

Students' Understanding of the Scientific Approach to the Learning Process in Early Childhood Educational Institutions

Sri Sularti Dewanti Handayani^a, ^aEarly Childhood Teacher Education, Faculty of Education Science Universitas Negeri Semarang, Email: dewanti@mail.unnes.ac.id

The scientific approach is a scientific method in learning activities which includes the observation, questioning, gathering information, reasoning, and communication. Regarding the scientific approach, which began to be implemented following the enactment of the Curriculum of 2013 about Early Childhood Education, it is a necessary to change the basic concept of thought in the learning process. Through a scientific approach, it is expected to develop scientific, logical, and critical thinking and is objective in both the teacher and the children. The problem which was highlighted in this study was that there are still many various incorrect concepts of the implementation of scientific approaches in the learning process at Early Childhood educational institutions. As a result, the students themselves also did not have a full understanding about the implementation of the scientific approach in the learning process in such institutions. Therefore, this study aimed to analyse students' understanding of the scientific approach to the learning process at Early Childhood educational institutions. The method used in this research is the descriptive quantitative approach. The data collection was done by questionnaire and documentation. The number of samples in this study were 29 students chosen by the purposive sampling technique. The data analysis was presented by using a quantitative descriptive design. The results showed that students in the Teacher Education for Early Childhood Education Department had knowledge related to the scientific approach concept with a score of 62.07 per cent (intermediate level of understanding), knowledge related to the planning process of a scientific approach learning with a score of 65.52 per cent (intermediate level of understanding), and knowledge related to the implementation of the scientific approach with a score of 48.28 per cent (intermediate level of understanding).

Keywords: *Students, Scientific approach, Early childhood education.*

Background

Learning activities are a series of processes which provide opportunities for children to develop their potential. Education and the learning process in the twenty-first century has been regularly discussed to present more demands for both teachers and students to have a scientific mastery in the 'four dimensions of C', namely critical thinking, creativity, communication, and collaboration. In short, teachers and students are expected to be able to think critically and creatively in making their steps to be able to communicate and collaborate effectively in the learning process, which is oriented in higher order thinking skills or HOTS.

The government has issued a regulation through the Curriculum of 2013 about Early Childhood Education, which has a foundation to the students themselves with a scientific approach paradigm. It places demand for a learning strategy, where in the implementation of this curriculum, the teacher must be able to perform innovations in the learning process so that the students are enabled to master skills in the challenges of the twenty-first century. Among them, is reference to inquiry learning and to the scientific approach. Inquiry learning is a student-centred learning model, where students' actively look for and find the object of learning by themselves. Sanjaya (2008) explains inquiry learning is a learning activity that emphasises the process of thinking critically and analytically to search and find the answers by themselves to the problem in question. The inquiry learning model emphasises the freedom of children to develop their creativity, initiative, and action, in the hope that their self-confidence will grow. Meanwhile, the teacher acts as a facilitator and guides students in the aforementioned process.

As for the scientific approach, as one of the paradigms in the Curriculum of 2013 about Early Childhood Education, it is an approach in the learning process. The scientific approach is a learning approach which emphasises the activities of students through observing, asking questions, reasoning, and trying and creating a network in the learning activities at school. The scientific approach is a learning approach that provides opportunities for students to broadly explore and elaborate the material which is being studied. In addition, it provides an opportunity for students to actualise their abilities through the series of learning activities designed by teachers (Rusman, 2016).

It must be highlighted that this approach builds a way of thinking so that children have the ability of knowledge, attitudes, and skills obtained through the process of observing, asking questions, gathering information, reasoning, and communicating the results of their findings and conclusions (Haenilah, 2015). In Early Childhood education, children learn by playing

with the implementation of a scientific approach, so that they are able to develop critical thinking, can be creative, and are able to communicate collaboratively in the learning process. By performing this learning through playing activities, children are able to develop their knowledge and it stimulates children to solve problems that they encounter. This is possible because every young child is an enthusiastic researcher; children always ask things that they see and have a high curiosity (Yulianti, 2008 in Gultom, 2017).

