VIDYA KARYA

Profile of Science Generic Skills in Biology Learning Materials for Students in Class X

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Abstract. Generic Science Skills (GSS) are the ability to think and act based on the knowledge possessed by individuals. Every human being has generic science skills that need to be developed along with the development of the human brain. This is because generic science skills can be developed in accordance with the development of the level of human thinking. After the COVID-19 pandemic, teaching and learning activities experienced changes in the learning process. This resulted in learning originally carried out in the network (online) turning into offline learning (offline). Biology is a science that allows students to discover for themselves the concepts and facts contained in the biology material. Finding concepts in biology requires direct observation of biological objects. This study aimed to describe generic science skills among class X students at SMAN 1 Daha Utara. The research was conducted using a descriptive method. The description of students' generic science skills was obtained from filling out the questionnaire distributed to students. The generic science skills questionnaire used uses aspects that refer to Brotosiswoyo in 2001, which contain direct observation, indirect observation, awareness of scales, symbolic language, a framework of mind obeying the principles of natural law, logical inference, the law of cause and effect, mathematical modeling, and building the concept. This study took the population of all class X students of SMAN 1 Daha Utara. The sample for this study took 98 students randomly from six classes, namely classes X1-X6. This study uses data analysis techniques that are carried out by categorizing test results based on low, medium, and high categories. Based on the results of this study, it appears that students' generic science skills are included in the high category.

Keywords: Generic Science Skills; Learning Biology; SMAN 1 Daha Utara

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INTRODUCTION
After the COVID-19 pandemic, there was a change in teaching and learning activities. This impacts the learning process, which was initially carried out remotely by utilizing online learning so that students are required to learn independently. The learning process is carried out by utilizing the internet as a technology to access various learning applications so that the assessment of students depends on learning mastery (Irianti et al., 2023). After the COVID-19 pandemic subsided, learning was repeated with a hybrid learning system until things returned to normal. This affects students' cognitive abilities because there is a change in the learning

process from initially studying independently from home without direct teacher guidance to learning in the classroom face to-face with the teacher. According to Kahfi (2021), the impact on children's cognitive development is disrupted due to the impact of online learning. This is because online learning can cause boredom, affecting children's cognitive development. In addition, online learning can also cause students to become passive, less creative, and unproductive. The accumulation of information and concepts for students is less useful, so they can experience stress. Thus, this surely can lead to disruption of the cognitive development of students.

Generic science skills are related to students' ability to solve problems in learning. The ability of students to solve this problem is different for each student and is closely related to their cognitive abilities. Generic science skills are the ability to think and act based on the knowledge possessed by individuals. Every human being has generic science skills that need to be developed along with the development of the human brain. Increasing generic science skills is suitable to be applied to upper secondary level students who are no longer considered small children and can find their solutions when faced with problems, especially problems regarding learning problems. In addition, doing a job based on one's knowledge and is supported by the work attitude demanded by the job (Martiningsih et al., 2018; Putra et al., 2021).

Generic science skills are closely related to biology subjects. This is because biology itself is part of science lessons. However, what needs to be considered is that learning science, including biology, requires good cognitive abilities. Learning science requires skills in solving problems related to learning about natural sciences, including biology, so generic science

skills are very important to train students.

Biology is a science related to finding out and understanding the environment and living things systematically (Murtiningsih et al., 2018), which means that biology is a science that allows students to discover for themselves the concepts and facts contained in the biological material. Biological material has characteristics in the form of facts, concepts, principles, and processes of living symptoms and intricacies that affect life, including its interactions with the environment (Hasruddin, 2009). Biology subjects contain material that is relatively easy to learn because the examples and phenomena are from life. However, the character students in Indonesia have a mindset that tends to be a process of remembering activities when studying biology (Kurniawan et al., 2018). Therefore, the teaching and learning process must lead to training students to explain information in their own words so that, through this process, students understand the lesson (Lestari et al., 2018). One of the learning materials in science, including biology that requires students to memorize and understand concepts is the human movement system (Ikhsan et al., 2016).

