

## Mapping 5M Abilities (Saintific Ability) in the Learning Process Using the Saintific Learning Approach

Nurhayatun Mahmudah<sup>1</sup>, Tengku Idris<sup>2\*</sup>

<sup>1,2</sup> Biology Education Departement, Universitas Islam Riau, Indonesia

\*Corresponding Author: [idrisbio@edu.uir.ac.id](mailto:idrisbio@edu.uir.ac.id)

### ABSTRACT

The scientific method, also known as scientific learning, is a good learning technique for individual learning activities during this pandemic. The scientific approach is a strategy that focuses on educating children so they can learn independently through the 5M stages (Observe, Ask, Gather Information, Process Information, and Communicate) during and after Covid. The aim of this research is to map students' 5M (scientific abilities) abilities through learning using a scientific approach to learning. online and face-to-face learning in Biology subject class XI IPA SMAN 1 Tembilahan Hulu. This research is a descriptive research. Data collection was carried out using observation, questionnaires, interviews and documentation. The sampling technique used is random sampling. The sample in this study was 68 XI IPA students. The results of this research show that the application of scientific methods in post-Covid learning is in the good category (77.94%). If you look at each ability, the ability to observe is 89.05% in the very good category, the ability to ask questions is 66.89% and the ability to collect information is 64.37% in the good category, and the ability to process information is 73.4% in the good category. good and communication skills of 74.69% in the good category. Based on the research results, it can be concluded that students' scientific abilities (5M) are in the good category with a percentage of 75.07%.

**Keywords:** mapping, scientific approach, scientific ability

### INTRODUCTION

COVID-19 has caused major changes to the current order of life, one of which is the learning process. Even though online education helps students to learn independently, the process of learning from home/online still has several obstacles including the availability of internet access, the ability to access learning media, the ability to buy internet quota, low student participation in the learning process, material that is difficult for students to understand because less interactive and communicative learning (Alchamdani *et al.*, 2020). Thus affecting student academic performance, most students think that face-to-face learning is better than online learning. There are many factors that must be addressed together to support smooth online learning at this time. Because students not only learn to receive material, but also carry

out practical activities which are certainly difficult to do online (Alchamdani *et al.*, 2020; Díaz-Noguera *et al.*, 2022).

In breaking the chain of spread of COVID-19 in 2020, the government issued a policy related to the current education process to implement the learning process through distance/online and/or offline learning. Then, in 2021 the implementation of learning during a pandemic in accordance with the Joint Decree of the Four Ministers, the learning process will be carried out with limited face-to-face learning while still implementing health protocols and/or remote learning (Kemendikbud, 2021b, 2021a; Onde *et al.*, 2021; Prawiyogi *et al.*, 2020).

Therefore, the implementation of the 2013 curriculum in learning during the COVID-19 pandemic has changed. Changes in the learning process also affect teachers in implementing the 2013 curriculum (Dalimunthe *et al.*, 2017; Darmadi *et al.*, 2021). Government policy requiring all learning activities to be carried out from home/online is a new challenge for teachers in carrying out their duties. At this time, teachers are required to make good use of online learning media in order to be able to improve the quality of student learning outcomes (Alchamdani *et al.*, 2020). In addition, students are also required to be more active, creative, and innovative in solving every problem they face at school (Darmadi *et al.*, 2021).

The scientific approach is one approach that teachers can apply during the current pandemic (Aisyiyah & Amrizal, 2020; Qonita *et al.*, 2019; Solikha *et al.*, 2022). The scientific approach is intended to enable students to actively construct their knowledge in concepts, laws, and principles through the stages of a scientific approach including observing, asking, gathering information, processing information, and communicating. (Djaelani, 2019; Firman *et al.*, 2018; KEMENDIKBUD RI, 2014; Persada *et al.*, 2020). Through this approach students can understand that information can be obtained from anywhere, not depending on the teacher. So that in practice the teacher will act as a mediator who encourages and trains students to learn independently (Dalimunthe *et al.*, 2017; Persada *et al.*, 2020).

