Exploring Science Issues from Social Media Platforms for PISA Framework 2025

Erman Erman[1], Enny Susiawati[2], An Nuril Maulida Faiziah[3] and Muhamad Arif Mahdiannur[4]

[1,2,3,4] Universitas Negeri Surabaya, Surabaya City, East Java Province 60231, Indonesia
erman@unesa.ac.id

Abstract. The ease of obtaining and disseminating information whose truth has not been verified on social media has the potential to give rise to misleading and misconceptions in science learning, uncertainty, and even detrimental social impacts, such as conflict or other detrimental things. This study aimed to describe students' ability to explain socio-scientific issue that are obtained and spread on social or digital media platforms. As 70 students were involved voluntarily in the survey on the ability to explore socio-scientific issues (SSI), explain SSI, and take appropriate decisions and actions based on SSI information. Data collected through surveys using a worksheet and rubrics were analyzed descriptively, namely percentage analysis according to the specified categories (high, medium and low). The research results show that students can identify, define and explain aspects of science that are written explicitly in SSI news but have difficulty with those that are related but not written in SSI. As a result, students have difficulty explaining SSI, taking ap-propriate decisions and actions. Guided ideation strategies can help students connect with SSI science but require a process to construct their knowledge.

Keywords: Socio-scientific Issues, Media Social, Framework PISA 2025, Science Ideas, College Student.

1 Introduction

Technological advances in the field of information and communication have made it easier for everyone to receive and disseminate information, such as through social media or digital media. Around 50% of Indonesians use social media and spend 79% of their time on social media [1]. Around 85% of people in the world get information from Google and 2/3 of them get information from YouTube [2]. The ease of receiving and disseminating information has the potential to cause very rapid changes in various dimensions of life, including education, especially science learning. This is what then prompted Program for International Student Assessment (PISA) to transform the PISA 2025 framework. Scientific literacy assessment is not enough just to explain scientific phenomena or issues scientifically but requires follow-up through decision making and appropriate action. The draft PISA 2025 framework is actually not new because since

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2000 the ability to make decisions to overcome problems in scientific literacy has been conceptualized [3].

The ease of obtaining information is basically very useful in science learning, but the ease of obtaining this information must be accompanied by the speed of verifying the correctness of the information received, which has often been neglected. Social media users generally have great trust in information obtained through social media platforms or digital media [2]. This condition has the potential to cause misleading (misleading information), uncertainty and misconceptions in learning [4, 5].

In science education, information received from various information sources, such as textbooks, both printed and digital, can be in the form of facts, concepts, principles and theories. On the other hand, information that is widely spread in society that is still unclear (controversial) or can still be debated is categorized as scientific issues or often called socio-scientific issues (SSI). Even though it is still an issue, socio-scientific issues are considered productive information that can trigger the development of critical thinking skills and scientific argumentation [6, 7]. The ability to argue based on critical thinking skills is very much needed in science learning, especially to explain scientific phenomena and issues so that it can prevent students from misleading and misconceptions [5, 8].

Two main factors could potentially cause someone to be unable or have difficulty verifying SSI received or shared via social media platforms. First, information literacy and SSI characteristics [9]. Information literacy determines the ability to understand and explain information. Information literacy containing science is determined by scientific literacy which will determine the ability to explain SSI. Second, the characteristics of SSI which are distributed on various social or digital media platforms. SSI is generally presented macroscopically in a language that is easily understood by all levels of society. As a result, even though SSI contains science, science is not written explicitly but implicitly determines someone's ability to explain the information in SSI [9]. Science basically has a strategic role to explain phenomena including issues developing in society, as has been widely formulated in the PISA 2018 frame-work and previously. With this framework, the ability to master science is often considered sufficient to simply measure cognitive capacity through scientific problems presented in the classroom or laboratory, but does not use the context in social life which is the main domain of scientific literacy in the 2018 frame-work and the previous PISA framework. In the 2025 framework, PISA begins to accommodate the ability to make decisions and take appropriate action to handle or solve problems.

