

Science Process Skills: Exploring Students' Interpretation Skills Through Communication Skills

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ABSTRACT

Students must be taught science process skills as a prerequisite for studying the scientific process characteristic of biology. In conveying the practicum outcomes, students employ clear and detailed interpretation and communication skills. This research aims to determine the relationship between communication skills and the development of interpretation skills of the eleventh-grade students of senior high school. The descriptive correlation research method employs test instruments and interviews to collect data. The samples of 54 students were determined using the cluster random sampling technique. The linear regression test was used to analyze the data. According to the findings, communication skills contribute 36% to developing interpretation skills. This study demonstrates that there is a strong relationship between communication skills and interpretation skills.

Keterampilan Proses Sains : Eksplorasi Keterampilan Interpretasi Siswa melalui Keterampilan Berkomunikasi

ABSTRAK: Keterampilan proses sains perlu dilatihkan kepada siswa sebagai bekal dalam mempelajari proses ilmiah yang menjadi karakteristik Biologi. Dalam menyampaikan hasil praktikum, siswa menggunakan kemampuan interpretasi dan komunikasi secara jelas dan detail. Penelitian ini bermaksud mempersepsikan hubungan antara keterampilan komunikasi dan pembentukan keterampilan interpretasi siswa SMA kelas XI IPA. Metode penelitian korelasi deskriptif memanfaatkan instrumen tes dan wawancara untuk pengambilan data. Teknik cluster random sampling digunakan untuk penentuan jumlah sampel sebanyak 54 siswa. Data dianalisis dengan uji regresi linier. Berdasarkan hasil yang ditemukan, ada kontribusi keterampilan komunikasi terhadap pembentukan keterampilan interpretasi sebesar 36%. Penelitian ini membuktikan bahwa hubungan antara keterampilan komunikasi dan keterampilan interpretasi berada dalam kategori yang kuat.

INTRODUCTION

Science learning is defined as learning that focuses on direct experience to increase students' understanding of science

(Wulandari et al., 2022). Understanding science is essential, and students are expected to comprehend the nature of science to actualize it. Students' science process skills can be trained by

comprehending the nature of science (Mutlu, 2020). Science process skills are critical for students to develop science by applying the scientific method to get new knowledge (Antrakusuma et al., 2017). As a result, the construction of science process skills is a key element in science education (Durmaz & Mutlu, 2016). Students can gain a comprehension of the subject and their scientific skills if science education is of high quality (Keiler, 2018). According to the PISA survey by OECD (2019), Indonesian students' scientific skills placed 71st out of 79 countries. Finally, initiatives to improve students thinking and science skills are critical.

Science process skills are specialized skills for acquiring science through developing a sense of responsibility, increased debriefing in learning, and scientific thinking (Karamustafaoğlu, 2011). This skill involves cognitive, physical, social, thinking, scientific behavior, and successful creation to reach goals during scientific activity (Rustaman, 2005; Prayitno et al., 2017; Suswati, 2018). Students' science process skills remain relatively low, owing to less practice throughout learning (Aiello, 1984; Irwanto et al., 2017). Because they are essential skills that students and teachers must possess (Narut et al., 2017), it significantly impacts how well students learn the subject (Fatimah, 2018). Science process skills are separated into two categories: basic and integrated. Basic skills include observing, communication, classification, measurement, inference, and prediction. Integrated skills include identifying variables, compiling data tables, creating graphs, characterizing relationships between variables operationally, designing investigations, and conducting tests (Rezba, 2007; Mutlu, 2020).

Communication skills are described as the ability to exchange information with people both orally and in writing (Ikhsan, 2011; Fadli & Irwanto, 2020). Communication is essential to teaching and learning (Arifin et al., 2016). Because communication is a means of sharing ideas,

ideas become objects of contemplation, refinement, discussion, and change. Students learn to be clear and convincing when challenged to think about biology and convey their thoughts to others both orally and in writing. Listening to other people's explanations allows students to develop their understanding. According to Haka et al., (2022), communication abilities in students can generate an active learning environment.

Meanwhile, interpretation ability is the ability to identify patterns in observations, check patterns that do not match the facts, and draw conclusions based on existing facts (Harlen, 2006; Murni et al., 2017). Understanding and providing meaning to data or information is intimately related to data interpretation (Utami, 2013; Murni et al., 2017).

