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Students' Communicat on Science on Profiles on ESD (Education Sustainable Development)

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Abstract— Humans found four skills in the twenty-first century, one of which is communication abilities. The purpose of this study is to gather data and analyze student communication profiles related to science communication abilities in the context of ESD (Education Sustainable Development). ESD is a critical component of education that students must understand. It is vital to be able to speak with ESD in order to comprehend ESD (Education Sustainable Development). Students with strong science communication abilities are able to argue and represent data using the ESD idea (Education Sustainable Development). a qualitative technique is used in this research. The participants in this study are students from Muhamadiyah University's FKIP IPA Study Program in Riau. This study will be evaluated using indicators of students' SCIENCE communication skills related to ESD (Education Sustainable Development), such as: 1) the ability to create graphs/tables related to ESD; 2) the ability to describe tables/pictures/diagrams in the form of verbal information related to ESD; 3) the ability to interpret related to ESD; and 4) the ability to draw conclusions related to ESD. The results of the scientific communication skills exam were studied descriptively and classified into three categories: 1) able to answer entirely and with logical explanations; 2) able to answer partially (without a logical explanation); and 3) no answer and no logical explanation. The findings revealed that science communication skills remained in the bad group, with science communication skills in each metric falling below 53%.

Keywords— Communication Profiles, ESD

I. INTRODUCTION

Education is considered as a cross-generational activity that focuses on cultural behavior. This means that educational activities involve both older and younger generations in order to inspire young people to become educated citizens

(Anggraini,2017). Education is critical to a country's human resource development (Fauzi and Hamdu, 2021). In order for Indonesia to achieve sustainable growth in the future, education must be able to play a beneficial role (Lathifah and Hidayat, 2022). As a result, it is critical to reconstruct and reformulate the educational design in order to promote the development of the Indonesian nation's golden generation. The character of the golden generation is defined by religious attitudes, honesty, tolerance for diversity, discipline, hard work, creativity, independence, democracy, curiosity, spirit of nationalism, love for the homeland, communicative achievement, love of peace, love of reading, caring for the environment, social care, and responsibility, according to the Ministry of Education and Culture (Agus, 2016).

The goal of the learning process in a student's class is to memorize information, one of which is communication. In the twenty-first century, communication is one of the most fundamental cornerstones of education (Pratiwi et al, 2022). Communication, cooperation, critical thinking, and creativity are all necessary abilities for 21st-century learning (Rahmadyah, 2020). As a result, as we move into an era of continuous communication and information based on a network system, information circulation becomes increasingly complex (Supratman, 2020). As a result, science communication is a crucial component of science learning.

Every student must have communication abilities, which are a type of science process ability. According to them (Hodiyanto, 2017). Aside from that, science communication abilities are a predictor of academic performance. Students will be able to readily express their thoughts vocally or in writing with these science communication skills (Gaffar, 2017). Students studying Biology must master science communication skills, because having good science communication skills allows one to express ideas, opinions, and information obtained through scientific activities in an appropriate manner, and the information can be well received by listeners or readers. Science communication skills include not only oral and written communication, but also the process of conveying information from the results of experiments or observations in a way that many people can understand. The functions of science communication include: 1) assisting in the communication of observation results, 2) conveying assistance in observation activities, teaching, and compiling results, and 3) conveying feelings (Fadly, 2017).

Students' science communication abilities include the ability to create tables, drawings, graphs, charts, essays, and reports based on observations or studies, as well as the ability to communicate an idea orally or in writing (Raharjo, 2022). One of the indicators in science communication is where students explain the outcomes of actions related to an issue or event and convey information about the observed problem (Lafiani, 2022). According to the above description of science communication skills, science communication skills are highly beneficial in forming concepts and communicating with scientific to the public for broad comprehension so that the community is engaged in scientific activities such as ESD commitment (Education For Sustainable Development).