SMAN 1 Daha Utara is a high school level educational unit located in the North Daha sub-district, Hulu Sungai Selatan Regency, South Kalimantan. Learning at SMAN 1 Daha Utara is carried out a full day a week. It is carried out for five days. The facilities and infrastructure at SMAN 1 Daha Utara are equipped with a library room and laboratory room.

Based on related research by Hasian et al. (2020) regarding the development of motion system animation media based on the POE model to improve understanding of generic science concepts and skills and Ayuningtyas et al. (2022) on the effect of digital

modules on Culture Literacy Digital Wetland (CLDW) mushroom concepts on students' generic science skills, student responses during the use of integrated modules in CLDW are in the agreed category in the effect of implementing CLDW digital modules on students' generic science skills. According to the results of research by Safitri et al. (2022), which examined learning outcomes and generic science skills in the use of culture literacy digital wetland LKPD vertebrate concepts for class X SMA students, the use of CLDW LKPD had a significant influence on the cognitive learning outcomes of class X SMA students 4 Banjarmasin on sub-concepts of vertebrate material. The same thing was also researched by Rusminah et al. (2022), who examined the effect of using digital handouts on the sub-concept of vertebrate animals on student learning outcomes, showing that the use of digital handouts was appropriate for use in the biology learning process because it got very favorable responses and had an effect on students learning results on the vertebrate animal sub-concepts.

Based on the problems and related research, the authors wanted to examine the profile of the generic science skills of class X students at SMAN 1 Daha Utara to describe the state of the generic science skills of students in class X SMAN 1 Daha Utara in learning biology.

METHOD
The researchers used quantitative research using descriptive methods. This descriptive research aims to explore and examine data from conditions that occur in the field. This is in line with Margaretha's explanation (2013) that the descriptive method is a research method used to show current or ongoing problems, aiming to describe what happened as it should have been when the research was conducted.

The data from this study were taken from the population, which provides an overview of the state of the generic science skills of class X students of SMAN 1 Daha Utara in biology for the 2022–2023 academic year. The research was conducted in class X SMAN 1 Daha Utara class of 2022 by taking the population of all class X students at SMAN 1 Daha Utara. The research sample took 98 students randomly from six classes, namely X1-X6. Random sampling aims to obtain results close to or representative of the population and can represent unbiased data from the total population.

The description of students' generic science skills was obtained from filling out the questionnaire distributed to students. The generic science skills questionnaire used has predetermined aspects. Aspects of the generic science skills applied in the research refer to Brotosiswoyo 2001, which contains direct observation, indirect observation, awareness of scales, symbolic language, a framework of mind obeying the principles of natural law, logical inference, the law of cause and effect, mathematical modeling, and building a draft. The generic science skills indicators used in this study are listed in Table 1.

Table 1 Indicators of Generic Science Skills

No.	Aspect	Indicator	Number of Item
1.	Indirect observation	▪ Using measuring instruments as sensory aids in observing natural phenomena/experiments ▪ Collecting facts from physics experiments or natural phenomena ▪ Looking for differences and similarities	1
2.	Awareness of size	▪ Being aware of natural objects and having a	2

No.	Aspect	Indicator	Number of Item
		high sensitivity to numerical scales as quantities/measures on microscopic and macroscopic scales	
3.	Symbolic language	▪ Explaining symbols, symbols, and terms ▪ Explaining the quantitative meaning of the units and quantities of the equation ▪ Using mathematical rules to solve problems/natural phenomena ▪ Reading a graph/diagram, table, and mathematical signs	3
4.	The logical framework adheres to the principles of natural law	▪ Searching for a logical relationship between two rules	4
5.	Logical inference	▪ Understanding the rules ▪ Arguing based on rules ▪ Describing the problem based on the rules ▪ Drawing conclusions from a symptom based on previous legal rules/laws	5
6.	The law of cause and effect	▪ Stating the relationship between two or more variables in a particular natural phenomenon ▪ Estimating the causes of natural phenomena	6
7.	Mathematical modeling	▪ Revealing phenomena/problems in the form of picture/graphic sketches ▪ Revealing phenomena in the form of formulas ▪ Proposing alternative solutions to problems	7
8.	Building concept	▪ Adding a new concept	8

(Source: processed from primary data)

The data collection technique was carried out by filling out a questionnaire by the students as participants. The questionnaire contained questions that were answered by selecting one of the answers according to the answer options presented. The correct answer is answered according to the answer key that has been determined. The questions contain all aspects of generic science skills. The questionnaire was distributed randomly to 98 students in the tenth grade.