Low scientific literacy will cause someone to experience difficulty in using their knowledge or the science they have mastered to explain related phenomena or issues. Judging from Bybee's scientific literacy category, someone who lacks scientific vocabulary or only memorizes the meaning or definition of terms in-volved in a phenomenon or issue can be categorized as having low scientific literacy on that issue or phenomenon [10]. On the other hand, content-based science learning as presented in textbooks or in conventional learning is not easy to use in social life or contexts because of the difficulty of transforming science from textbooks to phenomena or issues [11]. The results of our previous study found that students could explain science concepts in textbooks but could not use them to explain related SSIs. You can imagine what it would be like if some-one had difficulty understanding concepts, principles or theories. Some-one who can explain phenomena or issues, take appropriate decisions and actions is basically able to master the science related to these phenomena or issues. Judging from Bloom's taxonomy, at levels C2 and C3 there are no problems experienced in learning. With abilities at cognitive levels C2 and C3, science in SSI can be explored, both explicitly and unwritten (implicit).

Judging from the SSI-based science learning framework [7, 12, 13], to over-come difficulties in explaining SSI a connection is needed with science ideas from SSI. Connection with SSI science is the main door to developing thinking skills in the SSI context, including developing new ideas to overcome problems. To help students understand science ideas of SSI, scaffolding strategies are need-ed. In this study, we used the IDEA (identify, define and describe, explain, and apply) strategy to explore SSI science which consists of the ability to identify, define and explain SSI science and use the identified, described and explained science to explain SSI (idea) in learning biochemistry [9, 14]. Issues explored include health, nutrition and exercise issues. Four questions are the focus of this study, namely: 1) how are students' ability to identify SSI science accessed from social or digital media? 2) How are students' abilities to define and describe SSI science in social media? 3) What is the student's ability to explain SSI science on social media? and how are students' ability to use science to explain SSI, take decisions and take action to overcome problems or anticipate further impacts according to the information accessed from social media?

2 Method

This study uses a type of survey design which aimed to describe students' abili-ties in identifying, defining and describing, and explaining SSI, as well as the ability to use science to explain SSI in biochemistry learning. To describe stu-dents' ability to explore SSI science in social media, the IDEA strategy (identify, define, explain, and apply) [9] was used in this study. A total of 70 prospective science education teacher students who were taking a biochemistry course were involved in the survey. The instrument used in collecting data was a worksheet which was equipped with a rubric on aspects of SSI exploration abilities, including the ability to identify, define and describe, explain aspects of SSI science and use science to explain SSI, take decisions and take appropriate actions to over-come problems or anticipate adverse impacts based on illustrations of phenomena or issues. The collected data is then analyzed descriptively using percentage analysis based on categories developed by Hake [15], namely: low (if less than 30% of science aspects are explored), medium (if 30-70% of SSI science is explored), and high (if more than 70% of SSI science is explored).

3 Result and Discussion

The results of this study consist of 4 parts, namely: 1) the ability to identify science terms of SSI, 2) the ability to define or describe science terms of SSI, 3) the ability to explain science terms of SSI, and 4) the ability to use science to ex-plain, make a decision and action (Figure 1).

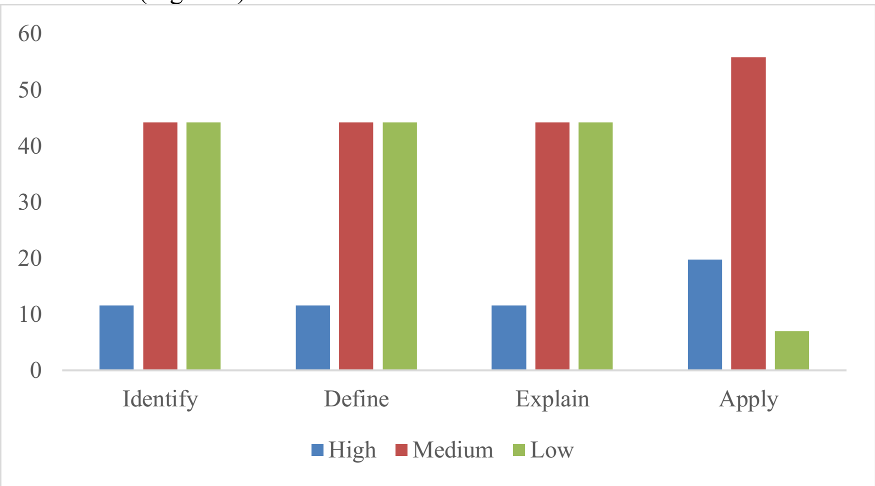

Fig. 1. Percentage of students in IDEA strategy

Figure 1 shows that students who practice identifying, defining, and explaining scientific ideas of socio-scientific issues can apply their scientific knowledge to explain socio-scientific issues up to a medium level. If practice is continued, students' ability to explain SSI can be improved.

