

Research Article

**Science Process Skills (SPS) Biology Education Students in Histology
Practicum Eye Epithelial Tissue Material**

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ABSTRACT

Background: Science process skills (SPS) can be trained to students to meet the demands of learning science based on the nature of science through practical activities. This study aims to determine whether there is an effect of science process skills on students' conceptual mastery of biology education students on histology practicum on epithelial tissue material. **Methods:** This research was conducted using a descriptive method. The sample used in this study was 40 students. Students carry out learning activities with practicum methods accompanied by assistants and practicum supervisors. Determination of research subjects with random sampling technique. The research instrument used consisted of a Science Process Skills (SPS) observation sheet covering four aspects, namely observation, classification, hypothesis, and communication, while the science process skills test scores were taken from the post-test results. The observation sheet analysis technique that will be assessed is the aspect of science process skills in the form of a checklist method. **Results:** Based on the post-test results of biology education students who participated in the histology practicum on connective tissue material, it appears that the average score achieved is a good percentage of 52.5%, meaning that the histology material conceptually can be understood well by students. **Conclusion:** the most dominant histology practicum of epithelial tissue material is classifying skills by 78% with good category, observing and communicating skills also have good criteria, respectively 68% classification and 50% for communication, while the sufficient category is 45% owned by hypothesis skills

Keywords : learning; experiment; think critically; integrated; observation

INTRODUCTION

Science is an understanding of existing knowledge and continues to carry out a continuous process to produce new knowledge (Johnson & Lawson, 1998). Science consists of two main parts namely scientific knowledge and scientific knowledge acquisition. understanding of scientific knowledge is also divided into two domains, namely the affective domain and the cognitive domain.

Science process skills are thinking skills that are used to build knowledge in solving a problem, formulating results, scientific thinking methods, and critical thinking (Bybee & DeBoer, 1993). Furthermore, science process skills are also intellectual skills that can be shared with students scientifically. Science process skills are categorized into two, namely basic process skills and integrated process skills. Basic process skills in the form of observing, inferring, measuring, communicating, classifying, predicting using space-time relationships and numbers. Integrated process skills in the form of controlling variables, operationally defining, formulating hypotheses, formulating models, interpreting data, and conducting experiments. The provision of science

education skills in Indonesia is regulated in the regulation of the Minister of National Education in brackets of the Minister of National Education Number 22 of 2006 concerning national standards of content which emphasizes that natural science discusses how to systematically find out about nature so that science does not only understand various kinds of knowledge in the form of what are facts, concepts or principles, but also a process of discovery (Nasional, 2006). Understanding science can be done in special ways, for example, observation, thinking, experimenting, and validation, which relates to the basic aspects of what science is and reflects how science is more than just knowledge. (Rustaman & Rustaman, 2003).

Science process skills are an important part of scientific understanding and can be promoted scientific literacy among students (Anderson & Butkus, 2011). Teachers must be proficient and capable of science process skills at various levels and must have the knowledge and understanding to teach science process skills. Science Process skills (SPS) plays an important role in biology learning and needs to be developed in practical activities. The importance of science process skills in the laboratory is emphasized by (Watson et al., 1995) that the laboratory skills approach provides direct experience, first experience to students, so that able to change students' perceptions of important things or materials in biology such as histology material which can be observed how each student's SPS fulfills.

This study aims to determine whether there is an influence of science process skills on students' conceptual mastery of biology education students on histology practicum on epithelial tissue material, to determine the significant increase in concept mastery of biology education students after attending histology practicum with a science process skills approach on epithelial tissue material.

This research is expected to be an alternative learning method to improve students' understanding of concepts that can be applied by students when teaching later, as an effort to improve students' science process skills in developing mastery of concepts and learning methods.

Based on several studies regarding the application of science process skills that have been carried out, the model of science process skills can be carried out with several learning models such as project-based learning and interactive computer simulations. based on project-based learning science process skills is a common practice for students to develop and improve psychomotor and affective cognitive abilities (Buyuktaskapu, 2012; Omar et al., 2014; Özer & Özkan, 2012) In this study, using interactive computer simulations, the results can significantly improve science process skills and mastery of concept processes regarding electrical circuits (Supriyatman & Sukarno, 2014). Scientific argumentation has a significant effect on science process skills. which is expected to be able to design skills experimentally (Gultepe & Kilic, 2015). while research attitudes towards science process skills are expected to have a significant relationship between students' knowledge level of science process skills and attitudes towards science (Zeidan & Jayosi, 2015). based on several studies it was observed that students who can process science skills can have a good influence on students' attitudes in learning (Aladağ, 2008; Boudria, 2002; Buyuktaskapu, 2012).