Based on the results of previous research by (Aisyiyah and Amrizal, 2020) it was found that the implementation of Biology learning with a scientific approach was dominated by the questioning stage and difficulties at the associating and communicating stages. Then (Dalimunthe *et al.*, 2017) states that the dominant stage in the scientific approach is observing (81%) and the non-dominant is associating (7%). Besides that, (Solikha *et al.*, 2022) explained that in implementing the scientific approach there are still several obstacles including passive students, limited time and the lack of ability of educators to implement a scientific approach.

Using a scientific approach in learning science or biology is an important approach for training students' scientific abilities. Some scientific abilities that can be trained using this approach are the ability to observe, the ability to ask questions, the ability to collect information, the ability to process information and the ability to communicate. The abilities trained are in line with the stages of the scientific learning approach. Several studies show that scientific abilities can be trained using various learning models such as inquiry (Nowak *et al.*,

2013), contextual collaborative learning (Dewi *et al.*, 2021) and 5E (Susilowati and Anam, 2017).

From the results of observations and interviews conducted with the Biology subject teacher for Class However, during the implementation of learning, activities could not take place optimally due to limited time constraints. Apart from that, teachers also have difficulty controlling activities optimally because some learning occurs outside of school or at home (online). For this reason, it is necessary to map students' synthetic abilities after implementing limited learning.

## METHOD

The research was conducted at SMAN 1 Tembilahan Hulu in March until May 2022. The population in this study was 137 students. The sampling technique was carried out using simple random sampling so that there were 68 students as research samples. This type of research is descriptive research. The instruments of this research are an observation sheet on teacher activities in implementing the scientific approach to biology learning, a student questionnaire sheet to determine students' perceptions of the scientific abilities they have and those that have been trained by the teacher, a teacher interview sheet to find out additional information regarding the scientific approach and documentation in the form of photos and Biology Lesson Plan. The observation sheet was analyzed using the Guttman scale, the questionnaire sheet was explained using a Likert scale, and the interview was explained descriptively. The data analysis technique used is descriptive statistical data analysis. The presentation of data is presented in table form by describing the information obtained as data. All data was analyzed by calculating the score divided by the ideal score, then interpreted in Table 1 below.

Table 1. Data interpretation criteria

No	Rank	Category
1.	81%-100%	Very good
2.	61%-80%	Good
3.	41%-60%	Adequate
4.	21%-40%	Poor
5.	0%-20%	Very poor

Source: (Riduwan, 2020)

## RESULT AND DISCUSSION

### Result

Based on the results of the data analysis that has been carried out, it can be seen that the implementation of the scientific approach in limited face-to-face learning which is currently applied is good although it still has several obstacles including time limitations in the learning process so that not all stages of the scientific approach can be applied by the teacher in the

classroom, The teacher's role as a mediator has not been utilized optimally by students in processing information so that students still have difficulty deciphering material found in general and specifically. The implementation of learning in implementing a scientific approach to the 2013 curriculum is an application of the lesson plans. Implementation of learning includes preliminary activities, core activities, and closing activities. The recapitulation of limited face-to-face learning activities based on the results of observations and questionnaires can be seen in Figure 1 below.

