

Psychological Foundations of Science Learning

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Abstract

In educational studies, psychology is the study of human efforts to learn in education, the effectiveness of educational interventions. Education is related to how students learn and develop, so that the psychological basis of education discusses various information about human life in general as well as symptoms related to aspects of the human personality at each stage. Forms of educational psychology include: developmental psychology, learning psychology, social psychology, and learning psychology. The contribution of educational psychology can provide benefits to curriculum development, learning systems and assessment systems. And in this paper we will discuss the psychological foundations of science learning at the basic level.

Keywords: *educational psychology, foundations of psychology, science learning.*

Abstrak

Dalam kajian pendidikan, psikologis merupakan studi tentang usaha manusia belajar dalam pendidikan, efektifitas intervensi pendidikan. Pendidikan berhubungan dengan bagaimana siswa belajar dan berkembang, sehingga landasan psikologi pendidikan membahas berbagai informasi tentang kehidupan manusia pada umumnya serta gejala yang berhubungan dengan aspek pribadi manusia setiap tahapan. Bentuk psikologi pendidikan meliputi : psikologi perkembangan, psikologi belajar, psikologi sosial, dan psikologi pembelajaran. Kontribusi psikologi pendidikan dapat memberikan manfaat terhadap pengembangan kurikulum, terhadap sistem pembelajaran dan sistem penilaian. Dan pada paper ini akan membahas berkaitan dengan landasan psikologis pembelajaran IPA (Sains) di tingkat dasar.

Kata Kunci: psikologi pendidikan, landasan psikologi, pembelajaran sains

INTRODUCTION

National Education in the 21st century aims to realize the nation's ideals, namely a prosperous and happy Indonesian society, with an honorable and equal position with other nations in the global world, through the formation of a society consisting of quality human resources, namely independent individuals. , willing and capable to realize the ideals of their nation (BSNP, 2010).

Various efforts have been made to achieve these national education goals. One of them is the development of the 2013 curriculum as a development of the previous curriculum, namely the Education Unit Level Curriculum (KTSP). In the Ministry of Education and Culture No. 68 of 2013 The 2013 curriculum aims to prepare Indonesian people to have the ability to live as individuals and citizens who are faithful, productive, creative, innovative and affective and able to contribute to the capabilities of society, nation, state and world civilization.

One of the applications of the 2013 curriculum is integrated learning of Natural Sciences. Natural Science comes from the word "science" or can be defined as science. Natural

Science or Science is a term used to refer to the family of knowledge of natural objects with certain and general laws, valid anytime, anywhere (Vardiansyah, 2008: 11). Science as a process is the steps taken by scientists to carry out investigations in order to seek explanations about natural phenomena. Meanwhile, Kuslan Stone said that science is a collection of knowledge and ways to obtain and use this knowledge. Basically, the mention of the name IPA actually contains integration within it. This is because natural science objects, symptoms and problems are essentially holistic.

In integrated science learning, in general, there are 3 foundations that support the implementation of learning, namely the philosophical basis, the theoretical basis for learning and the juridical basis. Judging from the philosophical basis of science learning in accordance with the nature of science (process, product, attitude and application). This means that in teaching science there needs to be a connection between processes, products, attitudes and applications in daily life. Apart from that, the problem object in science is

holistic or complete so that it can be studied from various aspects.

Then, if viewed from the theoretical basis of learning, the theory used is constructivism theory as proposed by Bruner that discovery learning is in accordance with the active search for knowledge by students, where students try themselves to find solutions to problems that will produce knowledge that is truly meaningful. Constructivism theory is one part of the contextual approach aspect. Next, it is viewed from the juridical basis, namely in National Education Ministerial Decree number 68 of 2013 that science learning is carried out on an integrative science basis.

However, integrated science (Science) learning has several challenges from various aspects, one of which is from the student aspect, namely that integrated learning requires relatively good analytical (regarding) thinking skills. If this condition does not have students, the application of integrated learning capital will be difficult to implement even though it is supported by the 3 existing foundations. For this reason, this paper will discuss one more foundation for science learning which is expected to help implement science (Science) learning at the basic level, namely the psychological foundation.

METHOD

Types of research qualitative Descriptive is a research method that utilizes qualitative data and is explained descriptively. This type of descriptive qualitative research is often used to analyze social events, phenomena or situations. Moeleong, defines qualitative methodology as a research procedure that produces descriptive data in the form of written words or verbally or from the form of policy action (Moeleong, 2002, p. 112) Descriptive research is collecting data based on factors that support the research object, then analyzing these factors to find their role. Meanwhile, according to Lofland and Lofland, the main data sources in qualitative research are words and actions, the rest is additional data such as documents and so on. The words and actions of people who are observed or interviewed are the main data sources. The main data sources are recorded through written notes or through

recording video/audio tapes, taking photos, or films (Moeleong, 2002, p. 157).