After obtaining the results from the description of the research data, the score was categorized according to the generic scientific ability level. The categorization was based on each subject's hypothetical mean value and standard deviation, with the categorization intervals depicted in Table 2.

Table 2 Interval Categorization of Generic Science Skill Levels

Formula	Category
$X < M - 1.SD$	Low
$M - SD \leq X \leq M+1.SD$	Average
$M+1.SD \leq x$	High

(Azwar, 2012)

The results of the observations were then analyzed based on each student's total score and then determined the category of generic science skill scores.

Table 3 is a guideline for the range of values of generic science skills for eight questions.

Table 3 Guidelines for The Range of Values for Generic Science Skills for A Total of Eight Questions

Range of Scores	Category
X < 20	Low
$20 \leq X \leq 30$	Average
$30 \leq x$	High

(Source: processed from primary data)

The stages carried out in the research include the initial stage, the core stage, and the final stage. The first stage was the initial stage by making a research design and compiling research instruments. The second stage was the stage in the field by filling out a questionnaire based on the indicators set for students. The final stage was carried out by analyzing the data from the questionnaire that had been distributed. The data were analyzed through the first stage, namely by scoring. The second stage was to categorize it into three categories: low, medium and high. The third stage was to perform calculations on the data, and then the results were made in the form of a table showing the number of data frequencies and the percentage of each category. The fourth stage was analyzing the data. The fifth stage was making conclusions based on data analysis. The next stage was to compile a report on the research results.

RESULTS AND DISCUSSION

The following are the data analysis findings regarding the percentage of students' Generic Science Skills in implementing biology learning based on the questionnaire. Table 4 shows the percentage of students' General Science Skills features based on the results of the questionnaire data analysis.

Table 4 Table of Results of Generic Science Skills

Interval	Category	Frequency	Percentage
X - 3,33	Low	23	23%
$3,33 \leq X \leq 4,67$	Average	12	12%
X > 4,67	High	63	64%

In Table 4 on the aspects of Generic Science Skills, the percentage results for the low, medium and high categories were obtained. The number of students in the low category is 23 people, with a percentage value of 23%, and the number of students in the medium category is 12 people, with a moderate category percentage value of 12%. In the high category, there are 63 people, with a percentage of 64%. Based on Table 4, the highest percentage of Generic Science Skill scores is in the high category, with a frequency of 63 with a percentage of 64%.

Generic science skills refer to a person's aptitude in essential life topics such as problem-solving, logical thinking, curiosity, and communication. As human beings pursuing an educational stage at school, learners have generic science skills that differ for each

individual, both in problem-solving and understanding in learning. Students' ability to solve this problem is highly related to their cognitive capacities. Generic Science Skills (GSS) are the abilities of humans to think and act depending on their knowledge. Every human being possesses generic science skills that must be developed alongside the growth of the human brain. Improving generic science abilities is appropriate for upper-secondary level students who are no longer regarded as tiny children and can find answers to their own when presented with problems, particularly problems related to learning. Furthermore, performing a job is based on one's expertise and backed by the work attitude required by the job (Martiningsih, 2018; Putra et al., 2021).

According to Kamsah (2004), generic abilities are employability skills utilized to apply knowledge. Thus, generic abilities are also required in a variety of domains of business and life. Furthermore, generic skills are talents that arise from combining intellectual abilities and psychomotor skills to develop attitudes that will last a lifetime. Generic skills can be an integrative solution concerning cognitive, emotional, and psychomotor qualities that students can learn and instil. Thinking skills such as logical and analytical reasoning, problem-solving, and intellectual curiosity; effective communication skills, collaboration skills, and the ability to identify, access, and organize knowledge and information; personal traits such as imagination, creative and intellectual rigidity, and values such as ethics, tenacity, integrity, and tolerance are all examples of generic skills. Meanwhile, generic skills or abilities are capabilities that may be used in various professions and take a long time to develop (Rosidah et al., 2017).

