Difficulties of pre-service physics teacher to design and implement inquiry learning

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Abstract. This research aims to describe the difficulties of the pre-service teacher in designing and implementing inquiry learning in senior high school. A case study design was used for this research. Three pre-service teachers were interviewed and observed to determine the distressing point. This research finds all of the respondents started to design learning inquiry from finding some examples of the inquiry learning process in the internet or senior thesis report and imitated that in their lesson plan. This reflected they had the problem of a doubt what the inquiry process looks like. Along with their self-research about inquiry process illustrations, some of them tried to get the clue in the published article on the internet. It took several weeks to self-analyse what they found on the internet. The majority of problems of this is lack of English understanding. For the implementation process, most of them were able to run the teaching but all of them had a problem with applying the assessment process. Most of them thought the assessment process was just in the formative assessment, not along with the learning process. This research also concludes if they still have much lack of knowledge in designing inquiry learning and lack skill in guiding the students in inquiry learning using guided questions.

1. Introduction
Learning is an attempt to know and understand a thing. Learning can be done through the process of studying a topic or by learning by doing. Characteristics of learning are characterized by changes in attitude to knowledge and skills after and before learning. Bloom identifies the level of knowledge into 6 stages. The highest stage in that level is called making. This stage asks students to make new things by megorisasi a number of elements or parts into a pattern or structure that had never existed before [1].

This cognitive process is usually in line with what has been previously learned. So, it can be said that creating is an accumulation of some prior knowledge. The creator process contains 3 main cognitive processes namely generating, planning and production [2]. At the generating stage, a student will think divergently to describe the problem experienced and look for clues or characteristics of the solution to be chosen. At this stage, the process of thinking that is out of bounds (unusual) and outside of the concepts accumulated in memory is very necessary. Generating becomes a crucial in all stages of the activity of creating because it is a reference stage in subsequent activities.

At the planning stage, students not only design the generating results and formulate what the producing process will do but also formulate the final goal implicitly. Planning activities become a stage
that can already describe the results of creation. The final process in creating is producing. Producing activities become the end and the process of completing what has been planned.

In the teacher education curriculum program. A teacher is required to be able to design learning and implement it in class. The ability to design this learning into something unique and requires a high level of cognitive level. The ability to design learning can be linked to the ability to create. This also relates to the learning design that is not the same and is typically between one design with another or the previous design. In accordance with the principle of learning that nothing is the same in one place with another time. One of inevitability in teaching and learning in science teaching is inquiry learning.

Inquiry learning is not something new in teaching science. The inclusion of inquiry into K–12 science curriculum was recommended by John Dewey, a former science teacher [3]. Dewey Inquiry learning argue learning science methodsshould consist of six step: sensing perplexing situations, clarifying the problem, formulating a tentative hypothesis, testing the hypothesis, revising with rigorous tests, and acting on the solution [4]. In Dewey’s model, the student is actively involved, and the teacher has a role as facilitator and guide. It mean students have control about how and what they learn. This situation also encourage student to gain self esteem. Self esteem is the feeling that students possess about their competencies and abilities to have a positive effect to confront rather that flee from chalanges, to learn from both success and failure, and to treat themselves and other with dignity [5].

Based on the strength of inquiry in teaching and learning. It has become a necessity to teacher candidates to master and skillful in designing good inquiry learning. Good design will be represented on good lesson plan which has include reflected goal of the learning, record daily detail, indicated a focus learning, specifies learning objective, clarifies how student learning will be assessed, identifies teachinfg teaching strategies, organizes teaching, student activity, material, assignment, lists procedur, estimate time, suggests alternative procedure, reflect future teaching [6].

Designing and implementing a design is not simple for new teacher candidate. Some difficulties need to determine and explain to design better curriculum for Pre-Service Physics Teacher program. In conclusion this research focus to describe difficulties of pre-service physics teacher to design and implement inquiry learning.

2. Methods

This research described difficulties of 5 Pre-Service Physics Teachers as samples base on observation and interview data. Interview was used to get information about the design, the reason background cunducted design and problems in designing process. Obsevation was used to draw how samples implement intructional which they design. The observation focus on conformity of design and process, fluency of teacher to guide using guided question, continuity each guided question and step of taking data and conclusion.