Lexy J. Moleong defines interviews with a specific conversational purpose. In this method, researchers and respondents directly (face to face) obtain information verbally by obtaining objective data that can explain the research problem. In the data collection technique by means of interviews, what the researcher does is to ask the source directly about the things to be researched. Namely interviews with Science Teachers at MTs Negeri Semarang, Head of Madrasah (Dr. H Hidayatun, M.Pd), Head of Curriculum, and some students at MTs Negeri Semarang.

Observation is a research activity to an object. If you look at the process of carrying out data collection, observation is divided into participants and non-participants. In observation or observation, the activity carried out is to pay close attention to the research object. Observation activities aim to record every situation that is relevant to the research objective, namely examining the role of parents in helping children do assignments during distance learning. Car Another way to obtain data is to use documentation. With documentation, researchers obtain information from various sources. This information includes residence, address and educational background. According to Arikunto, it is a documentation method for researchers to investigate written objects such as books, magazines, documents, regulations, meeting minutes, diaries and so on. (Arikunto, 2006., p. 158). To support the completeness of observations and interviews, researchers used the documentation method by examining teacher learning administration. The documentation is syllabus, prota, process, lesson plans, learning media, sources and teaching aids as well as assessment instruments.

According to I Made Winartha, the qualitative descriptive analysis method is analyzing, describing and summarizing various conditions and situations from various data collected in the form of interviews or observations regarding the problems being researched that occur in the field. (Winartha, 2006, p. 155). Meanwhile, according to Sugiyono, what is meant by data analysis

techniques is the process of searching for data, systematically compiling data obtained from interviews, field notes and documentation, by organizing data into categories, breaking it down into units, carrying out synthesis, arranging it into in the pattern of choosing what is important and what will be studied, and making conclusions so that they are easily understood by oneself and others (Sugiyono, 2012, p. 335). Miles & Huberman explained that analysis consists of three streams of activities that occur simultaneously, namely: data reduction, data presentation, drawing conclusions/verification.

Data reduction is defined as the process of selecting, focusing on simplifying, abstracting and transforming rough data that emerges from written notes in the field. Data reduction occurs continuously throughout a qualitative research-oriented project. During data collection, the next stages of reduction occurred (summarizing, coding, exploring themes, creating clusters, creating partitions, making memos). This data reduction/transformation continues after the field research, until a complete final report is prepared. Data originating from interviews with research subjects and the documentation obtained will be selected by researchers. Then the data set that has been obtained will be categorized. Which data is appropriate to the problem that has been formulated?

Data presentation is a collection of information arranged so as to provide the possibility of drawing conclusions and taking action. So that the data presentation does not deviate from the main problem, the data presentation can be realized in the form of a matrix, graphic, network or chart as a container for guiding information about what is happening. Data is presented according to what was researched.

Drawing conclusions is an attempt to find or understand meaning, regularity of explanation patterns, cause and effect flow or proportion. The conclusions drawn are immediately verified by looking and questioning them again while looking at field notes to gain a more precise understanding. Apart from that, it can also be done by discussing. In order for the data to be valid, the following steps need to be taken: recording important points in the field, collecting

data from various information, and researchers paying attention to processes in the field so that the results are maximized.

RESULTS AND DISCUSSION

PSYCHOLOGICAL BASIS OF SCIENCE LEARNING

Psychology comes from the Greek words *psyche* and *logos*. *psyche* which means soul, soul and spirit, while *logos* means knowledge. Psychology is literally defined as the science that studies a person's soul. Psychology studies humans in general and personally/more specifically.

In the world of education, especially at school, of course you often encounter students who have very diverse characteristics, not only differences in physical appearance, level of intelligence or talent, but also including differences in experience, level of student development, ideals or differences in overall personality. Students who have these differences certainly cannot be treated the same in learning activities. Teachers' understanding of students is very important to understand the level of growth and development of students. Understanding student development is expected to be able to overcome or minimize various problems encountered regarding students in learning.

Psychology is one of the main foundations of education. Psychology and education are a unity that is very difficult to separate. The subject and object of education are humans, while psychology examines the psychological symptoms of humans. In this way the two become an inseparable unit. Psychology as a foundation in education means that in implementing education, psychological elements must be applied because the target of education is humans. Therefore, in its implementation, education always involves human psychological aspects. To understand the various characteristics of diverse students, psychology is needed in education. Education positions humans as objects and subjects so that psychology is very necessary as a foundation for education.