Communication and interpretation skills must be cultivated during the schooling process. According to preliminary research on practicum reports, students have difficulties reading graphed data. Communication and interpretation skills are lacking compared to other skills Juhji (2016). Most research on science process skills (KPS) focuses on the capacity of each sign, leaving out the realm of interrelationships between KPS indicators. As a result, a study is needed to establish the role of communication skills in developing interpretation skills to help students grasp science learning, particularly in biology courses.

METHOD

In this research, the descriptive correlation approach was used. The sample was selected using cluster random sampling of 54 students. The research instrument featured 28 multiple-choice questions on biology topics compared to communication and interpretation skills indicators. In addition to tests, interviews were employed in this research to enhance and strengthen data on students' understanding of the two skills under study.

The research was conducted by gathering data on communication and

interpretation skills in science process skills. Changes in presentation form, consistently creating and submitting reports, describing the outcomes of tests and observations, and reading graphs, tables, and diagrams indicate communication skills. Meanwhile, there are indicators in the interpretation skills, such as detecting patterns in a data sequence and drawing conclusions (Astuti, Yuni; Suciati, 2017; Ikhsan, 2020; Sholikah et al., 2020). Researchers prepared and evaluated test questions before testing them, evaluating, editing, combining test instruments, and performing tests. The instrument was tested on eleventh-grade senior high school students majoring in science to determine its validity, reliability, level of difficulty, discriminating index, and item tracer index.

Data was collected online utilizing the Google Form platform. Data were collected using a test instrument consisting of 28 multiple-choice questions structured in the indicators proposed by Rustaman (2005), namely communication and interpretation skills. Microsoft Excel 2010 was used to analyze the data using the Pearson product-moment correlation with the regression test procedure Kusdiwelirawan (2014). Table 1 categorizes the outcomes of the two indicators' assessments.

Table 1. Scoring Scale

Skill	Value	Weight	Description
Mastery			
86 - 100	A	4	Excellent
76 - 85	B	3	High
60 - 75	C	2	Moderate
55 - 59	D	1	Low
≤ 54	E	0	Poor

RESULTS AND DISCUSSION

The research findings on science process skills on indices of communication and interpretation skills fall into the moderate category. Communication skills received a maximum score of 100 (n: 23), a minimum score of 14.29, and an average score of 67. Students struggle to communicate information through graphs, tables, and diagrams. Meanwhile, the highest score for

interpretation skills was 100, while the lowest score was 37.71, with a score of 62 on average. Some students have struggled to comprehend how to evaluate data.

Table 2. The Results of Communication and Interpretation Skills Score Processing

Indicator	Score			Category
	Hig	Low	Average	
Communi-cation	100	14,29	67	Moderate
Interpre-tation	100	37,71	62	

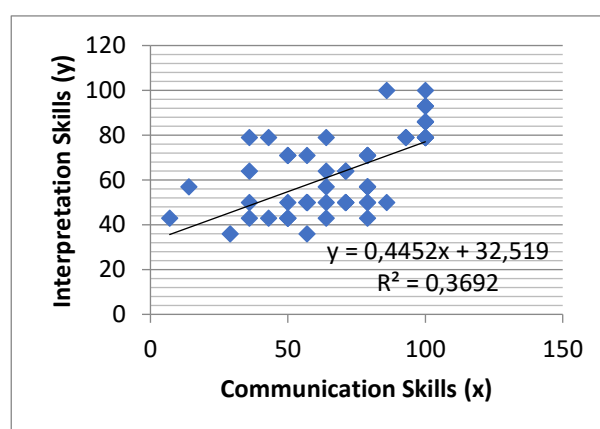


Figure 1. Regression Linearity Coefficient

Based on Figure 1, the α value obtained is 32.51, and the b value is 0.44. The $y = a + bx$ can determine the regression equation, $y = 32.51 + 0.44x$. Therefore, the data is linear. The regression equation shows that one increase in the value of communication skills will increase the value of interpretation skills by 0.44. Linearity testing aims to see if the two variables have a significant relationship. The analysis found that the F_{observed} value is 1.96, and the F_{critical} value is 4.84. Therefore, F_{observed} is lower than F_{critical} ($(1.96) < (4.84)$).

Hypothesis testing aims to see whether the hypothesis is accepted or rejected. The R_{observed} value obtained is 0.6. Furthermore, the R_{critical} value with a significance level α (1% or 0.01) shows a value of 0.34. So, R_{observed} (0.6) is greater than R_{critical} (0.34). Therefore, H_a is accepted, and H_o is rejected. The calculation results show a significant relationship between communication and interpretation skills, with a strong

relationship between the two. The value of r is a symbol of the correlation value coefficient α . The r square value (coefficient of determination) obtained is 0.36. Thus, it can be concluded that variable x (communication skills) has a contribution effect of 36% on variable y (interpretation skills). Meanwhile, 64% is influenced by other factors (Dewi 2020 ; Akbar, 2022).