3. Results and discussion

3.1. According to observation and interview data, this research find

3.1.1. Desining a learning. The choosing of the framework of design is crucial in this process. All samples did not know for clear and sure as to what inquiry learning was. Generally, they were not able to give an explanation of what is inquiry both literally and simply. They could only know by name and inquiry is one of the lessons commonly taught in science learning with a new curriculum in accordance with government regulations.

When they got the task of teaching with inquiry at the school where they were apprenticed then they do a mini research on internet sources to find out what and how to teach with the inquiry model. In their search, they got many Indonesian sources using the inquiry model developed by Wenning. After reviewing the inquiry designs according to Wenning and refers them to the situation and conditions. surprisingly the first step to create a learning design they take was to mimic the designs described in the articles and sources they read. it is necessarily the wrong way. They should focus more on how to
develop the learning process independently based on the learning principles described in the articles they read. This indicates that Pre-Service Physics Teachers were not confident or hesitant in designing their own learning.

After getting information that the design must be original and is their own work, then they tried to design it themselves. In designing this they still used existing reference examples, not constructed their own designs from information from designs or articles published by Wenning. This indicates there was a problem in reviewing these articles. Through interviews obtained information that their biggest weakness was the ability to read and understand texts in low English.

After trying long enough to analyze these articles their choice felt on the design of bounded inquiry. Bounded inquiry [7]. From the interviews, it was found that this choice was the most appropriate due to the practicum guide or previous study guide in learning physics on diffraction topics using an approach to determine the quantitative relationship. Moreover, they get references to teach inquiry that has the same approach.

From the findings above, it can be concluded that their initial knowledge about inquiry learning is limited so they rely heavily on sources that are instant and easy to understand and are easily copied. In addition, the skills in understanding English texts are still very low so they prefer to prioritize sources in Indonesian.

3.1.2. Implementation. Implementation of the design was quite challenging. All of the doubt if they could to teach what they had been design smoothly. Most of them worried about how to guide student along the learning process. Guided question become a problem because they could not estimate random question from students to carried out a new skill or knowledge.

In the initial preparation before entering the class all the teachers who were sampled stated that they were very worried about how to anticipate the questions that students would be asked. But, after entering the class and they started teaching all their worries did not become things that made them nervous.

Learning begins with apperception where the teacher explains what will be done and gives problems that will be done. The teacher explains what is meant by the phenomenon of diffraction and what kind of practice will be done. In its implementation in general students understand what is explained in apperception and there are almost no questions from students for this stage.

When learning takes place students are given a worksheet that guides them. The worksheet in question contains questions that help students to work. On the other hand, the teacher also continues to guide students with direction questions. The use of worksheets containing guided questions is very helpful for the teacher in guiding students because students have been helped enough by the details of the questions in the worksheet as well as helping the teacher not to repeat many questions.

The learning process that is guided by questions becomes the teacher's doubt before learning is not really a problem because there are not many questions back from students. Researchers noted the question and answer process began to be felt when determining variables. This difficulty is because the teacher uses the terms independent variables and dependent variables that are not understood by students. The guiding process is felt when students are asked to design experiments that they will do as well when formulating mathematical relationships \(d \sin \theta = n \lambda\). But all of these things can be lived well and smoothly.

The main obstacle for the implementation of learning in this study came from the teacher himself. They are too focused on how to guide students in learning to use guided questions and supervise and guarantee what students do in practice according to their expectations. This makes them forget about the implementation of the learning process assessment. When finished learning it was too difficult for them to give an accurate assessment of the performance of 29 students divided into 6 groups. Information was obtained through interviews that the use of assessment processes was not common to them both when practicing teaching practices on campus and when their lecturers were taught. This is what makes them consider the assessment process is not something that is important and needed in teaching so often forgotten when implementing learning.
4. Conclusion
This research finds all of the respondents started to design learning inquiry from finding some examples of the inquiry learning process in the internet or senior thesis report and imitated that in their lesson plan. This reflected they had the problem of a doubt what the inquiry process looks like. Along with their self-research about inquiry process illustrations, some of them tried to get the clue in the published article on the internet. It took several weeks to self-analyze what they found on the internet. The majority of problems is lack of English understanding. For the implementation process, most of them were able to run the teaching but all of them had a problem with applying the assessment process. Most of them thought the assessment process was just in the formative assessment, not along with the learning process. This research also concludes if they still have much lack of skill in guiding the students in inquiry learning using guided questions.

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