1. Psychological theory according to experts

1) Behavioral Psychology School

- a. Edward I. Thorndike's Attribution Theory

Based on the results of Edward I. Thorndike's experiments in the laboratory using several types of animals, he put forward a learning theory known as the 'connections' theory. This theory states that learning in animals and humans basically takes place according to the same principle, namely, learning is the event of the formation of a bond between an event called a stimulus and the response given to that stimulus (Ortton 1991:39 Rensick and Ford 1981: 13)

b. BF Skinner's Reinforcement Theory

Skinner also developed his learning theory from the results of experiments using animals, from his experiments. Skinner concluded that we can shape human behavior through regulating environmental conditions (operant conditioning) and reinforcement.

Skinner divided this reinforcement into two, namely positive reinforcement and negative reinforcement. Positive reinforcement is a stimulus, if its presentation accompanies a student's behavior which tends to increase the repetition of that behavior, in this case it means that the behavior is reinforced. Meanwhile, negative reinforcement is a stimulus that is removed because it tends to strengthen behavior.

c. Hierarchy Theory of Learning from Robert M. Gagne

According to Robert M. Gagne, learning is a process that allows someone to change their behavior quite quickly, and these changes are relatively permanent, so that similar changes do not need to occur repeatedly every time they face a new situation.

There are several important characteristics of learning according to Gagne, namely:

- 1). Learning is a process that humans can do.
- 2). Learning concerns the interaction between the learner (the theory that learns) and the environment.
- 3). Learning does not take place if there is a change in behavior that lasts long enough during the person's life.

Gagne uses an information processing model which starts from an analogy between humans and computers. The learning process is considered as information input to output, as is the process that usually occurs on a computer.

In developing his theory, Gagne paid attention to objects in studying mathematics which consisted of direct and indirect objects. Gagne also believes that learning is behavior in which learning activities follow a hierarchy of abilities that can be observed and measured. For this reason, the learning theory put forward by Gagne is known as the learning hierarchy theory.

2) Cognitive psychological flow

a. Jean Piaget's Theory of Intellectual Development

Since childhood, Jean Piaget was interested in the various structures of the human body in living creatures that enable them to adapt to their environment. Initially he studied the body structure of living creatures, followed by studying the mental structure. Jean Piaget called this mental structure a schema, where the schema is also an important element for adaptation like the physical structure. Jean Piaget spent his life explaining the various stages of mental organization.

Jean Piaget divided children's mental development into four stages, namely:

1. Sensorimotor Stage, namely at the age of 0-2 years.

At this stage, mental development is marked by great progress in the baby's ability to organize and coordinate sensations (such as seeing and hearing) through physical movements and actions.

2. Preoperational Stage, namely at the age of 2-7 years

The special characteristic at this stage is egocentric thinking, reasons are dominated by perception, more intuition than logical thinking, but not quick conservation. At this stage children begin to describe the world with words and pictures. Egocentrism, animism and intuitive thinking begin to emerge. Egocentrism is an inability to differentiate between one's perspective and the perspective of other people, in other words children see things only from their own side

3. The Concrete Operational Stage is at the age of 7-11 or 12 years

At this stage children can conserve logic about class and the relationship of knowledge about thinking numbers in relation to real ones. Children can also carry out logical reasoning to replace intuitive thinking as long as the thinking can be applied to specific or concrete examples.

4. Formal Operational Stage, namely at the age of 11-15 years

The special characteristics at this stage are the child's complete thinking,

proportional thinking, the ability to overcome the strong hypothesis of developing idealism.

According to Piaget, there are at least three things that teachers need to pay attention to when designing classroom learning, especially in science learning. These three things are:

1. All children go through the same stages in sequence.
2. Child have different responses to an object or event.
3. If only physical activities are given to children, it is not enough to guarantee the child's intellectual development.

- b. Learning Theory from Jename Bruner

Bruner is a developmental psychologist and cognitive learning expert. He thinks that learning is an information processing activity. Information processing activities include the formation of categories. Between these categories there is an interconnected possibility which is called coding. Bruner's learning theory is called discovery learning theory.

In its application in the classroom learning process, Bruner developed a discovery learning model. This model in principle provides opportunities for students to obtain information themselves with the help of teachers and usually uses real objects. The role of the teacher in this learning is not as a provider of information but as a guide in obtaining information.

According to Bruner (Teoti Soekanto, 1994), children's mental development consists of three stages, namely:

1. The Enactive Stage is where children carry out activities in an effort to understand the environment.

2. The Iconic Stage is where children understand the world through verbal images and visualization.
3. The Symbolic Stage means that children have abstract ideas which are heavily influenced by language and logic.

These psychological theories have helped to form an educational foundation in which children can learn effectively. Psychological foundations are very important because humans have different characters, so they require different theories to be applied in education.

