CHAPTER 1
INTRODUCTION

1.1. Background

In the 21st century, the global issue includes environmental, health, social, and economic issues is rising rapidly. As previous researches have mentioned that our world has faced increasing CO_2 emission, ecosystem degradation, human health issue, increasing poverty, and global unemployment (Cardak & Dikmenli, 2016; Muhammad, 2019; Nicholas & Breakey, 2017). Recently, our world has been struggling with the COVID-19 pandemic that also offers global issues in society. Therefore, students need to be prepared by learning 21st-century skills to encounter those issues. The 21st-century skill including critical thinking and problem-solving are stimulated by the argumentation skill (Permanasari et al., 2021; Rahayu & Widodo, 2019). Argumentation skill develops critical thinking because it facilitates students to deliver the problems by making a decision, considering the ethics, and assessing the validity and reliability of the claim from the media sources (Erika & Prahani, 2017). Besides, the argumentation process shows decent thinking skills, because students will analyze information about a topic in advance before accepting it as a whole (Astira et al., 2019). Moreover, by having argumentation skills students will have a deeper conceptual understanding and improving their scientific literacy (Purwati et al., 2019). Thus, it is important for the student for having argumentation skills to encounter the issues in this global era.

According to Toulmin, there are six components in an argument. These components are including a claim, data, warrants, qualifiers, backing, and rebuttals (Toulmin, 2003). Those six components can be used to analyze the quality of an argument, wherein the more of component presence it means the quality of an argument is forceful and stronger. In this case, the research investigation revealed that the majority of pupils scored poorly on the warrant, backing, and rebuttal aspects with results below 50% (Dawson & Carson, 2017). Another study also revealed that students had difficulty in developing argumentation skills. As consequence, they have lack of

1

rebuttal aspect of their argument natural (Astira et al., 2019). Besides, students still have difficulty conveying the results of their analysis both orally and in writing (Anwar et al., 2019). Regarding this, that is challenging to improve student argumentation skill.

Attitude toward science is an essential component to involve students in argumentation (Demircioğlu & Uçar, 2012). It has a significant impact on students' interest, attention, and reactions to science and technology, as well as issues that directly affect them. Personal gratitude, emotion, or a value judgment on science are examples of attitudes that students have in their classrooms (Jho et al., 2014). These may be influenced by students' participation in arguing. Furthermore, one of the goals in science education is to encourage students to participate in scientific discussions (OECD, 2020). According to a prior study, students with favorable attitudes toward science are more engaged in focusing on the learning process (Zeidan & Jayosi, 2014). Unfortunately, the present COVID-19 pandemic has affected classroom activity. Based on the previous studies, there is a lack of involvement of in-classroom activity in online learning (Al-Amin et al., 2021; Baber, 2021). Therefore, further research is needed to find out the way for fostering interaction that can highly affect participation that influences argumentation, especially in science learning.

On the other hand, the learning process in Indonesia has not been practicing argumentation skill and not habituated to solving the problem. This is supported by the PISA and TIMMS results of Indonesia shown apprehensive results. Both studies reveal that Indonesian students have low reasoning ability and the ability to construct explanations based on evidence and arguments through critical analysis (Erika & Prahani, 2017; Purwati et al., 2019). Besides, argumentation skill is not obtained naturally in most people, wherein it depends on the environment and practice (Purwati et al., 2019). This means it is important to provide students an environment and practice them that can develop students' attitudes toward science and fully supports argumentation in the learning activity. Nevertheless, there is SSI-BL as a learning approach that is expected to empower the argumentation and develop students' attitudes toward science.

The socio-scientific issue based-learning (SSI-BL) brings the societal issue as the learning context and provided a set of the learning experience as expected the student to use their knowledge of science and associated practices of science in the negotiation of real-world problems (Peel et al., 2019). Since it addresses the real problem and integrating with social aspects which are multidisciplinary, and complex so the student can improve argumentation skills (Dawson & Carson, 2017; Evren-Yapıcıoğlu, 2018). As a consequence's student can learn science content, scientific practices such as argumentation (Topçu et al., 2018). Afterward, students can provide multidisciplinary solutions to challenges that arise in everyday life.

Several studies implemented SSI has been effectively improved students' learning outcomes in the direct learning process. The research conducted by (Purwati et al., 2019) in Surakarta showed that the application of PBL-based modules on the topic of socio-scientific issues has effectively been used to improve senior high school students in learning biotechnology. Other researches were conducted to support students' argumentation skills in climate change topics (Dawson & Carson, 2017, 2020) within the rebuttal aspect still lack by the students. Even though, another resource has been found the use of Lucidchart in making argumentation maps show that for the student either both male and female reach rebuttal aspect. Because a lucidchart is a proprietary tool with related forms, arrows, and meanings, it provides argumentation elements. (Hsu et al., 2018). Lucidchart is a free online mapping that provides many features in creates a flowchart. By means, students are able to encounter they argumentation map through this free online mapping. Argumentation maps show the relationship between the evidence in an argument in a hierarchical form that students and teachers may easily understand (Dwyer et al., 2013; Rapanta & Walton, 2016). However, there is no recent study on the use of Lucidchart in the implementation of SSI-BL.

On the other hand, a previous study has implemented SSI at the level of higher education for geoscience courses and it shows a positive influence on student's attitudes about science (Pelch & McConnell, 2017). Moreover, a previous study applied SSI and investigate student's attitudes in a particular issue (nuclear energy), which is not investigating students' attitudes toward science (Jho et al., 2014).

