioned viewpoints, it can be said that education is a process and a collection of teacher initiatives or activities designed to help students develop the knowledge and skills they will need to succeed in society.

Natural sciences is a subject taught in elementary school that aims to give students organized knowledge, concepts, and ideas about the natural world. These things are learned through experience and a variety of scientific methods like research, collection, and idea presentation. This understanding is not significantly different from that of who define natural science as a way of thinking, a way of investigating, a body of knowledge, and its interaction with technology and society (Chiappetta & Koballa, 2010). This demonstrates that the natural sciences encompass dimensions of a way of thinking, a way of investigation or investigation, the building of knowledge, and its relationship to technology and society. The formation of students' scientific thought processes is the fundamental component of learning natural sciences.

Additionally, natural science is specialized knowledge that is gained through observation, experimentation, deduction, the formulation of theories, and other interconnected methods (Suherman et al., 2022). Natural science is related to how to learn about nature systematically, who holds a similar view (Wedyawati & Lisa, 2019). Natural science is not only the mastery of a body of knowledge in the form of facts, concepts, or principles but also a process of discovery (Siregar, 2018). Contrasts that natural science is simply the study of events that occur in nature.

The definition of "science" is "both a body of knowledge and a process" (Sund & Trowbridge, 1973) The creation of knowledge and procedures is the definition of science in this context. While go into greater detail about the three main elements of science, which are attitudes, practices, and products (Carin & Sund, 1990). An attitude is a set of convictions, ideals, or viewpoints. Suspending judgment until enough facts have been gathered about the issue is one such attitude. continually making an effort to be impartial. Specific approaches to problem-solving include processes or methods, such as developing hypotheses, organizing and carrying out experiments, analyzing data, and measuring. Facts, laws, regulations, and theories are all included in products, such as the scientific principle that metals expand when heated.

Natural science learning needs to be integrated because problems in the field tend to be holistic or all-encompassing. In his book "Conceptual Integrated Science," presents integrated natural science based on a contextual approach that connects science with everyday life, is direct and personable, places one of the main ideas, contains problem-solving as well as in Natural science is presented with a unified concept in its presentation (Hewitt et al., 2013).

An integrated approach involves the scientific process, organizing principles, organizing the natural integration of scientific knowledge, and organizing its application in daily life (Trefil & Hazen, 2016). Students are also expected to be able to relate to other fields in this integrated approach, such as physics, astronomy, chemistry, geology, biology, technology, the environment, and health and safety. This demonstrates the fundamentals of integrated natural science learning, which combines natural science with other subjects to present natural phenomena and events holistically and develop students' problem-solving skills (problem-solving).

Epistemology Overview of Integrated Natural Science Learning

The design of teaching policies that present learning materials in an integrated way, that is, by

uniting, connecting, or linking learning materials so that nothing stands alone or separately, is known as integrative or integrated learning. Two types of integrated learning exist (1) Internal integrative refers to the connection between the educational resources themselves; (2) The relationship between one field of study and another is an example of external integration.

A learning approach called "integrated learning" aims to bring together various subjects. One of them is integrating the subject, sub-subject, or field of study; refers to this information as the curriculum or teaching across fields of study (Nugroho, 2016). There are three possible variations of integrated learning related to education that takes place in a progressive education environment, namely (1) An integrated curriculum is the organization of the integration of various subject matter through a cross-field theme to create a meaningful whole, blurring or even eliminating the boundaries between various fields of study; (2) Integrated days, wherein activities from a class are planned for students to complete on a specific day to study or engage in a variety of activities that suit their interests; and (3) Learning activities that are more formally planned and diverge from a central theme or lesson are referred to as integrated learning (Cohen et al., 2010).

Children have been exposed to relevant and worthwhile learning environments thanks to integrated learning as a learning model in and of itself. By looking for connections and relationships between what they already know and new things or new information they discover in their daily learning process, integrated learning is a learning medium that effectively aids children in learning in an integrated manner.

