The skills of students following the microtechnic in making microscopic preparations for science learning in the Covid-19 pandemic period

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Abstract. The objectives of this study were (1) to analyze the skills of students who took the Microtechnical course in making microscopic preparations during the Covid-19 pandemic, and (2) to analyze the factors supporting the skills of students who took the Microtechnic course in making microscopic preparations. This type of survey research, a population of 134 students who took Microtechnic courses in the even semester of 2019/2020. Students' skills in making microscopic preparations are measured by performance observation sheets which are then categorized. Factors supporting student skills in making microscopic preparations were measured by a questionnaire which was then presented. The results of the study, most of the students who took the microtechnic course were skilled at making cross-sectional preparations of leaves using the freehand slice method. The supporting factors for students' skills in make microscopic preparations were obtained from reading microtechnic books and previous practical experiences on plant anatomy. All the students were skilled at making thin blood smears. Most of the supporting factors for students' skills in make microscopic preparations were obtained from reading micro-technical books and viewing the YouTube online platform.

1. Introduction
Improving the quality of education in Indonesia, particularly improving the quality of Science have still striven. Science was believed as underlying knowledge to develop Science and Technology in the 21st century. [1] Explained that in Science and Biology experiment activities shall have a microscopic specimen of plant and animal tissues and organs. The price of a factory-made microscopic specimen is relatively expensive and plant that used sometimes not necessarily known by students. The teachers could make their specimens by using simpler material and method.

Most of the teachers were unskilled to make microscopic specimens. Regarding the researcher’s experience during held a community service in Semarang and Kendal, apparently most Science and Biology teachers were unskilled to use a microscope and make simple microscopic specimens. [2] Reported that most of Science teachers in Junior High School 1 Purwokwrto were unskilled to use a microscope and make microscopic specimen. [3] Reported that most of Science teachers in Madrasah Tsanawiyah (MTs) in Tasikmalaya were unskilled to use a microscope and make microscopic specimen. [4] Said that most High School teachers in Lampung Timur have limited skills to make microscopic specimens. Eventually, to improve the skill of teachers, training was held.
The world community was shocked by the Corona virus outbreak which originated from the city of Wuhan, China. The spread was very fast and across continents [5]. Health is very important for every human being in the world. In dealing with the corona pandemic, new policies are needed.

The Government issued a policy to the public not to do any activities outside the home, all work is done from home, including teaching and learning activities. face-to-face teaching and learning process must be turned online [5],[6]. Online learning is one solution to implementing social distancing in order to prevent the chain of spread of the Covid-19 epidemic. This learning is carried out online / long distance with flexible timing / depending on needs. In online learning requires adequate facilities and infrastructure, such as laptops, computers, smartphones and internet networks. Students learn from home Study from home (SFH). This makes students more independent. Learning emphasizes student centered [7].

Sikadu and Elena are two mandatory systems for online learning at Universitas Negeri Semarang. The sikadu site can be accessed through the address https://apps.unnes.ac.id and Elena can be accessed through the address http://elena.unnes.ac.id. Learning tools can be delivered through both systems. SFH with E-learning is still not able to completely replace lectures as usual. Both of these systems have greatly assisted the implementation of microtechnical lectures, especially in theoretical activities. Microtechnic practicum activities that should be carried out in a laboratory using various chemical tools and materials cannot be carried out.

Universitas Negeri Semarang responsible to give provision skills to make microscopic specimens for students in Major Education of Biology. The achievement of student’s competence was done through laboratory experiments in the Micro-technic course. On these Covid-19 pandemic period forces all lecture activities, including Microtechnic, to be carried out online. In the beginning, Microtechnic planned to conduct the laboratory experiment at the end of the lecture period. But with the increasing patient of covid-19 in Indonesia, the online lecture was carried out for one whole semester. Regarding these several things above, a Microtechnic lecture was carried out online by utilizing Sikadu, Elena, WhatsApp, Email, and Google Drive. Students were asked to learn Microtechnic material from the textbook. Discussion and assignment to plan the experiment, make the microscopic specimen, and evaluation was carried out by using ELENA and WhatsApp. Particularly test of making microscopic specimens was focused on skills to make a transverse section of the leaf using the freehand section method and make thin blood smear.

According to these several things above, so the objectives of this research are (1) Analyze the student’s skill who attend Microtechnic course on making microscopic specimen in Covid-19 pandemic period, and (2) Analyze the supporting factor of student’s skill who attend Microtechnic course on making microscopic specimen in Covid-19 pandemic period.

