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Enhancing Student Scientific Attitudes towards Civic Education Lesson through Inquiry-based Learning

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ABSTRACT

The purpose of this study was to investigate student scientific attitudes toward civic education lesson through inquiry-based learning. The samples in this study were selected using stratified random sampling technique. Interactive data analysis consists of two stages: data collection and data display. The data were gathered by observation and interviews. Statistical results indicated that the student scientific attitudes towards civic education were a positive. Inquiry-based learning enhances student scientific attitude, where the most visible indicator of scientific attitudes is students' curiosity. Building scientific attitude can provide a logical solution to the problem student faced in their daily life and has scientific thinking skills. Creating and using science concepts related to students' lives and interests will provide opportunities for a student to build their scientific attitude through meaningful learning activities. Scientific attitudes are grown through a series of experiences that students discover on their own during the learning process.

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1. INTRODUCTION

Student interests and attitudes have a significant general impact on pedagogy, assessment or curriculum reform. Students perceptions about civic education can enhance their learning and contribute to the development of a wider range of teaching strategies and to raising the levels of student attainment in civic education, and to achieve meaningful learning in their students experience [1], [2]. Students' interest in civic education has been conceptualized as a complex and diverse construct that includes teacher motivation, perceptions of teachers, value of science as a discipline, enjoyment, and achievement [3], [4]. Students gave a high instrumental value to civic education because civic education was related to their everyday lives. In order to achieve this goal, civic education should involve students in authentic experiences to develop an epistemic and conceptual understanding of the real-world phenomenon, skills for conducting scientific investigations, and abilities for problem-solving [5], [6].

Civic education research studies carried out in recent years emphasize that constructivist learning theory provides a useful and functional framework [7], [8]. Constructivism is a learning theory which essential for a learner to constructs knowledge and applies it in their lives through investigation. Student investigation is a necessary element in civic education learning. These investigations should take place in the community, the classroom, or the field where students are given opportunities to interact directly with naturally occurring phenomena or with data originating from such phenomena[9]. Civic education teacher is advised to incorporate into their instruction contradictions that puzzle student in order to cause them to modify their understanding.

Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work. Inquiry represents a set of abilities and understandings that include asking scientifically oriented questions, giving priority to evidence in responding questions, formulating explanations from evidence, connecting explanations to scientific knowledge, and communicating and justifying explanations [10]. In other words, learning science as inquiry exposes students to a type of learning that parallels the work of scientists, helps students develop a deeper understanding of science, and thus can lead to the development of critical thinking skills [11]. Inquiry-based learning (IBL) is a pedagogy which best enables students to experience the processes of knowledge creation and the key attributes are learning stimulated by inquiry, a student-centered approach, a move to self-directed learning, and an active approach to learning. Students should develop research skills and become life-long learners [12]. IBL is the process of seeking knowledge and new understanding as well as to a method of teaching grounded, where the process is about discovery and systematically moving from one level of understanding to higher level thinking[13], [14]. IBL start from a slightly structured and guided activity at lower levels through to independent research, and also occur at a range of scales within the curriculum from a discrete activity through to the design principle for the whole degree [15].

Basically, learning by using inquiry model itself has been implemented by a teacher, but limited to the syntax in the model and only focus on the student achievement in cognitive competence. There is an abandonment of the students' scientific attitude during the implementation of the inquiry model. The attitude and scientific behavior of students are often neglected. Scientific attitude is found to be lacking even in highly related with the students, where the students need to have scientific outlook. Teachers in learning sometimes forget about how students' scientific attitudes during learning, such as curiosity, critical in observation and thought, open-mindedness, objective based on evidence, respect other's point of view. Science should not only possess knowledge of science but also should acquire favorable attitudes towards and develop an interest in it. An attitude defined as a predisposition to react in a favorable or unfavorable manner with respect to the object [16]. Attitude can be also defined as a positive or negative feeling and distinguished attitude from related terms for instance value, belief, and opinion [17]. Attitude plays a vital role in science classes involve the teaching strategy, complex concepts, and in the lives of the student pursuing science education [18]. Scientific attitude is an essential outcome of science teaching. Though some people view the scientific attitude as the product of teaching science, so far a majority of the people consider them as similarly crucial of the cognitive aspect. Science should be taught directly and systematically because building scientific attitude has a numeral of distinctiveness features which differentiate it from other attitudes [19]. It is therefore imperative that educational systems recognize the critical role played by student attitudes and seek actions that will achieve a positive view [20]. Bloom refers to the importance of attitudes by stating the effect of the affective domain in achieving cognitive domain behavior in the learning process. Scientific attitude stands for willingness to know and understand, the desire to asking everything, collecting data and acquiring its meaning, ambition to prove out, thinking of the results, considering the hypothesis and respecting logic [21]. In line with this definition, curiosity, critical in observation and thought, open-mindedness, objectives, and respect others point of view also become of the basic needs of individuals to have high scientific attitudes.