The learning process with the implementation of a scientific approach can be done in classroom settings with various learning models, including the angle model, area model, and centre model. The definition of these learning models is a term of the place or zone where children do their playing activities. According to Ningrum (in Rakhmalia, 2014), in Indonesia, the use of centre and circle models is considered to be the most ideal because it does not require a lot of equipment but can still optimise children's intelligence. Therefore, to implement a scientific approach in the learning process, teachers need to customise the learning space to accommodate childrens' freedom of learning through playing with things which suit their ideas, and the available time.

As for what is expected in the learning process, it is hoped that the teacher will be able to bring out the potential that exists in the children and to help it develop in accordance with their talents and needs. In Early Childhood education, especially for those aged four to six years, this can be done by the teacher providing guidance in the form of counsel, direction, development, and stimulation. In order to carry out development activities in these young children, the teacher places these children at the centre of attention or what is usually referred to as student-centred learning (Hatch, 2010).

The learning process with a scientific approach is designed so that children become active in building their own concepts of knowledge. It is expected that this approach will encourage children to find out information from various sources through their own observation activities, so that they are not just simply receiving the information from one source or teacher. This is undertaken in accordance with the stages of development, wherein Early Childhood is a period in which there is total absorption or an absorbent mind. In addition, at these early ages, the experience and learning factors become very important because they will have the ability to instil the basics of knowledge in children. Scientific learning is a scientific approach to learning that can be applied at various levels of learning (Wieman, 2015).

Students in the Department of Teacher Education for Early Childhood Education, as the future educators or teachers of Early Childhood, should understand about the stages of child development and know how the scientific approach should be implemented in the learning process at Early Childhood educational institutions. The experience which is acquired by

young children in this learning process will shape their behaviour in everyday life (Meisels, 2001).

The most common problem encountered in the field is that there are various concepts of implementing a scientific approach to the learning process at Early Childhood educational institutions, and exclusively Kindergarten teachers, which have not yet applied the scientific approach to the learning process. Kindergarten teachers generally still carry out their teaching method by simply giving instructions on tasks that children need to do. The teacher does not have a scientific approach to formula in its implementation, both in the learning process in general terms and in science learning. Furthermore, it is necessary to know students' understanding in implementing a scientific approach to the learning process at Early Childhood educational institutions. Thus, the purpose of this study is to analyse students' understanding of the implementation of the scientific approach to the learning process at Early Childhood educational institutions.

Research Method

This research uses quantitative descriptive methods. The study was conducted at the Department of Teacher Education for Early Childhood Education, Faculty of Education, Semarang State University, with a total sample of 29 students. The data collection was performed by questionnaire and documentation. The questionnaire is a data collection technique which is performed by providing a set of written statements to the respondents to answer (Sugiyono, 2010). The closed questionnaire is used by researchers as a research instrument. First of all, the questionnaire instrument must be tested for its validity and reliability, so that the research is able to produce valid and reliable data. A valid instrument means that the instrument can be used to measure the subject which should be measured. Meanwhile, a reliable instrument indicates an instrument which if used several times to measure the same object, will produce the same data. The instrument used to measure the variables of this study was a Likert scale (Prasetyo & Jannah, 2006). Meanwhile, the documentation comes from the word 'document', which means written items. In this case, books, magazines, documents, regulations, meeting minutes, diaries, and so on (Arikunto, 2010). The data analysis is presented by descriptive percentages.

Result and Discussion

Result

a) Students' Understanding of the Concept of the Scientific Approach

Based on the data obtained, it showed that students' level of understanding in the concept of a scientific approach is divided into three categories. Namely, a high level of understanding,

with nine people or 31.03 per cent; an intermediate level of understanding, with 18 people or 62.07 per cent; and a low level of understanding, with two people or 6.90 per cent. This data is presented in Table 1 below.