Based on previous research to look for scientific process skills in the patterns of objects observed, they look for patterns of objects observed using the five senses by classifying similarities and differences to form new concepts and communicating what they can do and what they know both verbally and verbally. writing (Rezba et al., 2003). The results are obtained into new information, then predict the possible results obtained before they are actually observed so that

science process skills are interrelated with one another. The best ways to measure science process skills are laboratory reports, oral presentations, and observations (Feyzioglu *et al.*, 2012).

Research on the practical skills needed can be developed by students in the form of scientific research reports (Kurniawan & Astalini, 2019; Mayasari *et al.*, 2015). Science process skills in students can be seen in practicum activities because practicum activities involve students in the use of laboratory equipment used in discovering new concepts, both individually and in groups, the evaluation results of the lecturers stated that the problem with students in the process of implementing the practicum of students' science process skills in the laboratory was still very low, in this situation it means that students have not been able to independently carry out practicum activities and lack the initiative in solving a practicum problem. (Kuswanto & Walusfa, 2017).

Based on the science process skills of very unskilled students, several factors influence students' initial experience before practicum, there is still little student knowledge about concepts on practicum topics, the availability of practicum tools, and practical guidance who do not understand science process skills. The quality of the process skills possessed by students is very important (Halim & Meerah, 2002). Furthermore, research on understanding the nature of scientific inquiry is not good with conceptual understanding. Students must have practical experience from lecturers while still practicing in the laboratory because the ability of lecturers to provide practical learning becomes a provision for students to face the world of work or reach the next level of education. In addition, the practicum guide or practicum module as a source of learning in practicum activities must be a guide module for students in developing science process skills. One of the efforts made to improve students' science process skills at the laboratory is to create a practicum module that is by the learning model (Sagala & Simanjuntak, 2017), students' science process skills taught by problem-based learning are better than there are students who are taught using problem-based learning). n conventional learning especially in biology learning by applying it to students In the early stages of education it may be more helpful in achieving effective and efficient lifelong learning skills. The use of problem-based learning methods in learning science is more effective and increases students' ability to learn concepts by instructing them in their minds. Science process skills can be improved by using problem-based and practical guide-based learning (Inel & Balim, 2010; Turan & Demirel, 2011).

METHOD

This research was conducted using a descriptive method. Descriptive research is research that describes and interprets existing conditions, ongoing processes, and ongoing consequences. After the data was obtained, the researcher analyzed the data by describing it using words. The sample used in this study was 40 students. Students carry out learning activities using the practicum method, where each practitioner/student observes epithelial tissue preparations under a microscope starting from the type of epithelium, the shape of the epithelium, the epithelial layer, the structure of the epithelium, and the location of the epithelial tissue, accompanied by assistants and practicum supervisors. Determination of research subjects by sampling random sampling technique, namely taking sample members from the population is done randomly without regard to the existing position in the population.

The procedures carried out in the scientific process skills research instrument are taken based on previous research (Hidayati, & Listyani, 2010), namely by formulating the aspects that will be used in science process skills, making indicator items related to aspects of science process skills, validate and revise instruments that have been made, conduct trials and refine research instruments.

The research instrument used consisted of an observation sheet for Science Process Skills (SPS) and Post Test. Observation sheet to see students' scientific process skills directly in practicum on epithelial tissue material. There are 4 aspects of science process skills used in this research, namely observing, classifying, hypotheses, and communicating (Rustaman & Rustaman, 2003; Samatowa, 2016). The observation sheet analysis technique that will be assessed is the aspect of science process skills in the form of a checklist method. The observation sheet is used to describe the science process skills during the learning process. The score of the observation sheet is calculated based on any indicators that appear in every aspect of science process skills during the practicum. The stages of analysis are as follows:

- a. Summing up the indicators of the observed SPS aspects
- b. Calculate the percentage of SPS aspects with the formula

$$\text{Percentage} = \frac{\text{observation score}}{\text{total score}} \times 100\%$$

The data that has been obtained from the results of data analysis in the form of observation sheets are then converted into percentage value categories and can be seen in Table 1.

Table 1. Categories of Science Process Skills (SPS)

Percentage	Category
81-100	Very Good
61-80	good
41-60	Average
21-40	Deficient
0-20	Very deficient

The instrument validity test was conducted to determine the feasibility of the instrument and instrument validation. Analysis of research instrument validation data was carried out by finding the average of each component and aspect on the validation sheet. The research data in the form of science process skills test scores were taken from the post-test results developed by the supporting lecturer in the form of multiple-choice questions. The Post Test consists of 10 multiple choice questions containing aspects of science process skills regarding epithelial tissue material. The data will be analyzed descriptively and measured categorically, then the data will be interpreted based in the following table:

Table 2. Interpretation of Science Process Skills

Score	Interpretation
0-20	Very bad
21-40	Bad
41-60	Average
61-80	Good
81-100	Very good

Post-test scores for students' epithelial tissue material in the form of numbers 1-100

RESULTS AND DISCUSSION

RESULTS

Science process skills (SPS) consist of basic science process skills and integrated SPS. The basic SPS consists of (1). observing/observing, (2). classify, (3). communicate, (4). Measure, (5) predict, (6). conclude. Meanwhile, the integrated SPS consists of (1) recognizing variables, (2) creating data tables, (3) creating graphs, (4) drawing relationships between variables, (5) collecting and processing data, (6). analyze research data, (7). formulate hypotheses, (8). Measuring variables (9). Designing research, (10). (experimenting). (Zaki & Williams, 2013).