2. RESEARCH METHOD

2.1. Research Questions

This research will investigate the students' scientific attitude in civic education lesson through inquiry-based learning. This study is expected to be used as a basis for teachers to pay more attention to students' scientific attitude and become a reference to build the character of the students. The research questions investigated here is how does inquiry-based learning can enhance student scientific attitude in civic education lesson?

2.2. Participant

The setting of this research is on one of secondary school in Surakarta which is located in Central Java Indonesia. The sample of classes in this study was selected using stratified random sampling technique. The participant consisted of 90 students in the first year of civic education classes or in tenth grade. There were 57 females and 33 male students studying in three different classes and the same teacher taught all of the students. Participants were organized into a small group of learning, each group consisting of three or four students. This small group is more appropriate and more accessible to evaluate. Social interaction can occur when students work in groups, have a group discussion, group projects, and group presentation [22]. Ethical approval to undertake this informed consent was assured confidentiality and anonymity.

2.3. Research Design

The selected civic education classes were treated by applying Inquiry-based Learning in the learning process. The civic education lesson implemented through IBL include student cognitive, affective, and behavioral processes [23].Together or separately, they can endorse student scientific attitude in the civic education lesson.

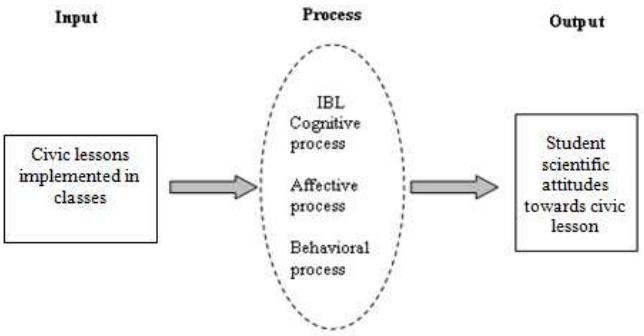

Figure1. Scientific attitude toward in civic education lesson

The cognitive attitudinal refers to the student evaluative beliefs in the learning such as curiosity, the affective attitudinal refers to a feelings and emotions that student has during learning processes such as objective and open-mindedness, and the behavioral attitudinal refers to the student tendencies toward the learning process such as, critical in observation and thought, and respect other's point of view. The development of student attitudes regarding civic education courses is one of the principal responsibilities of every secondary school civic education teacher.

2.4. Data Collection and Analysis

Interactive data analysis consists of two stages: data collection and data display. The data were collected by observation and interviews. The observation was started from the first of learning activities and was completed at the last of courses, which means that all of the student activities in the learning process were captured. In conducting observations, the researcher was assisted by seven observers to retrieve data and information about students' scientific attitudes during the learning process. Some participants were interviewed individually before and after classes learning. Through the interview, the researcher is able to learn and investigate more information about the student opinion, comments, and feelings [24]. The display of data was an organized assembly of information that allows for discussion and conclusion. This is the main component of research, where all of the data help researchers to interpret the learning process. Student scientific attitude was the dependent variable identified in this study. Student scientific attitude measured students' curiosity, critical in observation and thought, open-mindedness, objectives, and respect other's point of view. The independent variable identified in this study was inquiry-based learning model through laboratory work in class and out a class.

This study took place over a four months period and utilized an experimental design of class investigation. Assessment data and attitudinal data were gathered and analyzed to measure the instructional value of civic education social laboratory experiences in terms of student attitudes. The social laboratory involves the student in experiences to study the social phenomenon. This research needed in-depth analysis and inevitable led to the selection of the method [25], [26]. In an attempt to tease out the student scientific attitude, it was using a checklist by following categories: 5 (always), 4 (usually), 3 (sometimes), 2 (rarely), and 1 (never). The level of scientific attitude divided into two criteria positive and negative. It was considered of positive if each of the dimensions of scientific attitude was greater and equals of 3 and negative if the scale was less than of 3.A reliability of the scales and internal consistency of items within scales were calculated. The scales were statistically valid and reliable with Cronbach's alpha valued 0.781.