2. Understanding the Psychological Foundations of Education

To form the characteristics of students in childhood, adolescence and adulthood. Educational psychologists develop and apply theories of human development. Developmental theories describe changes in mental abilities (cognition), social roles, moral reasoning, and beliefs about the nature of knowledge.

Pidarta (2007: 194) psychology or mental science is a science that studies the human soul itself in a state of physical control which can be influenced by the surroundings. The human soul develops parallel to the body. Education always involves aspects of human psychology, so that educational psychologists are a foundation in the educational process which discusses various information about human life in general as well as symptoms related to aspects of the human personality. At each particular developmental age stage to recognize and respond to humans according to the developmental age stage. which aims to realize the educational process.

3. Forms of Educational Psychology

a. Developmental psychology

Developmental psychologists have three theoretical approaches to development, the approaches in question are (Nana Syaodih: 1989):

1. Phased approach, individual development proceeds through certain

stages. Each stage has special characteristics that are different from the characteristics of other stages.

2. Differential approach, this approach views individuals as having similarities and differences. On this basis, people create groups. Children who have the same intellect, talent, race, status, socio-economic status and so on.
3. The ipsati approach, this approach tries to look at the characteristics of each individual, could be called an individual approach looking at a person's development individually.

b. Learning Psychology

Psychologically, learning can be defined as an attempt to make a change by a person to obtain conscious behavior from the results of his interaction with the environment (Slameto, 1991:2).

Psychologists tend to use patterns of human behavior as capital which becomes the principle of learning. This learning principle is commonly called learning theory, which consists of:

1. Classical learning theory is still used, among other things, to practice multiplication and mental discipline questions.
2. Behaviorist learning theory is useful in developing real behaviors such as being diligent, disciplined and so on.
3. Cognitive learning theories are useful for studying complex material that requires understanding, to solve problems and to develop ideas.

c. Social psychology

According to Hollander, social psychology is psychology that studies psychology of a person, society, which combines the characteristics of psychology with social science to study the influence of society on individuals and between individuals.

Forming first impressions of other people has two main keys:

1. That person's personality, we have heard about that person before or stories similar to that person.

2. That person's behavior, when you see that person's behavior when confronted.

4. Contribution of Educational Psychology in the Learning Process

The contribution of educational psychology in the learning process can be classified into three parts, namely:

1. The contribution of educational psychology to curriculum development. Educational psychology in relation to the development of educational curricula is primarily concerned with understanding the aspects of behavior in the context of teaching and learning.
2. The contribution of educational psychology to the learning system. Educational psychology has given birth to various theories that underlie learning systems.
3. The contribution of psychology to the assessment system. Educational assessment is one of the important aspects in teacher education to understand the level of educational success. Changes in circumstances from children to adults due to guidance and efforts that interact between educators, students and the environment. The older a child gets, the more mature their minds will become. In the process of learning natural sciences, you will increasingly understand the conditions and changes that occur around you. Thus, the more mature the child is in terms of age, the better or more stable the child's psychological level will be. So that in mastering the material studied regarding natural sciences, it will be easier to understand it.

CONCLUSION

Based on the discussion above, it can be concluded that the psychological foundation of education is a form of foundation for the educational process that supports various information about the development of human life as a whole as well as symptoms related to the internal aspects of a human being at each particular developmental age stage in

recognizing and responding to humans based on with age stages of development which aims to facilitate the educational process. The basic forms of educational psychology include the psychology of social learning development. In its development, the psychological foundation of education has a role in developing the curriculum in the learning and assessment system.

Psychological forms of education include developmental psychology, learning psychology and social psychology. Developmental psychology has three aspects of development, namely the phasing approach, the differential approach and the ipsative approach. Psychological learning prioritizes using patterns of human behavior as a model that becomes the principles of learning. The learning theory used is classical theory (memorizing multiplication and practicing questions), behavioral theory to develop diligent behavior, behavior, politeness and so on. Cognition theory to help facilitate problems with a high level of difficulty and to develop ideas. Social psychology studies the influence of society on individuals and between individuals.

The benefits of educational psychology in the learning process in various fields of education include curriculum development, paying attention to educational input, processes and output that can run well without ignoring aspects of students' behavior and personality. The benefits of educational psychology for learning systems, which learn directly from objects (doing or doing).

Educational psychology also has benefits for the education system to determine the level of educational success. Educational psychology also functions to determine changes in symptoms that arise psychologically, understand changes that occur both in development and growth. Changes in circumstances from children to adults are due to guidance and efforts that interact between educators, students and the environment. The older a child gets, the more mature their minds will become. In the process of learning natural sciences, you will increasingly understand the conditions and changes that occur around you. Thus, the more mature the child is in terms of age, the better or more stable the child's psychological level will be.

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