ESD specialized institutions and support networks are desperately needed. In the National Eye (2010-2014), the 2013 curriculum displays a commitment to ESD (Education For Sustainable Development). The major purpose of this ESD program is to help each learner develop the values, attitudes, and abilities that will enable them to make a lifelong commitment to sustainable change and to make their own lives more sustainable (Pometun & Mehlmann, 2013). ESD offers a concept of quality education that emphasizes lifelong learning and the development of learners' skills, beliefs, and competences to help them become change agents, rather than focusing solely on quantitative learning outcomes and national standards (Didam and Manu, 2020).

ESD provides students with the knowledge and skills they need to address a variety of environmental, social, and economic issues (Schopp, Bornemann & Potthast, 2020; Bell, 2016). Furthermore, it can provide students with the knowledge, skills, and characteristics needed to work and live while also protecting the environment, social, and economic systems (Kopnina, 2015). ESD is also regarded as a fundamental solution to the problem of global climate change (Ponzelar, 2020). Meanwhile, the next trend in sustainable development is initiative-based thinking, with students and other stakeholders acting as mobilizers (Araneo, 2019). 1) Environmental education, 2) global education/education for global responsibility, 3) civic education/political education, 4) education against violence and racism, and 5) health education are all examples of ESD (Education For Sustainable Development) (Segera, 2015). Not only that, but ESD also encompasses the development of attitudes, views, and values that steer humans toward living a sustainable existence by focusing on the future generation (Supriatna, 2018). It is vital to transform the community's values, conduct, and beliefs in order to make a more sustainable transition to society. Where a community's well-being is threatened by environmental, social, and economic difficulties. To overcome obstacles, one must think and act sustainably (Álvarez Etxeberria et al., 2017).

ESD (Education for Sustainable Development) examines issues from three perspectives: environmental, social, and economic (Indrati and Hariadi, 2016).

This pillar is unquestionably linked to global challenges, as well as the long-term viability of human life next. In terms of conceptualization, the example of Education Sustainable Development (ESD) purposefully incorporates one generation employing another generation, encompassing economic, social, cultural, and ecological sustainability (Anggraini,2017). ESD learning entails transformative learning that develops knowledge, skills, attitudes, and theories connected to sustainable development, as well as learning to ask critical reflective questions, clarify values, and envision a more sustainable future (National et al, 2019).

ESD (Education for Sustainable Development) provides learners with the knowledge, skills, values, and attitudes they need to analyze information, make decisions, and take actions that benefit the environment, the economy, and future generations (Sartika Ami, Hidayah & Mucharommah, 2021). Next, according to (ABD. SYAKUR, 2017), ESD (Education For Sustainable Development) has the capacity to bridge a gap between business and school courses, as well as between school classes and the community. As a result of this intimate association, it is believed that the environment, which is a place where humans dwell, would be preserved and able to sustain human needs in the future. Furthermore, it is intended that by applying science to everyday life in relation to environmental challenges, the learning experience in schools will be more relevant, leading pupils to think forward and be aware of sustainable ideals (sustainability awareness).

II. Methods

This research takes a qualitative approach. Students from the Muhamadiyah University of Riau's FKIP Science Study Program made up the sample. To obtain data, a questionnaire was used, with four indicators to be measured: 1) the ability to generate ESD-related graphs/tables; 2) the ability to communicate ESD-related tables/drawings/diagrams in the form of spoken information; 3) the ability to interpret connected to ESD; and 4) the ability to draw ESD-related conclusions. There are three types of science communication: 1) being able to provide a comprehensive and logical response; 2) providing a partial response; and 3) providing no response and no logical explanation. A data analysis strategy that must be performed is scoring the responses of the respondents. The information was then tabulated to make it more compact, understandable, and visible.