2. Methods
This research is a survey. The number of the respondent was 134 students who took a Microtechnic course in the even semester of the 2019/2020 academic year. The skill of students making microscopic specimen is focused on two things, namely: cross-cutting skills of leaves with the freehand section method and skills of making thin blood smears. Both skills are measured using student performance observation sheets. The first performance-focused on four aspects, namely: accuracy of leaf sampling, the accuracy of cork size used to clamp leaf samples, the accuracy of slicing technique, and results of slices. The second performance is focused on six aspects, namely: accuracy in carrying out hand and tool sterilization, accuracy in treating the first drop of blood that comes out of the fingertip, the accuracy of dropping the second blood on the glass of the first object, the accuracy of the tilt of the second object glass to the glass of the first object, accuracy in positioning the second object-glass on the blood drop, and the accuracy of the blood erasing technique. The two skills in this study were assessed indirectly, namely assessed through student performance videos sent to lecturers via Google Drive. The results of the assessment of the two skills are then described categorically. The descriptions of the two categories of skills are grouped into five, namely: highly-skilled, skilled, moderately skilled, unskilled, and highly
unskilled. Factors supporting the skills of students who took micro technical courses in making microscopic preparations during the Covid-19 pandemic were measured using a questionnaire.

The questionnaire is sent to students via the WhatsApp group, and students answer questions by writing down the two-digit Student Identification Number (NIM). Furthermore, the factors supporting the students' skills in making microscopic preparations were grouped and percentages. Students are also asked to provide suggestions for improving the implementation of online lectures by writing to the WhatsApp group.

3. Results and Discussion

According to the categorized result of student’s skill who attend Microtechnic course on making microscopic specimen known that: (1) Skill to make a transverse section of the leaf using the freehand method was spread in all categories as shown in Table 1; and (2) Skill to make thin blood smear, the students were in the moderately skilled category until highly-skilled category as shown in Table 2.

| No. | Category              | Number of Students (%) |
|-----|-----------------------|------------------------|
| 1.  | Highly-skilled        | 14.18                  |
| 2.  | Skilled               | 39.55                  |
| 3.  | Moderately skilled    | 23.88                  |
| 4.  | Unskilled             | 20.15                  |
| 5.  | Highly-unskilled      | 2.24                   |

Table 1 shows that the number of students who were highly-skilled on makes a transverse section of the leaf using the freehand method was low, its only 14.18 % of the highly-skilled student category and skilled student category 39.55 %. In total students who were highly-skilled and skilled were only 53.73 %. This happened because of the Covid-19 pandemic that forced experiment activities that planned to carry out in the laboratory at the end of the semester could not be carried out. If looked at every aspect of the skill shown that only 23.88% of students who could do leaf sampling correctly. In each of making microscopic specimens, the precision of sampling was the key to assess appropriate or not the specimen. [8] Stated that the correct leaf sample was taken from the fifth leaf. Sample size 1 cm x 1.5 cm which including the costa. The sample which meets this requirement could describe the transverse section of the leaf representatively.

Only 26.86 % of students who could use Styrofoam as a clamp for leaf sample with the correct size. The purpose of this Styrofoam was to help during hold the leaf sample, so it could be thinly sliced easily. One of the requirements for the microscopic specimen is thin. If it was not thin, the structure for each cell of the leaf tissue could not visible perfectly. These following the rules stated by [8] that there are four requirements of a microscopic specimen which are: the size was small, thin, transparent, and one part and other parts could be distinguished. If looking at the aspect of slice precision for the leaf sample, 44.77 % of students got the correct slicing technique. Styrofoam and leaf sample sliced by razorblade that facing the student’s body. This technique could make it easier to control the section thickness and prevent the damaged section. The number of students who could get representative results for a transverse cross-section of the leaf was low just 14.18 %. With this result, the students must do a lot of practice. The skill of cross cutting leaves using the freehand method is a scientific skill. [9] Argues that scientific skills consist of basic skills (basic science process skills) and integrated scientific skills (integrated science process skills). These skills need to be trained for science and biology teacher candidate students so that they have experience and provision in carrying out learning that develops science process skills. This skill could not be owned by just reading a textbook but could be owned by a look at the demonstration and do the practice. [10] Explained that learning in a multimodal style, using videos, illustrations, taking self-notes, and facilitating each student to get hands-on experience can improve the quality of learning. Meanwhile, visual media that shown the skill to slice the leaf with the
correct technique was not available. Some videos shown on YouTube were not represented to be used as guidance for the students who took the Microtechnic course.

Categorized results for the skill of making thin blood smear for students who took the Microtechnic course shown in Table 2.