However, there is no recent study that applied Socio-scientific Issue-Based learning (SSI-BL) students' attitudes toward science at the level of a junior high school student. Socio-scientific issue-based learning (SSI-BL) is expected to increase students' attitudes toward science at the level of junior high school since it emphasizing the connections between science and society (Pelch & McConnell, 2017). Besides, it also lacks a study that investigates the implementation of SSI-BL in energy resource topics.

Energy resources are processed by humans so that they can be used to meet energy demand. As we know, the sustainable use of fossil-based fuels is massive even though it has environmental effects, such as greenhouse gas emissions and other air pollutants (İskenderoğlu & Akdağ, 2019). Hence energy resource topic theme is relevant to pollution prevention and public health. In this case, students as the next generation of nations need to understand more about a variety of contentious issues that are being debated and addressed from various perspectives surrounding energy issues(Rahayu & Widodo, 2019). It is important to foster a sense of responsibility and energy-efficient living among citizens of the 21st century (Ochoa et al., 2019).

Considering the things mentioned, it is important to improve the argumentation skill and attitude toward science in energy resource topic. The point of this research is to investigate the students' argumentation skills and attitude toward science by implementing SSI-BL supported by lucidchart in learning energy resource topics for the junior high-level students. Based on that statement, this study has the intention to conduct research entitled ***"Student's Argumentation Skill and Attitude toward Science through Socio-scientific Issue-Based Learning Supported by Lucidchart in Energy Resource Topics"***

1.2. Research Question

Based on the disclosure above, the research problem of this study is " How does socio-scientific issue-based learning (SSI-BL) by using Lucidchart in learning energy resource topic improve students' argumentation skill and attitude toward science?". Therefore, the research is carried out to explore the following questions.

a. How is the implementation of SSI-BL supported by lucidchart in learning energy resource topics?

b. How is the effect of SSI-BL supported by lucidchart on students' argumentation skills in learning energy resource topics?

c. How is the effect of SSI-BL supported by lucidchart on students' attitude toward science in learning energy resource topics?

1.3. Research Objective

The objectives of this research are as followed: from this study, the objectives that would be raised are:

a. To investigate the implementation of socio-scientific issue-based learning supported by lucidchart in learning energy resource topic.

b. To investigate students' argumentation skill through SSI-BL supported by lucidchart in learning energy resource topic.

c. To investigate students' attitude toward science through SSI-BL supported by lucidchart in learning energy resource topic by using Lucidchart

1.4. Research Benefit

The results of this study are expected to provide the following benefits.

a. Students

Students can be visualizing their argumentation using Lucidchart to be presented publicly. Besides, they are expected to improve the argumentation skills and students' attitude toward science to encounter the issues or daily life problems for both personal and social facets.

b. Teachers

Teachers can have to select alternative learning methods to apply in improving students' argumentation skills. Even more, the Lucidchart can also be used as the learning media to assess students' skills or even delivering the material

c. Other Researchers

This study can be used the data as reliable information and a recommendation for future studies, especially in improving students' argumentation skills and attitude toward science. Furthermore, other researchers may develop another research in improving students' argumentation skills toward the socio-scientific issue in science teaching and learning activity.

1.5. The Organization of Research Paper

The research paper contains five-part with each sub-chapter. The systematic of this research paper is as followed:

a. Chapter I: Introduction

This part covers the background of the research, research questions, research objectives, research benefits, organization of research paper, and limitation of problem.

b. Chapter II: Literature Review

This part contains the relevant theories and researches related to the variables. The literature includes the fundamental explanations about socio-scientific issue-based learning, Lucidchart, argumentation skills, students' attitude toward science, and energy resource topic.

c. Chapter III: Research Methodology

This part enlightens the details of methodology in conducting the research beginning from the research design, research subject, operational definition, research instruments, data analysis, and research procedure.

d. Chapter IV: Result and Discussion

This chapter describes the data and discussion related to the findings on the implemented research. The research problems stated are being answered in this chapter with the analysis using figures, tables, and relating to the previous studies.

e. Chapter V: Conclusion, Implication, and Recommendation

This part is the closure which consists of the conclusion of the research, implication, and further recommendation for further related researches.

1.6. Limitation of Problem

To avoid a wide problem in this research, then the research is limited to as follow:

a. Socio-scientific issue-based learning (SSI-BL)

As a learning approach, SSI-BL has certain frameworks to be implemented. The researcher used a framework that refers to (Presley et al., 2013). The framework consists of the design element, learning experience, peripheral influences, teacher attribute, and classroom environment.

b. Students' Argumentation Skill

Based on (Toulmin, 2003) there are six components of argumentation which are claim, data, warrant, backing, qualifier, and rebuttal. These aspects are Toulmin Argumentation Pattern (TAP) used in this research

c. Students' Attitude toward Science

Students' attitudes toward science sub-scale were adopted from (Abd-El-Khalick et al., 2015). There are five sub-scales of students' attitudes toward science were measured including students' attitudes, unfavorable outlook, control belief, behavioral belief, and intention

d. Lucidchart

There are many mapping tools provided. However, this research will be used a Lucidchart as it will present the aspect of argumentation in certain features provided by Lucidchart. The features of Lucidchart are used refer to (Hsu, Dyke, Smith, & Looi, 2018)**.**

e. Energy Resource

In both the 2013 National Curriculum and Cambridge, the topic of energy resource is combined with energy transformation. The topic is learned in grade 7th semester one for national and semester two for Cambridge curriculum. However, the chapter focuses on energy resources. Energy resource is limited by discussing renewable and non-renewable resource. The issue of coal energy as non-renewable energy is used as the context of learning wherein the social dimension including ethics, policy, and economy was included.