III. Results and Discussion

Table I

Science Communication Categories	**Indicator of science communication**			
	The ability to generate ESD-related graphs/tables	***The ability to communicate ESD-related tables/drawings/diagrams in the form of spoken information***	***The ability to interpret connected to ESD***	***The ability to draw ESD-related conclusions***
1) being able to provide a comprehensive and logical response	44%	30%	20%	65%
2) providing a partial response	49%	40%	70%	30%
3) providing no response and no logical explanation	7%	30%	10%	5%
Amount	100%	100%	100%	100%

The scientific communication abilities of students investigated in this study are: 1) the ability to generate ESD-related graphs/tables; 2) the ability to communicate ESD-related tables/drawings/diagrams in the form of spoken information; 3) the ability to interpret connected to ESD; and 4) the ability to draw ESD-related conclusions.

3.1. The Ability to Generate ESD-related Graphs/Tables

In general, students' ability to create research-based tables and graphs shows promising results. In the entire answering category, as many as 44% of pupils can answer problems with logical reasons. Meanwhile, up to 49% of students can answer but are missing information, implying that 93% of students can generate tables/graphs in general. This fact might be interpreted as follows: the greater the pupils' degree of thinking, the higher their level of logical reasoning, the better. This is corroborated by the findings of Didem Kilic, Nazan Sezen, and Meltem Sari's (2012) study, which discovered facts about students' ability to read graphs from the first to the fourth year, despite the fact that statistically, the average ability to read graphs is still very low.

3.2. The Ability to Communicate ESD-related Tables/Drawing/Diagrams in Form of Spoken Information

Students' ability to describe tables, drawings, and diagrams in the form of verbal information is 30% in the category of complete replies with logical explanations in the form of verbal information. This can be explained by the fact that there is a link between self-efficacy and communication skills, with self-efficacy correlating favorably with students' communication skills, according to Mehpare and Hikmet (2010). This can be explained by pupils' lack of boldness in putting the information they've gathered into good words. Students only provide process information for each part of the table/graph and do not explain the urgency part; additionally, their lack of experience in turning data into information that is interesting and understandable to readers is still evident in the fact that they are unable to explain it freely. Meanwhile, as many as 40% of those in the category answered but left out crucial information, implying that 70% of people can describe tables, images, and diagrams verbally.

3.3. The Ability to Interpret Connected to ESD

Students' capacity to interpret is still severely deficient, with as many as 20% of students falling into the category of providing entire answers in the form of logical explanations. This occurs due to a variety of difficulties students face, including a lack of accuracy in translating question commands, an inability to classify data in tables and convert it into useful information in the form of graphs, and a continuing limitation in providing information that does not address the urgency of the data presented. This occurs due to a variety of difficulties students face, including a lack of accuracy in translating question commands, an inability to classify data in tables and convert it into useful information in the form of graphs, and a continuing limitation in providing information that does not address the urgency of the data presented. However, 70% of students in this category can answer but only partially, indicating that up to 90% of students can interpret.

3.4. The Ability to Draw ESD-related Conclusions

In general, students' ability to draw conclusions from data provided in a table or graph shows promising outcomes, with up to 65 percent of students in the complete answer category providing logical answers. This is a fascinating fact since, contrary to the findings of Didem Kilic et al. (2012), who showed that science class students in Turkey are still deficient in reading graphs, the capacity to represent data and explain phenomena is highly prevalent in scientific class students in Turkey. Difficulties detecting the value of functions and calculating intervals in the form of graphs, as well as determining the axis on the graph, are common problems in reading graphs and extracting information from graphs / tables. This ability to draw conclusions is strongly linked to a comprehension of the problem's context as revealed by the question's discourse. Students can comprehend the problem in this study so that they can readily determine the conclusion from the form of data representation in the graph, where a conclusion is usually the answer to the problem based on the data shown in the graph / table.