The integrated learning approach is a method that gives kids the chance to reach their full potential in a way that is optimal, balanced, and integrated. The integrated approach aids in the holistic development of kids, enabling them to become knowledge creators and builders through hands-on learning. Children are taught through an integrated learning process to collaborate with their peers or teachers in learning new things and finding solutions to problems they encounter. The teaching and learning process is more informal with the integrated learning approach, and children's learning activities rise as a result. This approach aims to make learning relevant and meaningful.

While integrated learning is only permitted in junior high schools, thematic learning is permitted in elementary schools as well. Thematic learning is integrated learning that uses themes to connect various subjects and provide students with a fulfilling educational experience (Indrawati & Setiawan, 2009). Specific themes serve as the foundation for the design of thematic learning. Throughout the discussion, various perspectives on the subject are examined. The theme of "Water," for instance, can be viewed from the perspectives of mathematics, physics, biology, and chemistry. Social sciences, languages, and the arts are a few academic fields where the theme can be seen in a broader context.

Thematic learning offers students numerous opportunities to highlight the dynamics in education by implementing the curriculum in both breadth and depth. The thematic unit is the epistemology of the entire language of learning, enabling students to answer self-evident questions in a useful way and sate their curiosity with a genuine appreciation of their surroundings. Thematic learning is a method of instruction that can be used in elementary schools with both low-grade (i.e., students in grades I, II, and III) and high-grade (i.e., students in grades IV, V, and VI) students. The 2013 Curriculum includes the idea of thematic learning. The 2013 Curriculum explains that thematic learning is a method that must be used in Elementary Schools/Madrasah Ibtidaiyah to implement learning. Therefore, learning activities should be planned in an integrated manner by using themes as a unifier of their learning activities for elementary school teachers whose students still behave and think in concrete terms. Students' education can become more complete, meaningful, and thoroughly relevant to their world through this method. The following traits apply to thematic learning: (1) Learning opportunities and activities are extremely pertinent to the needs and developmental stage of children in primary school; (2) The activities chosen for thematic learning are based on the requirements and interests of the students; (3) For learning outcomes to last longer, learning activities will be more significant and memorable for students; and (4) Assist in the development of student's cognitive abilities; 5. Foster the development of students' social abilities, including cooperation, tolerance, communication, and openness to other people's viewpoints.

The importance of thematic learning includes: (1) emphasizing the students' active participation in the learning process so that they gain firsthand experience and are prepared to independently discover the various knowledge they learn; and (2) emphasizing the application of the idea of learning by doing. Integrated science learning is a concept that can be considered as a learning approach that connects concepts in science to provide a more meaningful learning experience for students. Integration / unified means blending, merging so that it becomes one (Astuti & Hayati, 2019; Ekapti, 2016). The integrated meaning in

learning natural sciences is the existence of linkages between various aspects and materials contained in the Basic Competencies of natural science so that it gives birth to one or several learning themes. Integrated learning can also be said to be learning that combines material from several subjects or scientific studies in one theme. The characteristics of Integrated natural science learning are as follows: (1) It is holistic (related to the whole system as a whole rather than a collection of parts); (2) Student-centered; (3) Give a direct experience to students; (4) The separation of materials is not very clear; (5) Presenting the concepts of various topics; and (6) Learning outcomes can encourage child development.

There are many models of integration, and it can be said that there are ten models of integration in total. These models come in a variety of forms, including fragmented, connected, nested, sequenced, shared, webbed, threaded, integrated, immersed, and networked models (Forgarty, 2018). Additionally, it is explained how the ten models are split into three groups: within and across learners and across disciplines (sequenced, shared, webbed, threaded, integrated), as well as within and across single disciplines (fragmented, connected, nested) (Immersed and networked). Three of the ten models—connected, webbed, and integrated—are appropriate for science learning (Akib et al., 2020; Kuzmanović & Gazibara, 2014).

The following three models of science integration are described by Forgarty (2018), with each model's traits, benefits, and drawbacks listed in table 1.

Table 1. Characteristics of Integrated Learning Model Connected, Webbed, and Integrated

Model	Characteristics
Integrated Model	Teach some basic competencies whose concepts overlap.
Webbed Model	Explain some related basic competencies through a theme.
Connected Model	The concepts in the basic competencies are combined with the concepts in other basic competencies when teaching a basic competence.