In this study, the SPS which was integrated into the post-test questions was a combination of basic SPS and integrated SPS, namely observing/observing, classification, hypotheses, and communication. The following is an assessment of the average SPS percentage taken from the post-test results:

Table 3. Percentage of post-test results of histology of epithelial tissue material

Value Range	Amount	Percentage (%)	Interpretation
0-20	0	0	Very deficient
21-40	2	5	Deficient
41-60	7	17,5	Average
61-80	21	52,5	Good
81-100	10	25	Very Good

Based on the post-test results of biology education students who took the connective tissue material histology practicum, it appears that the average value achieved by the percentage shows well at 52.5%, meaning that the histology material conceptually can be understood well by students, this is influenced by many factors. namely the existence of assistance and theory giving at the meeting before the practicum so that there is information that is obtained by students. The following diagram shows the percentage of the average posttest value of biology education students during histology practicum with epithelial tissue material.

The good results obtained as shown in diagram 1 reflect that the SPS owned by biology students is very satisfactory, although there are still sufficient and insufficient categories that color the posttest results. The second category is very good which is achieved by 10 students with an average score percentage of 25%. The percentage of 17.5% which is still mostly obtained by biology education students as many as 7 students shows a sufficient category in understanding epithelial tissue material. There are 2 students who fall into the less category with a percentage of 5% which is influenced by the motivation, concentration, and willingness of the students in carrying out the practicum.

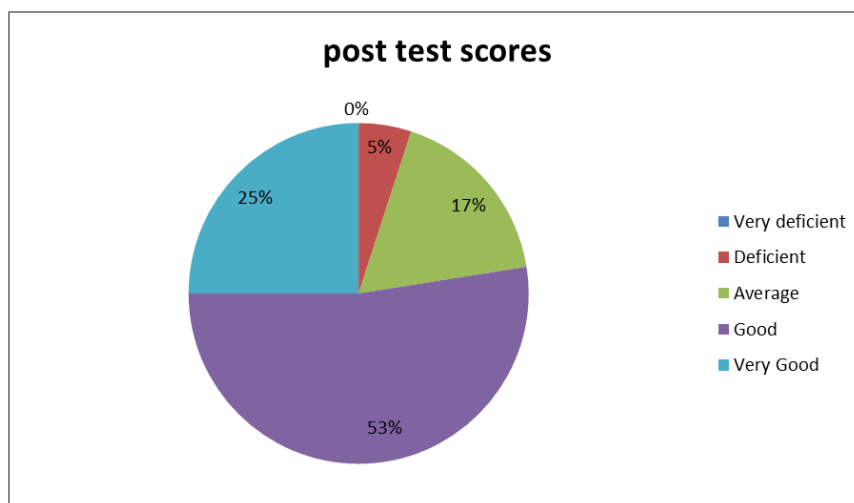


Figure 1. Percentage of pretest results of histology practicum of epithelial tissue material

The role of SPS in the histological practicum learning process emphasizes science learning which provides opportunities for students to develop their abilities such as the ability to solve problems in the practicum process by carrying out a series of practicum activities on epithelial tissue material and showing significant abilities, especially in the aspect of observing/observing, classifying, perform hypotheses, and communicate the results of the practicum.

The following are the results of the SPS obtained using the observation sheet carried out during the histology practicum, which is presented in table 4.

Table 4. Percentage of Histology Practicum of Epithelial Tissue Material

	Enough	Good	Very good
Observation	20%	78%	3%
Classification	23%	68%	10%
Communication	40%	50%	10%
Hypothesis	45%	40%	15%

Table 4 states that science process skills (SPS) of biology education students in histology practicum of epithelial tissue material provide various assessment results. Observation/observation skills have the largest percentage for the good category as much as 78%. Classification skills with a percentage of 68%, communication skills with the best percentage of 50% are also in the good category. Meanwhile, the highest percentage of hypothesis skills is in the sufficient category as much as 45%.

DISCUSSION

Science process skills (SPS) have a very important role in the process of forming knowledge (Dimiyati, 2006). States that process skills can be classified into two, namely basic process skills and integrated skills. Basic process skills include activities related to observation, classification, measurement, communication, prediction, inference. Integrated skills consist of: identifying

variables, tabulations, graphs, descriptions of variable relationships, data acquisition, and processing, investigative analysis, experimental hypotheses.