3. RESULTS AND DISCUSSION

3.1. Result

The accountability of developing scientific attitude among the students lies on the teacher who can persuade all the situations to encourage the student scientific attitude and at the same time presenting him as an example to the pupils. A considerable body of evidence how inquiry-based learning can enhance student attitude and conceptual understanding of scientific content knowledge. The inquiry-based learning model was applied to civic education course learning. The teacher provides an explicit lecture including terminology and theory about the subject matter. After the explicit lecture, students were organized into a small group of work where each group was given a topic. Each group then performs social work both in class and outside of the class depend on the predetermined concept. During the learning process, students were monitoring and observing through an observation sheet to find out the scientific attitudes. In this stage teacher help student to prepare their reports and work. Finally, teacher evaluates the result of student investigation and their project.

According to the observation data, almost all of students contributed to learning activities. The students recognized and discussed the connection between course material and another aspect of their lives. The results of students' scientific attitudes through IBL were as table follows:

Table 1. Student Scientific Attitude

Indicator	Mean	SD	Descriptive Criteria
Curiosity	4.53	0.84	Positive
Critical in observation and thought	4.15	0.91	Positive
Open-mindedness	3.71	0.90	Positive
Objectives	4.29	0.86	Positive
Respect other's point of view	4.00	0.88	Positive

Based on the table, it appears that the most visible student scientific attitude was curiosity more about 4.53 and the lowest indicator was open-mindedness approximately 3.71.Overall the data showed that students' scientific attitude during the implementation of IBL approach was rigorous criteria

3.2. Discussion

IBL is finding out about something. It centers on the desire to answer questions and learn more about object phenomenon. A central element in learning is what student knows when they come to the class. Their minds are no empty, ready to fill with a body of knowledge, where they also already possess many ideas. The table provides that students' curiosity is higher when compared to other indicators of student scientific attitude. IBL is a creative process that fueled by curiosity and hard work which encourages students to discover their own concepts. Science is an activity that involves thought processes that engage the mind as a form of curiosity and a desire to understand and explain a phenomenon. Curiosity is a characteristic of scientists who have an interest in the object and social phenomena. Many students ask why, the question why and how can which proposed by students shows that they have a desire to understand the concept deeply. Students build on their prior knowledge as they engage in the cognitively challenging situation. They are allowed to ask a question and to do more research in the learning process. The students search and read literature and discuss it with other members of the group to answer their curiosity. The contextual learning enhances students' curiosity. Curiosity is regarded as a means to increase and support the outcomes and processes of learning and often manifested the many interests of scientists, even beyond that of unraveling the mysteries of phenomena [27], [28].

The objective attitude is shown by stating what it is, without being accompanied by personal feelings. Students declare what they know, trying to express their opinions based on the knowledge that they have and giving an evidence. In scientific thinking, a student fair in giving a view. Not only look at the things from the positive side but also look at the negative side, in a balanced manner. The inquiry is not only about the acquisition of conceptual and procedural knowledge and understanding, but foster flexible thinking that prepares students to be lifelong learners. By acquiring inquiry, the student will gain insight on how knowledge is produced, its values and assumptions and will be able to become more critical consumers of scientific information. In terms of critical observation, students still need to be trained to be more careful and accurate, such as how to observe correctly. This critical attitude is fundamental to train students to think about something that is not visible, or something different from the theory. Most observations are carried out through the sense of sight, but other sense like hearing, feeling, smelling, and tasting also part of the observation process. Inquiry facilitates students to think critically through their own knowledge skills.

Through critical observation data and information are gathered and organized correctly in order to make sense of phenomenon.

In the discussion, students can learn to respect the opinions of another student and try to accept if their ideas or opinions were not accepted. Inquiry makes students believe in something based on fact or empirical evidence. Students trained to trust and appreciate the opinions of other students who are able to present their opinions with evidence. Inquiry makes students believe in something based on fact or empirical evidence. Learning to respect the opinions of others is one of social behavior. Students in this study also suggest that experiential and interactive activities resulted in an essential increase in their knowledge of the subject matter. Through group work, the students focus more on working together and collaborating in understanding a concept. Group work is an excellent way to engage the student in learning. The strategy encourages students to work together, sharing ideas and working cooperatively at tasks that lead the typical product. This can be a robust strategy to learn the content and process, promote good working habits and cooperative, and build positive classroom atmosphere [27].