**Table 2. Category of student’s skill to make thin blood smear**

| No. | Category              | Number of Students (%) |
|-----|-----------------------|------------------------|
| 1.  | Highly-skilled        | 76.87                  |
| 2.  | Skilled               | 19.40                  |
| 3.  | Moderately skilled    | 3.73                   |
| 4.  | Unskilled             | 0.0                    |
| 5.  | Highly-unskilled      | 0.0                    |

Table 2 shows the number of students who were highly-skilled to make thin blood smear was 76.87%. This number was boast because, under online lectures, the students own the skill to make thin blood smear. This thin bold smear was needed as a provision skill for a candidate of Science and Biology teacher. The expectation is after being Science teachers, they could provide a microscopic specimen of blood thin smear by themselves for the Introduction of Human Blood Component Experiment. [11] Explained that this method is still used in clinical and hospital laboratories as a control or cross check of the automatic method.

Analysis results of the supporting factor of student’s skills who attend Microtechnic course on making microscopic specimens in the Covid-19 pandemic period shown in Tables 3 and 4.

**Table 3. The factor which makes students could be skilled in making transverse section of the leaf using the freehand method**

| No. | The Factors of Skilled Student                               | Number of Students (%) |
|-----|--------------------------------------------------------------|------------------------|
| 1.  | Read a textbook and experience in plant anatomy experiment  | 79.51                  |
| 2.  | Read microtechnic textbook                                  | 18.15                  |
| 3.  | Watched online platform (YouTube)                           | 2.34                   |

79.51% of students stated that the skill to make a transverse section of the leaf using the freehand section was owned by reading a Microtechnic textbook and their experience from their lecturer in plant anatomy experiment course (Table 3). This was in accordance with [12], that education and training were important for developing skills. Also explained that just 10% of adult learning happens in the class, starting from reading a textbook, listen to cassette or online learning activities. This happens because learning in this format more passive. Most of the learning (70%) that happen in adults were from learning through on the job training or full leadership. 2.34% of students stated that learn how to make a transverse section of the leaf through the YouTube platform. After being tracked further, YouTube that being watched turned out to be bad. This causes the low number of students that are categorized as highly-skilled or skilled. The factor which makes students could be skilled in making thin blood smear is shown in Table 4.

**Table 4. The factor which makes students could be skilled in making thin blood smear**

| No. | The Factors of Skilled Student                               | Number of Students (%) |
|-----|--------------------------------------------------------------|------------------------|
| 1.  | Read a Microtechnic textbook and watched online platform (YouTube) | 49.65                  |
| 2.  | Read a Microtechnic textbook                                 | 30.77                  |
According to Table 4, shows that reading a Microtechnic textbook contribute 30.77 % to student’ s skill to make thin blood smear. 46.65 % of the students were skilled in making thin blood smear after reading the Microtechnic textbook and watching YouTube. After reading a Microtechnic textbook, students know the procedures to make a thin blood smear. During students watch videos from YouTube cause their senses of sight and hearing work together to process the information clearer in how to make thin blood smear. This is related to the generic science skills of students. The research [13] it was concluded that there was a positive and significant relationship between generic science skills on student learning outcomes class X IPA 5 at SMA Negeri 9 Bandar Lampung. [14] and [15] Argued that learning video could create curiosity in students so generate happiness during learning. Senses of sight and hearing work together; more senses that used could give the students more information. The results of this research show that the experience of making thin blood smear during the took Animal Physiology course just contributes 19.58 %. This because the procedures that were conducted were a little bit different from than Microtechnic textbook and YouTube.

According to the result of this research made it clear that video which watched by students through YouTube give positive impact to the skill of making thin blood smear for the students. Watching videos containing learning materials raises student interest or interest in learning. This learning interest is very influential on learning activities. Strong interest in learning creates motivation in students. Motivation to learn has three basic functions, namely a stimulating function, points to a function and maintains and regulates functions [16]. Based on students experience through watching videos of making microscopic specimen for transverse section of the leaf and specimen for thin blood smear in YouTube platform, the Microtechnic students suggest to the lecture of Microtechnic to make a tutorial video how to make a transverse section of the leaf using the freehand method, thin blood smear, and all experiments that planned in the Education Planning Period.

4. Conclusion
In the period of the Covid-19 pandemic, most students who took microtechnical courses were already proficient in making cross-sectional preparations using the freehand cutting method. The factors supporting students' skills in make microscopic preparations are obtained from reading micro books and previous practical experience in the field of plant anatomy. All the skilled students made thin blood smears. Most of the factors supporting students' skills in make microscopic preparations are obtained from reading micro-technical books and viewing the YouTube online platform.

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