The data analysis yielded an average of 67 for communication skills, indicating a moderate category (Purwanto, 2018). Items about communication skills supplied data in graphs, tables, and diagrams that students could understand, indicating that students could digest knowledge from practicum data. According to Dewi et al., (2020), students must present the outcomes of their observations in practicum reports in a structured manner (Likita, 2020;Rustaman, 2005). So that when students write practicum reports, they can examine graphs, tables, or diagrams of practicum data that explain the practicum outcomes. Matsna et al., (2023) claim that practicum plays a key role in embracing science learning so that it is not solely through reading, writing, or listening activities. Rahayu (2020) supports the finding that students' communication skills can be strengthened through practicum activities that allow them to experience or conduct their observations and judgments.

The interview results suggest that students are still puzzled when answering questions with graphs or diagrams due to a lack of student insight in properly comprehending and reading charts. According to Pamer & Signer (2005), in Kurnia & Suryowati (2014), students frequently easily describe diagrams, tables, or graphs but perform poorly in expressing the information contained in the chart. According to Rusyady & Ambarwati (2022), students can practice inferring from the evidence to properly understand their research results.

According to the observations, students struggle to write a good practicum activity report. This is because students are only

assigned the task of creating practicum reports by following the teacher-provided practicum guidelines. Still, the teacher does not assist students in making good and correct reports by making the internet a reference for students in making these reports where practicum reports on the internet have not been proven correct. This finding is strengthened by Ratulangi et al., (2020), who found that the aspect that causes student challenges is that the teacher does not direct students to discover and build their knowledge. Narut et al., (2017) stated that professors should be able to communicate how to generate good reports so that students are trained to modify the shape of a presentation and train students to make empirical data from practicum outcomes using tables, graphs, or diagrams. Fadli & Irwanto (2020) believe students' communication abilities influence student-teacher relations (Safahi et al., 2019).

Meanwhile, the interpretation skills had an average score of 67, which was evaluated as moderate, as proposed by Purwanto (2018). This finding demonstrates that students can interpret data to form conclusions by explaining the observed outcomes based on their knowledge.

The findings revealed that the teacher did not provide direct direction regarding data interpretation; therefore, some students were still perplexed in interpreting the data in the question items that had been provided. Murni et al., (2017) state that high school students could not use observation data to make acceptable conclusions since they had not been trained in translating data into a logical explanation.

Students are frequently used to practicum activities while learning activities take place. As a result, fieldwork, such as practicum activities, can help students strengthen their skills (Peasland et al., 2019). Syara et al., (2020) agree that these activities will stimulate students to learn and boost understanding. They are instructed in these practicum activities to interpret various data displayed to identify trends. Data

interpretation is the process of categorizing and interpreting data derived from information acquired about an object or event that depicts a specific situation by making inferences and identifying clear relationship patterns (Sheeba, 2013; Hamadi et al., 2018). Putri & Muhartati (2019) found that understanding the patterns supplied to the teacher makes it easier to comprehend the data. Students can create patterns such as graphs, tables, and diagrams to draw inferences. Exploring data through tables, graphs, and other charts is critical in data interpretation (Rustaman, 2005).

Following the description above, it was discovered that there was a relationship between communication skills and the formation of interpretation skills in eleventh-grade science students, as determined by the findings of the product-moment correlation analysis. The contribution value in both variables is 36% with an r^2 value of 0.36, while other factors influence 64%.

Based on the analysis findings, a positive correlation exists between communication and interpretation skills in eleventh-grade science major students. This finding indicates that the greater the ability to communicate, the greater the ability to interpret. If communication skills are poor, interpretation skills will be poor as well. As a result, communication skills play a significant role in developing the ability to evaluate data, particularly the results of practicum activities.

CONCLUSIONS AND SUGGESTIONS

Based on the findings, it is possible to conclude that the science process skills, particularly communication and interpretation indicators, are rated as strong. The data analysis shows a positive correlation between communication skills and the development of interpretation skills, with a 36% contribution, while other factors influence the remaining 64%. Communication skills have a significant influence on students' interpretation ability.

By considering these suggestions, educators and curriculum developers can create a conducive learning environment that empowers students to excel in both communication and interpretation within the realm of science process skills.

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