Open-mindedness has been identified as an essential factor of the educated mind [29]. Open-mindedness creates opportunities for students to rethink assumptions, recognize propaganda, and consider other ways to make decisions [30]. The open-minded of a student in the civic education lesson needs to be increased. This open-mindedness still needs to be considered. The basic knowledge that students possess dramatically affects students' open-mindedness. Interview results show that students who are active in learning are more open than passive students. Student open-mindedness is widely accepted as an intellectual virtue as a means of pursuing cognitive make contact with the reality. Open-mindedness as a virtue is primarily an attitude toward particular beliefs or toward oneself as a believer [31].

Civic education always includes the improvement of curiosity, values, attitudes, aptitudes, and gratitude. In the present world of science and technology, all students should not only acquire knowledge but also should obtain a positive attitude towards and develop awareness in it. Scientific attitudes are the most important outcomes of science. The responses to the semi-structured interview provided that the activities through laboratory work as being meaningful to their interest and learning. The student defines their scientific attitude increase as result of their experience practically. They believed that experiment or laboratory work and model building experiences improve their scientific attitude. The student enjoyed scientific inquiry activities, where they had an opportunity to create, share and put their idea into action. Positive attitudes toward science increase the likelihood that students will become ‘‘scientifically literate young who will then be able to make rational decisions in their lives [32]. The student also mentioned that experience and interactive activities resulted in enhancing their concept of the subject matter. The student conceptualized their current science experience as being more challenging and as fostering a deeper level of thinking.

The interesting thing in this research was some students feel that learning civic education requires a desperate effort. They feel a bit depressed and anxiety about their work. Student perceived a workload in IBL and suggest that anxiety occurs over the need to become self-directed learners [33], [34]. This feeling of distress and anxiety in some students arises because students feel bored and tired with all of the tasks. The results of the interview also show the dominance of the smart students making them challenging to give ideas in every discussion. This certainly needs to be a concern where active learning in groups is not dominating each other or getting recognition from friends but how to build knowledge together within a group. Student-centered learning is the process of constructing declarative and procedural knowledge through discussion [35]. The real learning IBL was well planned by teachers such as creating a pleasant learning environment in class and out class, where the student has expected more actively and guiding their own learning processes and support meaningful learning.

Scientific inquiry is centered on the development of models of reality that guided thinking and investigation learning based on a process of seeking knowledge and new understanding. The use of experience and discourse is invaluable for the learning process. The goal is to have student success in their understanding through experiential learning and actively involved with the concrete experience [36]. It is essential for teachers to encourage positive attitude student in their activities. The student becomes more engaged and enthusiastic for more inquiry courses. Students were allowed to manipulating different scientific objects and material so they could have interaction. Through IBL particularly laboratory work, they have practiced the work of a real-life scientist, act like a scientist and follow scientific processes. Creating and using science concepts related to the students’ lives and interests will provide opportunities for the student to build their scientific attitude through meaningful learning activities. A learning environment that integrates cognitive apprenticeship provides a rich context for helping students build scientific habits of mind [37]. Learning is not passive and knowledge-consuming, but an active, constructive and self-directed process in which learner builds up their internal knowledge through his learning experiences. By inquiry, the student determines the problems, develop solutions and alternative solution, search information, evaluate the

information and communicate with their group[38]. In short, choosing Inquiry-based learning by the teacher was highly supportive to the student scientific attitudes

4. CONCLUSION

Based on the result and discussion obtained in this study, building scientific attitude can provide a logical solution to the problem student faced in their life and has scientific thinking skills. Creating and using science concepts related to students' lives and interests will provide opportunities for a student to build their scientific attitude through meaningful learning activities. Scientific attitudes are grown through a series of experiences that students discover on their own during the learning process. Inquiry makes students believe in something based on fact or empirical evidence. Through inquiry, students can learn to respect the opinions of other students and try to accept if their ideas or opinions are not accepted by other group members. Students are trained to listen and respect the opinions of others as part of a social process. Further research should aim at focusing on the student obstacles during learning activities and discussion. In short, a more in-depth investigation should be gathered by analyzing more focus on the student difficulties in the teaching and learning processes. The result of this study is expected to be used as a reference for teachers to pay more attention to student attitudes during learning because it is critical to build concepts and success in achieving learning objectives.

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