Table 1. Percentage of students based on ability category to identify aspects of science

Category	Explicit written science aspects in SSI text (%)	Implicit aspects of science are not written in SSI text	Ability to identify science aspects of SSI (%)
High	48 (55,81%)	1 (1,16%)	11,63
Medium	32 (37,21)	9 (10,46%)	44,19
Low	6 (6,98%)	76 (88,37%)	44,21

Table 1 shows that students only identify aspects of science that are written explicitly in the SSI but still have difficulty identifying aspects of science that are not written in the SSI (implicit). Under these conditions, students' ability to identify SSI science is still relatively low to moderate.

3.1 Ability to Define and Describe SSI Science

Table 2. Percentage of students based on ability category to define aspects of science

Category	Explicit written science aspects in SSI text (%)	Implicit aspects of science are not written in SSI text	Ability to define science aspects of SSI (%)
High	48 (55,81%)	1 (1,16%)	11,63
Medium	32 (37,21)	9 (10,46%)	44,19
Low	6 (6,98%)	76 (88,37%)	44,21

Table 2 shows that the percentage of students who can define and describe the aspects of science they have identified. However, because what has been identified is still limited, the ability to define is still dominated by those written in the SSI.

3.2 Ability to Explain SSI Science

Table 3. Percentage of students based on ability category to explain aspects of science

Category	Explicit written science aspects in SSI text (%)	Implicit aspects of science are not written in SSI text	Ability to explain science aspects of SSI (%)
High	24 (27,91%)	1 (1,16%)	11,63
Medium	48 (55,81%)	9 (10,46%)	44,19
Low	14 (16,28%)	76 (88,37%)	44,21

Table 3 shows that students still have difficulty explaining aspects of SSI, especially the relationship between aspects of science involved in SSI.

3.3 Ability to Explain SSI, Make Decisions and Action

Table 4. Percentage of students based on ability category to apply aspects of science to explain SSI

Category	Macroscopic	Microscopic	Science literacy category
High	32 (37,21%)	17 (19,77%)	Multidimensional or conceptual
Medium	68 (79,07%)	48 (55,81%)	Conceptual or Functional
Low	1 (1,16)	6 (6,985)	Functional or nominal

Table 4 shows that students' difficulty in explaining SSI is still relatively moderate and is limited to aspects of science that are written explicitly. Conditions result in difficulties in making decisions to identify and overcome problems. All students are still limited to efforts to explain SSI and have not yet reached the stage of making decisions to overcome problems or anticipate the impacts caused by problems contained in SSI (see Figure 2).