Some research findings highlight important facts about the components of scientific communication in the realm of education. Students' performance modeling in science is currently limited to the stages of observing phenomena and distinguishing important factors that affect problems, so modeling, which was previously only part of training activities, is urgently needed to be incorporated into the curriculum into modeling courses (Belma T, Yasemin S, & Aysun U, 2010). Students' ability to understand graphs is still lacking, so schooling that focuses on model representation and interpretation of science and mathematical processes is required (Didem K, Nazan S, & Meltem SU., 2012). Students still encounter challenges in developing science communication abilities, such as graphic, drawing, and chart skills, in the field. Students who can understand graphs are nonetheless unable to deliver the same information in a different graphic format (Meltem SU., Nazan S., Ali B., 2012). It may be concluded from this that students understand the notion of science process skills, but it has not been integrated in their performance.

Changes in student self-efficacy have been found to be positively connected with changes in communication abilities. This indicates that as one's communication abilities improve, so does one's professional attitude (Hulya Y, 2010). In general, students have acknowledged the value of communication skills in obtaining academic achievement. It is also recognized that preserving the status quo and refusing to take steps to communicate will obstruct the communication process.

There have been research that have attempted to improve scientific communication abilities through the use of Argument Driven Inquiry (ADI), which supports the ability to argue (Tuba D &Sedat u., 2012). Practitioners of scientific communication have also discovered the stages of approach (Didem L., Nazan S., & Meltem SU., 2012). But the most essential thing is to figure out how to establish a positive learning environment in which each component of scientific communication abilities can flourish. As a result, it is vital to develop a scientific communication model for students who are able to develop both verbal and nonverbal science communication skills in order to overcome hurdles and achieve the learning objectives of science process skills.

Science as a product refers to a body of knowledge that comprises facts, concepts, theories, and scientific principles, whereas science as a process refers to the skills and attitudes that scientists use to acquire and develop science products. These are process skills in science. Students can find information, build concepts, hypotheses, and scientific attitudes while learning science / biology by building process skills, which can have a good impact on educational processes and products.

Process skills, according to Rustaman (2005), include cognitive, intellectual, manual, and social abilities. Because process skills need the student to utilize his thinking, cognitive skills are involved. Because they include the use of tools and materials, measurement, drafting, or tool assembly, manual skills are obviously included in process skills. Because individuals interact with others in carrying out teaching and learning activities, such as discussing the outcomes of observations, social skills are also included in process skills. Hands-on experiences as learning experiences are required to acquire process skills. A person can live up to the process or activity that is being carried out through direct experience. The inquiry process, or the thought process that occurs when a person engages in activities such as 1) observing, 2) predicting, 3) suggesting, 4) planning research, 5) formulating hypotheses, 6) interpreting data, 7) controlling variables, 8) conducting experiments, and 9) communicating, is closely related to the learning process of FKIP Science Study Program students. The following qualities reveal the existence of the inquiry process in learning: 1) the learning objective is to solve specific issues contained in an object in order to develop generalizations about the object, 2) the learning objective is to solve specific difficulties contained in an object in order to make generalizations about the object; 3) lecturers operate as data controllers, material objects, and classroom leaders; 4) students engage with data, material, and objects to discover patterns of relationships based on their own and others' observations; 5) Classrooms are used as laboratories; 6) generalizations, which are commonly made by students; and 7) Lecturers invite students to share the generalizations they have made. Science process skills are gained through research-based learning. Students gain indirect experience of science process skills, which are fundamentally inquiry activities, through activities carried out in class and in the laboratory. Finally, students who forgive must build science process skills in order to realize their science communication abilities.

IV. Conclusion

According to the findings of the data analysis, students' science communication skills are still insufficient. There are three indications of science communication skills where the percentage of comprehensive and logical replies is still less than 53%. As a result, it is necessary to carry out the program created in the form of learning activities that stress mastery of these two talents. The first stage is to map out any skills that aren't quite there yet. It also identifies the program objectives that are important to the competency map that has to be curated. The required program, as well as its monitoring and evaluation methods, are then prepared.

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