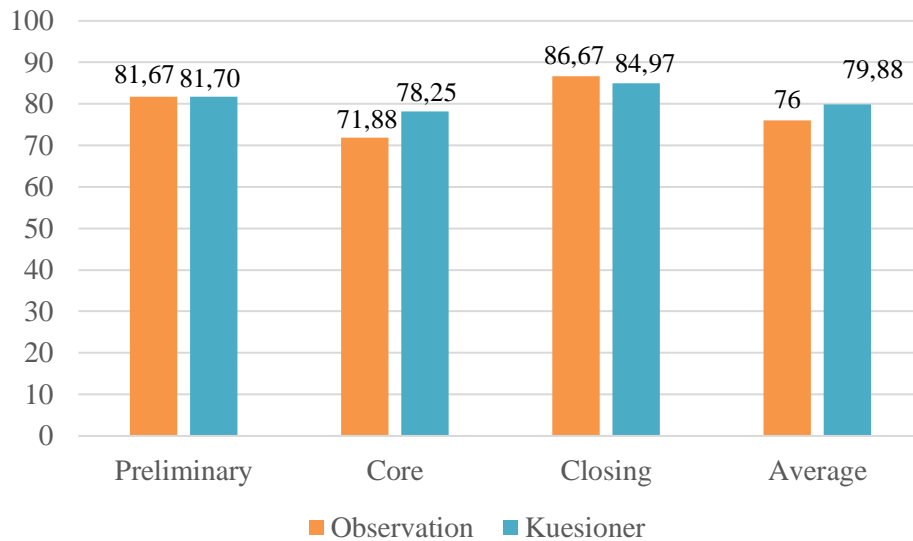


Figure 1. Graph of the percentage of implementation of the scientific approach in limited face-to-face learning

Figure 1 is a recapitulation of all Biology learning activities with a scientific approach in limited face-to-face learning in class XI IPA which is taught by 2 Biology teachers. From all observation and questionnaire data it was found that learning activities using a scientific approach in limited face-to-face learning activities had a score of 77.94% in the good category. Based on the results of observations, it is known that preliminary activities have a score of 81.67% in the very good category, core activities have a score of 71.88% in the good category, and closing activities have a score of 86.67% in the very good category. Meanwhile, based on the results of the questionnaire, it is known that the preliminary activities have a score of 81.70% in the very good category, the core activities have a score of 78.25% in the good category, and the closing activities have a score of 84.97% in the very good category. The stages of the scientific approach include observing, asking, gathering information, processing information, and communicating which are the core activities in the learning process. Recapitulation of core activities with a scientific approach in limited face-to-face learning at each stage can be seen in Table 2 below.

Tabel 2. Recapitulation of observation results and questionnaires of the stages of a scientific approach in limited face-to-face learning

No	Activity	Observation		Questionnaire	
		Percentage	Category	Percentage	Category
1.	Observe	95%	Very good	83,09%	Very good
2.	Question	60%	Edaquate	73,77%	Good
3.	Gathering information	56,67%	Edaquate	72,06%	Good
4.	Processing information	70%	Good	76,80%	Good
5.	Communication	68%	Edaquate	81,37%	Very good
	Amount	71,88%	Good	78,25%	Good
	Average			75,07%	
	Category			Good	

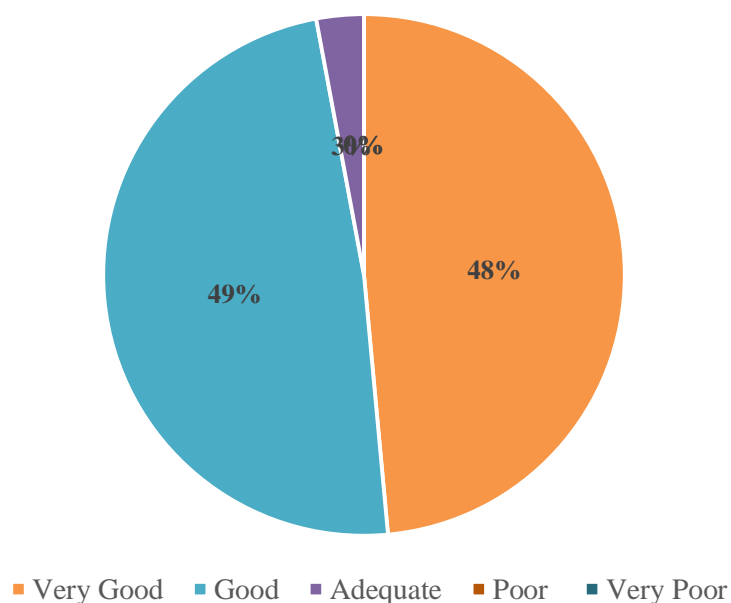


Figure 2. Percentage diagram of student perception categories of the implementation of a scientific approach in limited face-to-face learning

Table 2 is a recapitulation of the results of students' scientific abilities in limited face-to-face learning activities at the stages of the scientific approach. In general, it can be seen that the implementation of the scientific approach in learning has a score of 75.07% in good category. Based on the results of observations, it is known that observing activities are scientific approach activities that have the highest score of 95% in the very good category.