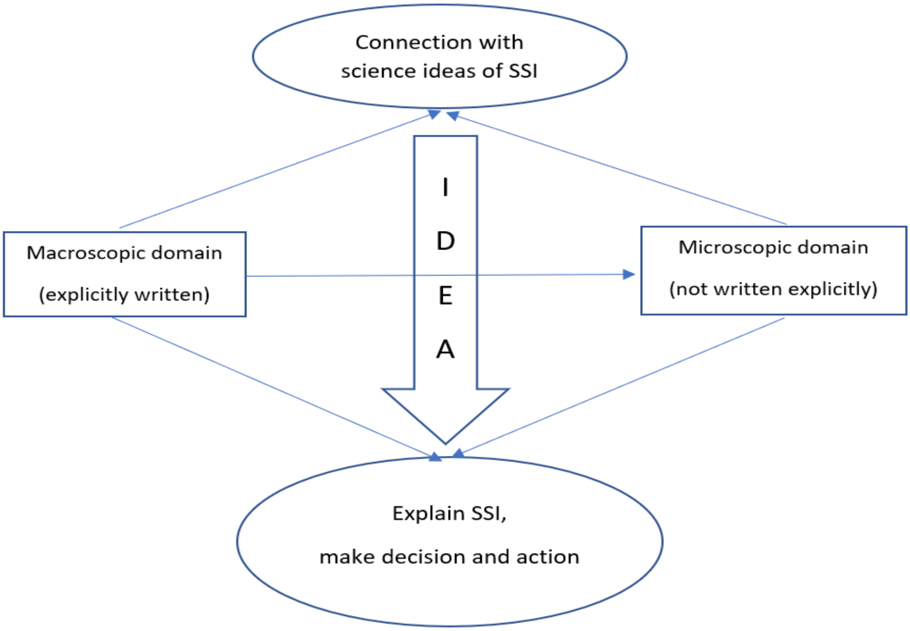

Fig. 2. The relationship between the ability to connect with science ideas and the ability to explain SSI, make decisions and act appropriately.

The survey results show that it is easier for students to identify aspects of science that are written explicitly in SSI news than other aspects of science that are related but not written in SSI news (implicit). Aspects of science that are written explicitly are generally presented in very limited quantities and in popular or general terms, such as: carbohydrates, fats, proteins, energy, and so on. Terms that are not written but are related are generally still difficult to identify, such as metabolic processes that produce the required energy. Difficulty identifying aspects of SSI science has an impact on subsequent learning activities, such as de-fining and describing and explaining aspects of SSI science.

In order to explain SSI, 2 factors are needed, namely students are connected to the scientific aspects of SSI [9, 12]. Connection with SSI will occur if students have sufficient prior knowledge in the SSI context. Therefore, the connection with the SSI context also determines the connection with the SSI. Connection to the SSI context represents information literacy about the phenomenon or SSI including science literacy [25]. Prior knowledge of science is necessary to identify aspects of science that are written explicitly. If students understand aspects of science that are written explicitly, students will easily connect with aspects of science that are not written but are related to SSI [16]. To connect aspects of science that are written macroscopically with aspects of science that are not written (microscopic) can be done using a mind mapping strategy. Mind mapping is easy to create if SSI science content is well understood and you are able to think abstractly [17].

The controversial SSI is widely used in science learning, especially to im-prove critical thinking skills and scientific argumentation [6]. This will happen if there is a connection with SSI science. Using guided ideation strategies can in-crease students' ability to connect with SSI science [9]. In this condition, of course, students still have difficulty using their knowledge to explain SSI (Figure 1). Cognitively, students are still trying to succeed at the understanding (C2) and application (C3) levels, but it is still difficult to rise to the C4 level to analyze SSI phenomena based on their critical thinking skills or high order thinking skills [27, 28, 30]. Thus, further processes are still needed, especially if students are expected to be able to take appropriate decisions and actions in overcoming problems and anticipating the impacts they cause as expected in the PISA 2025 framework [2].

The difficulty in explaining SSI can be seen from two factors, namely 3 stu-dent factors, the science material involved, and the SSI being explored. Students who still have difficulty operating their abstract thinking and scientific thinking skills tend to experience difficulties in learning science meaningfully [17–20]. As a result, scientific material can only be understood at a surface level because the learning is only surface learning or even rote learning. Students like this will have difficulty connecting science that is written explicitly in the SSI news with science that is closely related but not written in the SSI news (implicit). In terms of the scientific substance involved in the SSI being explored, it contains many abstract and complex concepts, such as phenomena that occur in cells [21]. Abstract and complex science concepts are generally difficult for students to under-stand even though they are written explicitly in SSI texts. This is demonstrated by students' explanations about SSI which are macroscopic in nature. Finally, the characteristics of SSI are generally displayed macroscopically so that it is easy for everyone to understand [26]. Difficult and complex aspects of science are generally not written about in SSI. This condition leads readers to understand SSI macroscopically [9, 22, 29]. However, if the practice of exploring science ideas is continued, the ability to explain SSI can be improved. IDEA can scaffold students connected to SSI and explain SSI [17, 23, 24].

4 Conclusion

Based on the discussion of research results, it can be concluded that students still experience difficulties in identifying, defining and explaining aspects of SSI science, especially aspects of science that are not written explicitly in SSI. These difficulties cause difficulties in explaining SSI, including in taking appropriate decisions and actions both to overcome problems and to anticipate all possible unexpected outcomes. However, the ability to explain SSI can be improved if training in identifying, defining and explaining science related to SSI is continued.

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