Table 1: Students' Understanding of the Concept of the Scientific Approach

| No | Category | Total | |
|----|-------------------|-----------|------------|
| | | N | % |
| 1 | High | 9 | 31.03 |
| 2 | Intermediate | 18 | 62.07 |
| 3 | Low | 2 | 6.90 |
| 4 | Do not understand | 0 | 0 |
| | Total | 29 | 100 |

b) Students' Understanding of the Planning of using the Scientific Approach in the Learning Process

Based on the data obtained, it showed that students' level of understanding about the planning of using the scientific approach in the learning process is divided into three categories. Namely, a high level of understanding, with eight people or 27.58 per cent; an intermediate level of understanding, with 19 people or 65.52 per cent; and a low level of understanding, with two people or 6.90 per cent. This data is presented in Table 2 below.

Table 2: Students' Understanding of the Planning of using the Scientific Approach in the Learning Process

| No | Category | Total | |
|----|-------------------|-----------|------------|
| | | N | % |
| 1 | High | 8 | 27.58 |
| 2 | Intermediate | 19 | 65.52 |
| 3 | Low | 2 | 6.90 |
| 4 | Do not understand | 0 | 0 |
| | Total | 29 | 100 |

c) Students' Understanding of the Implementation of the Scientific Approach in the Learning Process

Based on the data obtained, it showed that students' level of understanding in the implementation of the scientific approach in the learning process is divided into three categories. Namely, a high level of understanding, with 13 people or 44.82 per cent; an intermediate level of understanding, with 14 people or 48.28 per cent, and a low level of understanding, with two people or 6.90 per cent. This data is presented in Table 3 below.

Table 3: Students' Understanding of the Implementation of the Scientific Approach in the Learning Process

| No | Category | Total | |
|----|-------------------|-----------|------------|
| | | N | % |
| 1 | High | 13 | 44.82 |
| 2 | Intermediate | 14 | 48.28 |
| 3 | Low | 2 | 6.90 |
| 4 | Do not understand | 0 | 0 |
| | Total | 29 | 100 |

Discussion

a. Students' Understanding of the Concept of the Scientific Approach

Based on the research data, it shows that students have an understanding level about the concept of scientific approach at the level of intermediate understanding, with a percentage of 62.07 per cent. This means that students conceptually understand about the meaning of the scientific approach to Early Childhood education. The scientific approach is a learning activity which includes the process of observing, asking, gathering information, reasoning, and communicating (Educational and Cultural Ministerial Regulation no. 146 in the year of 2014 concerning Curriculum of 2013 about Early Childhood Education). The scientific approach is not interpreted as a learning process assisted by science but is interpreted as a learning process which implements a scientific process. Scientific learning is carried out in a fun process because it involves children directly and provides full opportunities for children to try and find their own knowledge. The purpose of a pleasant learning process is so that children are able to follow and experience the learning process in a happy, fun, entertaining, and educating atmosphere (Hamruni, 2008).

The characteristics of a scientific approach in Early Childhood education are that children are actively involved in learning activities, children will seek solutions to problems they encounter, children will construct knowledge through scientific processes, and teachers will facilitate children's thought processes by using various approaches (Ayuni, 2015). The scientific approach also contains teaching concepts which aim to achieve a better understanding of scientific knowledge (Verejiken, 2013). In other words, conceptually, the scientific approach is a pedagogical approach which underlies the teaching method in a scientific way.

b. Students' Understanding of the Planning of the Scientific Approach

The research result about students' understanding to the planning of implementing the scientific approach in the learning process is that students in the Teacher Education for Early Childhood Education Department have an intermediate understanding category, with a percentage of 65.52 per cent. The students, as future educators in Early Childhood education, need to understand how to design a scientific approach in the learning process which suits the needs of children, where this is actually included in the area of pedagogical competence. The pedagogical competence is the ability of teachers to teach and control the class, and the ability to convey information to students (Rose, 2018). An understanding to plan a learning process means that students have mastery about developing educational goals into operational plans. However, planning is not only carried out by the teacher, but the children need to be involved in order to make it conform to the needs, development, and level of experience of the children themselves. This is on the basis that the material and learning methods are in accordance with the interests of the child (Sagala, 2005).