While the gathering information activity is a scientific approach activity that has the lowest score of 56.67% in the adequate category. In line with this, the results of the questionnaire also showed that the observing activity was a scientific approach activity which had the highest score of 83.09% in the very good category and the gathering information activity was a scientific approach activity which had the lowest score namely 72.06% in the good category. As for student perceptions of the implementation of the scientific approach in limited face-to-face learning in Biology class XI IPA SMAN 1 Tembilahan Hulu that has been carried out by the teacher can be seen in the Figure 2 that showing students' perceptions of the implementation of the scientific approach in limited face-to-face learning are in the very good category with a percentage of 48.53%, good with a percentage of 49%, and in the adequate category with a percentage of 3%.

### **Discussion**

Preliminary activities are activities to create conditions for students to be psychologically prepared and become the center of attention for students for what they will learn, this activity also aims to achieve the expected competencies. (Solikha *et al.*, 2022). In this preliminary activity there are 6 aspects that the researcher observes to find out whether the teacher has implemented the aspects made by the researcher. Of the 6 aspects that were observed, only 2 aspects were not able to be implemented by the teacher properly. This means that in general, the teacher has implemented the preliminary activities very well as evidenced by the observation results of 81.67%.

Aspects that have not been able to be implemented by the teacher occur because of the limited time for the teacher to teach in each subject. Supported by the results of the researcher's interviews, it is known that the teacher tries to maximize the time provided by providing a different learning style from online learning such as forming groups of students to discuss, asking students to solve problems in pairs, and focusing students' attention on the teacher when explaining material. However, it turns out that this has not been able to make students fully interested, because the teacher's efforts to provide different learning styles with the aim of making students interested are inappropriate. The teacher should provide various teaching materials/teaching media so that students are interested in the material. On the other hand, the teaching materials/teaching media provided by teachers in both online learning and limited face-to-face learning are the same teaching materials/media. So that there is no significant difference from the teacher in motivating students with the teaching materials presented. The prominent difference shown by the teacher in limited face-to-face learning is by using infocus to display the teaching materials they have (videos on the introduction of the reproductive system, fetal development in a woman's body and so on). Face-to-face learning should be limited because learning is carried out directly, teachers can also take advantage of learning media available in the Science Biology laboratory as teaching aids for teachers so that students are more enthusiastic and interested in participating in the learning process.

Based on the findings of researchers through observation, questionnaires, and interviews, in the preliminary activities the teacher has ensured students are psychologically and physically ready to take part in learning by asking students to sit neatly, greeting them, preparing students' learning needs, checking student attendance, and reminding students to continue to comply with health protocols during learning. In addition, the teacher also greets and asks about students' news, provides motivation and enthusiasm even though learning only lasts 3 hours for 1 shift of student study groups. Then, the teacher has also started learning activities by asking students to pray according to their respective beliefs as evidenced in the results of student questionnaires with the dominant response always being 91.18% and the observation results being 100%. Furthermore, the teacher has also asked daily activities related to the material to be studied by asking questions that are closest to students such as experiences and incidents that have been experienced related to the material to be studied. Then, the teacher has also asked questions that relate previous knowledge to the material to be studied.

Core activities by (Aisyiyah and Amrizal, 2020) includes conveying information, reviewing material to shape student competence and character, question-and-answer discussions between teachers and students, sharing experiences and opinions about the material presented, or solving problems/projects given. In limited face-to-face learning observing activities are activities with the highest percentage while information gathering activities are activities with the lowest percentage. This is because, in implementing a scientific approach during face-to-face learning, the learning time is limited so that the process of collecting information according to the stages presented cannot be carried out by students completely. Students can still collect information through devices/gadgets. However, this does not fully work optimally considering the material studied is a lot and the time provided is small. The discussion at each stage of the scientific approach activity can be seen below:

#### Observing Activities and Abilities

Observing activities can be carried out by students by reading, listening, seeing and listening to the teacher's explanation (Qonita *et al.*, 2019; Solikha *et al.*, 2022). In observing activities, the things that the teacher does are ask students to read the material, listen to the teacher's explanation, look at various literature, and listen to the subject matter. In this activity the teacher implemented it very well at 95% based on the results of observations and 83.09% based on the results of the questionnaire. Observational aspects of observing activities consist of 4 aspects of observation, all aspects of which can be implemented by the teacher well. So that there are no aspects that have not been implemented by the teacher. Observing activities begin by asking students to read the modules that the teacher has provided in Google Classroom, apart from reading the modules students are also asked to pay attention to pictures and important information related to the material being studied. Then, the teacher also asked students to listen to the presentation of the material presented seriously. Then the teacher also asked students to listen to the subject matter presented. After the teacher finishes delivering the material, the teacher will invite students to discuss with questions and answers to find out

whether students are listening, paying attention, and understanding the information provided. Students are also asked to look at various literature that they can reach. However, this activity requires quite a long time so the teacher only focuses on the information that has been provided and conveyed by the teacher with the help of teaching materials sent by the teacher.

#### Questioning Activities and Abilities

The questioning activity was carried out by the teacher immediately after the students finished observing. In this activity, the teacher has implemented it by 60% based on the results of observations and 73.77% based on the results of the questionnaire. The process of asking questions takes place between teachers and students, students, students and teachers. From the 2 aspects of observation, the teacher is only able to implement it in 1 aspect, other aspects the teacher has not been able to implement properly.

The activity of asking questions is carried out by baiting students with basic questions about the material presented, for students who pay attention to their academic grades they will ask the teacher, but not critical thinking questions. The teacher has also provoked students to ask critical questions by giving examples of issues related to the material, only a few students are interested in listening and asking questions. However, in this activity the students' ability to understand and absorb information was different, so the questions asked were more simple questions about the material. For in-depth questions that think critically, only a few students ask questions.

In asking questions, the teacher should provide opportunities for students to ask questions regarding the material that has been presented. In addition, students are directed to think critically and respond quickly to ask questions about objects that have been observed, the teacher also provides guidance to students regarding the questions that have been asked. The questioning stage aims to identify students' abilities after observing the material presented by the teacher (Qonita *et al.*, 2019; Solikha *et al.*, 2022). At this stage, the teacher has carried out his role by directing students to ask more broad questions, but students have not used this optimally. In addition, based on the results of interviews with researchers, it is known that students tend to ask only information they do not know, not in-depth questions. For this reason, sometimes the teacher lures students with critical thinking questions so that students' thinking skills increase. However, it turns out that this has not been running optimally.

#### Activities and Abilities to Collect Information

In information gathering activities students are expected to be able to collect information independently and the information found should be occupied and studied. This activity can be carried out by conducting experiments, reading books or other supporting sources, observing objects/events, conducting interviews with informants as a form of communication skills. After this activity, students will process the information found in the form of a report or in accordance with the teacher's directions (Qonita *et al.*, 2019; Solikha *et al.*, 2022). In this activity, the teacher has implemented it by 56.67% based on the results of observations and 72.06% based on the results of the questionnaire. The information gathering activity carried out is by asking



students to observe events in everyday life related to the material, students are also asked to explore sources other than textbooks and conduct interviews with sources related to the material.

Of the 3 aspects of observation, there are 2 aspects of observation that the teacher has not been able to implement properly. This aspect is the activity of exploring sources other than textbooks, because during face-to-face learning it is limited that schools give permission to students to bring and use devices/gadgets/mobile phones. Even though students have brought gadgets/handphones. These activities are not fully carried out because the teacher must allocate teaching time optimally. So that to collect information students are usually diverted by reading books that contain only related material. In addition, the next aspect of interviewing resource persons cannot be carried out as long as face-to-face learning activities are limited because the school environment and school time are limited. So that interviews can only be conducted to the extent of peers and school members, the rest of the interviews must be conducted outside of school hours. This is what causes information gathering activities to be activities with the lowest percentage in limited face-to-face learning.