The combination of SPS observed in this study includes observation, classification, communication, and hypotheses that were carried out during the histology practicum of epithelial tissue material. Histology practicum places great emphasis on the ability to use the microscope correctly and the understanding of epithelial tissue material observed under a microscope. Students do the practicum process enthusiastically because it has been almost two years during the covid-19 pandemic, students do not do practicals directly in the laboratory.

Observation/observing skills are a very important basic aspect of SPS that is needed to grow other aspects of SPS, so that when the observation takes place, maximum honesty, objectivity, and accuracy are required using all the senses you have. Students are encouraged to make detailed observations of the preparations and document the observations accurately. The results of observations or observations of the preparations on the microscope show good categories, meaning that the observation process is carried out correctly according to the correct procedures and working methods, also using relevant facts about objects such as object characteristics, properties, equations, and other identification features, so that students can understand completely and thoroughly the epithelial tissue preparations being practiced.

The ability to observe the preparations was in line with the ability to classify which was also seen in a good category. Students can carry out the process of grouping and structuring objects well. The ability to communicate the results of the practicum using multimedia, writing, graphics, pictures or other methods for various findings has also been well supported by the ability of students' hypotheses which need to be improved because there are still many who meet sufficient categories as shown in the following figure:

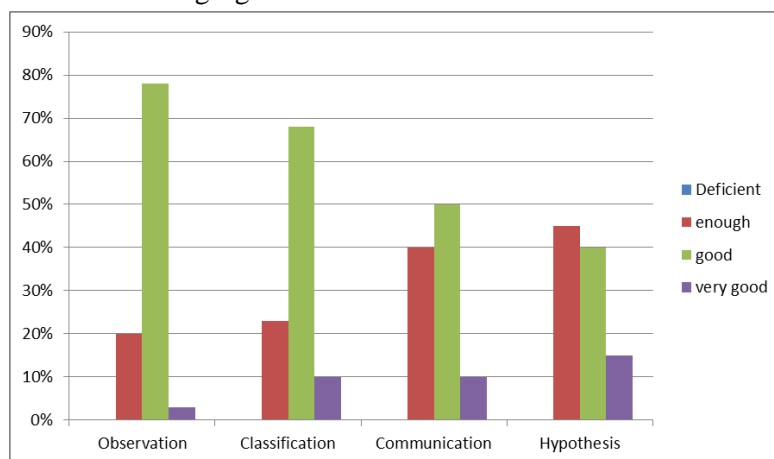


Figure 2. SPS practicum histology of epithelial tissue material

Classification skills have indicators to find differences and similarities of types of epithelial tissue preparations which include seven different forms and also a different number of layers. Students have the ability to classify epithelial tissue according to shape groups well. This is supported by (Dimiyati, 2006), that classifying is a process skill to sort various objects and based on their special properties so that similar groups/groups are obtained from the object in question.

Communication skills in the SPS are a form of skill related to the ability of students to convey or receive ideas or ideas both verbally and in writing, describing the results of observations visually in the form of pictures of preparations and documentation of epithelial tissue preparations. Referring to Figure 4 above, shows that the average level of communication skills in SPS is a good

criterion, this indicates that students are accustomed to interpreting observations in the form of pictures, some practicums carried out in the laboratory will usually produce results in the form of reports, pictures, diagrams or graphs and so on. The picture of the preparations produced in the histology practicum is a form of communication as stated by (Johnston et al., 2012) that communication is based on symbolic values and with different expression processes such as words, sounds, language. body, text, and images. All are accumulated into experiences and transmitted between individuals, generations, ages, races, and cultures in several forms such as speaking, writing body language, or symbols. Communication in the form of images of the results of this practicum is assessed as effective, precise, and not multi-interpretational communication.

SPS in the hypothesis aspect shows different criteria from other SPS aspects. The hypothetical skills of students in the histology practicum of epithelial tissue material are actually sufficient criteria which are more dominant and occupy 45% compared to good criteria of 40% and very good criteria of 15%. This informs that students have difficulty in doing hypotheses. The factors that cause this hypothesis to be lower than other aspects of SPS are more students who are not used to doing hypotheses in practicum activities, accompanying lecturers and assistants also rarely ask students to carry out hypothetical activities in practical activities. Improvement of the hypothetical aspect is very much needed considering that hypothesis skills are basic skills in scientific work.

Based on the results of the research above, suggestions that can be submitted are that it is hoped that further researchers can examine other aspects and further deepen aspects related to aspects of data interpretation.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the science process skills of biology education students in histology practicum of epithelial tissue material are the most dominant classification skills of 78% with good categories, observation and communication skills also have good criteria, respectively 68% classification and 50 % for communication, while the sufficient category of 45% is owned by hypothesis skills.

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