A good planning of learning activity requires adequate time and thought. For this reason, planning the learning activity needs to be carried out in several stages with a never-ending assessment to keep improving continually and on an ongoing basis. There are several stages in the planning of a learning activity, which are mapping competency standards, basic competencies and indicator development, setting themes and creating a theme net, and making learning tools. However, the teacher usually does not need to follow all these stages because some learning tools have been provided by the school and adjusted to the school curriculum. In addition, the scientific approach itself needs to be implemented as simple as possible, which should match to the characteristics of the minds of young children.

From the results of the study, the thematic learning planning process showed that the teachers did not go through every step that must be taken in preparing a thematic plan. Furthermore, teachers did not make a mapping of competency standards and basic competencies in the planning stage because the syllabus had been provided by the school. Therefore, the teacher only developed the existing syllabus into the weekly learning implementation plan or the daily learning implementation plan.

According to Daryanto (2014: 13), the aspects that need to be considered in the planning process of a learning activity are creating a map of competency standards, basic competencies, indicators, and then determine a theme net, compiling a syllabus, and creating the daily learning implementation plan. The teacher implements the scientific approach, which consists of five steps (observing, asking, trying, reasoning and communicating), into the core activities of thematic learning. This is already in line with the Educational and Cultural Ministerial Regulation Number 81A in the year of 2013, which explains that the

process of developing learning activities needs to contain preliminary, core, and closing steps. In the core activities, it elaborates in detail the five activities of the scientific approach, which are observing, asking, trying, reasoning, and communicating. However, the steps of the scientific approach used are still simple because they are adapted to the characteristics of the minds of young children. This is also in accordance with the theory offered by Ridwan Abdullah Sani (2014: 53–54), which explains that the stages of learning activities carried out with a scientific approach do not need to be presented in rigid procedures, but can be adjusted to the specific knowledge which is going to be learned.

The obstacle experienced in the planning process of the learning activity is that the teacher still has difficulty in integrating the basic competencies from different subjects. In addition, teachers also still encounter obstacles while applying the steps of the scientific approach in Early Childhood education because there are some children who still need special guidance in learning. Even though the Early Childhood educational institution's syllabus has already provided standard competencies and basic competencies that have been integrated, the teacher found that there are still some basic competencies that cannot be integrated. In addition, the implementation of a scientific approach in the steps of learning activities is still simple, considering the fact that the students themselves are young children who still require special guidance.

The solution which is practised by the teacher in overcoming these obstacles is by continuing to separately teach some basic competencies that cannot be combined. This is in line with the theory offered by Daryanto (2014: 213), which explains that not all subjects must be integrated, and basic competencies that are not covered in certain themes must be taught either through other themes or stand alone. In the core learning activities, the scientific approach is being used, even though the teacher still provides some guidance to the students so that the application of the scientific approach continues to exist, although the form of it is still simple. In addition, the description of the results of this study is also in accordance with the theory offered by Sani (2014: 53–54), explaining that the stages of learning activities carried out with a scientific approach do not need to be presented in rigid procedures, but can be adjusted to the specific knowledge which is going to be learned.

c. Students' Understanding of the Implementation of the Scientific Approach

As for the sector of the implementation of the scientific approach in the learning process, the data obtained that students in the Teacher Education for Early Childhood Education Department have an intermediate understanding at 48.28 per cent. In this case, students need to have knowledge about the role of the teacher as the executor of the learning process, which means these prospective teachers should master the material or knowledge which is going to be taught, and develop their skills in learning activities because it will determine the

achievement of the children's learning outcomes (Usman, 2002). The students have the ability in developing the learning system which shows an effort to improve the quality of learning both the content or material to be taught, and the strategies or method being used in learning. Learning with a scientific approach is proven to improve children's learning outcomes. This can occur because of the effective interaction between the teacher and child during the learning activities (Sullivan, 2018). Specifically, the scientific approach includes the following steps:

1. *Observing*: which means giving an opportunity to young children to observe objects according to the theme and using their own senses. This is in line with the theory offered by M. Hosnan (2014: 40), that in the implementation of the learning process, students need to observe objects to be learned by reading, listening, paying attention, and seeing, with or without tools. However, this process of observation was still carried out as classical and the print media which were prepared by the teacher were still less attractive and unclear because of the very limited time for the teacher to provide clearer images for the students to observe.
2. *Asking questions*: which means giving an opportunity to all children to ask the things they want to know about the topic discussed. The questions raised by students during the learning process are still factual questions and are not really in the form of hypothetical questions, which encourages teachers to train and stimulate students with questions that explore students' asking abilities. Sani (2014: 57) said that teachers should ask questions with a purpose to motivate students to ask questions. In addition, the results of this research regarding the questioning activities in the learning process are already in accordance with the opinion of M. Hosnan (2014), which explains that the second step in the scientific approach is asking questions. It means that the students should ask questions to obtain additional information about what is being observed, starting from the factual questions to the hypothetical questions, and even though questions raised by children in this research are still factual questions and have not yet arrived at hypothetical questions.
3. *Gathering information*: which means seeking information about the topics discussed from various sources and conducting experiments to prove and answer the questions raised by children. The Educational and Cultural Ministerial Regulation Number 81A in the year of 2013 explains that the activity of gathering information is carried out through doing experiments, reading sources other than textbooks, observing objects or events or activities, interviewing informants, and so on.

4. *Reasoning or interpreting*: which is a process of making joint conclusions about themes or topics that the teacher and students discuss. The results of the research conducted by M. Hosnan (2014) explain that reasoning is a process of thinking logically and systematically on empirical facts that can be observed to acquire conclusions in the form of knowledge.
5. *Communicating*: which means conveying the knowledge gained through stories and works. However, in practice, the results of the reported activities had not yet been responded to by other students, despite the opportunity given by the teacher. Therefore, the teacher then gave immediate responses by explaining again and using language that can be understood by the students. The teacher then made conclusions along with students so that all students would get the same understanding. The teacher responded to the results of student activities as an adjustment to the learning hours which were about to end. The activities carried out in this section of the learning process were conveying the result of observations and conclusions based on the results of the analysis, and in a form of verbal language, written, or other media. However, the teacher had not provided an opportunity to the students to communicate the results of the activities in front of the class, and the results of student activities are still not well responded to by other students. Therefore, it is the teacher who responds by aligning the answers that are still incorrect and emphasising the correct answers, making conclusions together with the students.

The activity steps in learning with the implementation of a scientific approach have been applied to the teacher in the classroom to the fullest extent, even though in the process of the learning activities the teacher has not conditioned student activities effectively. The students have been directed and facilitated by the teacher in conducting various learning activities, starting from observing activities, asking questions, trying or collecting information, reasoning or processing information, and finally, communicating activities.

Conclusion

The scientific approach is a learning activity that includes a process of: 1) observing, which is giving an opportunity to young children to observe objects according to the theme and by using their own senses; 2) asking questions, which is giving an opportunity to all children to ask the things they want to know about the topic being discussed; 3) gathering information, which is seeking information on topics discussed from various sources and conducting experiments to prove and answer the questions raised by children; 4) reasoning, which is making conclusions together on the themes or topics that teachers and students discuss; and 5) communicating, which is conveying knowledge gained through both stories and works.



The students' understanding of the scientific approach in the learning process in Early Childhood education can be seen from three aspects, which are the understanding of the concepts, the understanding of planning, and the understanding of the implementation of the scientific approach in the learning process. From the results of this study, it is obtained that students in the Department of Teacher Education for Early Childhood Education already have knowledge in terms of the concept of the scientific approach, with a score of 62.07 per cent (intermediate level of understanding); knowledge in terms of planning a learning process with the implementation of the scientific approach, scoring of 85.52 per cent (intermediate level of understanding); and knowledge in terms of the implementation of the scientific approach to the learning process, with a score of 48.28 per cent (intermediate level of understanding).

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