#### Information Processing Activities and Abilities

The activity of processing the information presented by (Madina and Kardena, 2021; Rhosalia, 2017; Saefuddin and Berdiati, 2016) is an activity of thinking logically and systematically based on the facts that have been collected to draw results in the form of conclusions. Teachers can direct students in identifying, classifying and connecting the information found to draw conclusions as the final result. This activity is carried out by students to generate relationships from various data or information found to be concluded in the form of a report (Qonita *et al.*, 2019; Solikha *et al.*, 2022). This activity was implemented well by 70% based on the results of observations and 76.80% based on the results of the questionnaire. In this activity, the teacher participates in helping students process the information that has been collected, guiding students to process general-specific information, and giving real examples to students in solving the problems they are working on. However, from the 3 observational aspects, there are still 2 aspects that have not been able to be implemented optimally. Apart from the limited time for learning, this is also based on the not optimal role of the teacher as a student mediator. The teacher should direct students to process information by providing motivation during discussions by asking questions that make students think critically, so that students can use their ability to reason with the questions that have been given. Then, teachers and students can align the problems found with the material being studied (Dewi and Rochintaniawati, 2016; Solikha *et al.*, 2022).

#### Communicating Activities and Abilities

Communicating activity is the last stage in the scientific approach which is an activity to express the results of discussions based on the results of student analysis through activities to collect and process information. (Madina and Kardena, 2021; Rhosalia, 2017; Saefuddin and Berdiati, 2016). This activity is believed to be able to increase students' confidence in

conveying their ideas, establishing cooperation and friendship with their peers (Qonita *et al.*, 2019; Solikha *et al.*, 2022). In this activity the teacher has implemented 55% based on the results of observations and 66.67% based on the results of the questionnaire. Communicating activities carried out by students are conveying the results of discussions in the form of reports, in the form of conclusions, orally and in writing. In general, students are able to convey the results of discussions well according to the teacher's request, but there are still some students who need to be trained in communicating the results of discussions in the form of conclusions, because most students when tested by the teacher to convey conclusions both verbally/in writing, students only copy the information provided. provided by the teacher through modules and powerpoints. So the teacher should encourage students to read more often and understand the material being studied.

While closing activities are carried out by mutually compiling learning conclusions, providing feedback on the process and learning outcomes, as well as explaining the planning of further activities in the form of assignments and so on. In this activity, the teacher can submit a lesson plan for the next meeting as the closing of learning activities (Qonita *et al.*, 2019; Solikha *et al.*, 2022). In general, in the closing activities, the teacher has implemented it very well, as evidenced by the consistent results of observations of 86.67% and 84.97% of student questionnaires. In this closing activity, the teacher and students make conclusions on the subject matter together, provide further assignments related to the material being studied, provide feedback to students when conveying the results of their discussions in front of the class. However, based on the results of observations, it is known that teachers sometimes forget to inform students about plans for learning activities for the next meeting. Because the class conditions were not conducive when closing learning. In this case, the researcher saw that many students were quite active when the class was about to end. To overcome this, according to the results of the interviews that have been conducted, it is known that the teacher will convey the lesson plans for the next meeting via the WhatsApp class group. Thus, in general the closing activities were carried out well.

As for the general perception of students on the implementation of a scientific approach in limited face-to-face learning that has been done by the teacher is in the good category. Because in general, based on the results of the student questionnaire, the response always shows. The explanation above is supported by research results (M. Mustakim, 2020) shows that students prefer face-to-face learning because online learning has just taken place. This is supported by research (U. S. Mustakim *et al.*, 2021; Nurlatifah *et al.*, 2021) that online learning is less effective than face-to-face learning. Implementation of limited face-to-face learning is an attempt to solve problems that arise during online learning (Tasdik and Amelia, 2021). Dalam hal ini (Artayasa *et al.*, 2022) explained that the limitations of technological infrastructure and the lack of interaction between teachers and students during online learning were the main reasons students stated that face-to-face learning was more effective for students compared to the application of online learning.

## CONCLUSION

Based on the results the implementation of the scientific approach in limited face-to-face learning on the Biology subject class XI science at SMAN 1 Tembilahan Hulu, it can be concluded that overall students' scientific abilities are in the good category with a percentage of 75.07%. with percentages for each ability as follows: observing (95%), asking (60%), gathering information (56.67%), processing information (70%), and communicating (68%).

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