Axiology Overview of Integrated Natural Science Learning

The strengths of integrated learning are: (1) combining various subjects can save time because all three disciplines (physics, chemistry, and biology) can be taught at the same time. Material overlap can also be reduced or even eliminated; (2) students can see a meaningful relationship between the concepts of physics, chemistry, and biology; (3) increasing the level of thinking skills of students, because students are faced with broader and deeper ideas or thoughts when dealing with learning situations; (4) integrated learning presents the application or application of the real world experienced in everyday life; (5) students' learning motivation can be improved and improved; (6) integrated learning helps create a cognitive structure that can bridge between students' prior knowledge and related learning experiences; and (7) there is an increase in cooperation between teachers of related sub-subjects, teachers and students, students and students, students/teachers and resource persons so that learning is more fun, learning in real situations and more meaningful (Hernawan & Resmini, 2009; Kemendikbud, 2013; Resmini, 2010).

In contrast, integrated natural science learning is developed in addition to achieving the learning objectives that have been set, it is hoped that students can also: (1) increase the understanding of the concepts they learn more meaningfully; (2) develop skills to find, process, and utilize information; (3) develop positive attitudes, good habits, and noble values needed in life; (4) develop social skills such as cooperation, tolerance, communication, and respect for the opinions of others; (5) increase interest in learning; and (6) choose activities according to their interests and needs (Kemendikbud, 2013).

Another opinion from Lipson (1993), integrated learning offers several advantages, namely: (1) more focus on the theme, because one theme is discussed from various points of view; (2) enabling the transfer of learning, for example, the application of physics concepts in chemistry; and (3) provide a better understanding of the relationship between one discipline to another. Integrated Natural Science Learning has the following advantages: (1) the experience and learning activities of students are relevant to their level of development; (2) selected activities according to the interests and needs of students; (3) meaningful learning activities for students, so that the results can last a long time; (4) students' thinking skills develop in an integrated learning process; (5) teaching and learning activities are pragmatic following the students' environment; and (6) students' social skills develop in an integrated learning process. These social skills include cooperation, communication, and listening to other people's opinions (Cvjetićanin & Anđić, 2018; Lamanauskas, 1998).

As was already mentioned, teachers can use the benefits of integrated natural science learning to support students' growth following their level of intellectual development. From the numerous benefits listed above, it can be deduced that the following are the main advantages of integrated natural science learning: (1) students are taught to be able to find their various concepts that are thoroughly studied (holistic), meaningful, authentic,

and active; (2) integration in Natural Science Learning is intended to make Natural Science Learning more meaningful, effective, and efficient; and (3) students can gain direct experience through integrated Natural Science Learning, increasing their strength to receive, store, and apply the concepts they have learned.

Conclusion

According to the ontology overview of integrated natural science learning, this type of instruction uses natural science to present natural phenomena and events holistically and to develop students' problem-solving skills. In integrated natural science learning, students are expected to be able to relate to other disciplines such as physics, astronomy, chemistry, geology, biology, technology, environment, and health and safety.

The epistemology overview of integrated natural science learning concerning integrated meaning in natural science learning is the existence of a link between various aspects and materials contained in the Basic Competencies of natural science so that it gives birth to one or several learning themes. From several integrated learning models according to Fogarty, three models are suitable for natural science learning, namely the connected model, the webbed model, and the integrated model.

The axiology overview of integrated natural science learning is related to its benefits, namely (1) integration in natural science learning is intended to make natural science learning more meaningful, effective, and efficient; (2) through integrated natural science learning, students can gain direct experience, so that they can add strength to receive, store, and apply the concepts they have learned; and (3) students are trained to be able to find their various concepts that are studied thoroughly (holistic), meaningful, authentic and active.

The recommendation given is that teachers should tend to the interdisciplinary study of the natural sciences. Teachers must be knowledgeable in biology, chemistry, physics, earth and space science, as well as other natural science disciplines to meet these demands. They must also be able to integrate each field's natural science into the overall field.

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