Every learning can be done by applying generic science abilities (Utami

et al., 2023). One of them is learning biology. Biology is a subject that explores the concept of living things, and it is transferred through the learning process by completing practicum and direct observation. This is consistent with Afcariono's (2008) claim that learning biology entails doing something, knowing something, and solving difficulties linked to learning biology.

The online biology learning process used during the pandemic affected student learning outcomes. This is considering online learning requires students to study independently and provides less direction from the teacher than offline learning, making online learning less successful. According to Ula et al. (2021), adopting online learning has its own obstacles for educational actors, such as instructors, students, institutions, and even the wider community, such as parents. In practice, instructors must discover strategies to impart learning material while still being easily accepted by students. Similarly, students must be able to adjust to settings and conditions such as today, one of which is mental preparation.

Online learning, sometimes known as distance learning, is a type of technology-based learning in which learning materials are provided electronically to students via a computer network. According to the government, online learning is the most effective approach to conduct learning in a pandemic like today. Many students, however, grumble about online learning because it is less effective. So far, inadequate mastery of information and communication technology gadgets has been a concern in Indonesian education. This influences students' ability to access varied knowledge, resulting in the advancement of the world in general and education in particular (Nureza, 2020). Google Classroom is one of the learning media utilized during a pandemic, since

using Google Classroom as an online learning medium is less effective in meeting learning objectives. This is due to many factors, including the teacher's lack of explanation of the material, students' lack of understanding of the material being taught, the influence of internet (network) signals on the learning process, and parents' busyness, which results in students being less attentive to doing this online (Khovivah et al., 2021).

The use of online or distance education impacts how practicums are implemented. It can be seen that practicum plays an important role in science learning because it can demonstrate the concept of a theory that has been applied. In its activities, many applications of science process skills and an increase in scientific attitudes encourage students to gain insight (Ariani & Widodo, 2022). Practicum becomes highly significant in supporting learning and focusing on process factors. This is based on the goals of science learning as a process of developing thinking skills and improving generic science skills such as direct observation, indirect observation, scale understanding, ability to use symbolic language, ability to think in terms of principles, ability to logical inference, ability to master the law of cause and effect, ability to create mathematical models, and ability to form abstract concepts (Brotosiswoyo, 2001).

The main obstacle experienced by teachers and students is limited facilities and infrastructure because practicums are carried out in their respective homes. Teachers have difficulty guiding and observing the process of taking a practicum online. This causes students to experience difficulties doing practicum, and many misunderstandings occur. Another obstacle is the practicum method, which is not varied, making students feel objectionable and bored (Ariani & Widodo, 2022). This is in line with Khusnah's research (2020), which

explains that most teachers have difficulty making practicum methods online due to a lack of knowledge and skills in using technology.

Practical implementation must be carried out because it can increase students' understanding. This is in line with the findings of Kastawaningtyas & Martini's (2017) study, which claims that 97% of students have more control over the material the teacher teaches through practicum activities. Students feel happy and more interested when there are observational and practicum activities because, through these activities, students can learn new things by practising directly based on the material obtained (Kastawaningtyas & Martini, 2017). Based on this, online learning makes students feel bored during learning. Students only sit in front of the screen and do the teacher's assignments. Meanwhile, practicum activities and direct observations that increase students' learning motivation are rarely carried out. According to Novia et al. (2020), the drawbacks of learning lie in the speed of the feedback process; the teacher's preparation time is longer and has the potential to decrease feelings of comfort, anxiety, and confusion. Based on the results of research by Ula et al., (2020), regarding the effect of using technology during the COVID-19 pandemic on learning outcomes in biology subjects at MAN 2 Jember, it also shows that students at MAN 2 Jember feel boredom in online learning. This is because comfort in the learning process is very supportive regarding the success rate of student achievement during the COVID-19 pandemic. So to improve generic science skills they can be realized through learning that is carried out offline, one of which is through practicum activities. This is because practicum activities can train students' generic science skills. In addition, practicum activities make students motivated to learn because they can

make direct observations and discover new things.

Based on the research results, it was found that 64% of students had generic science skills in the high category. 12% of students have generic science skills in the medium category and 23% in the low category. Based on these results, it is known that the learning outcomes of students, as seen from the results of the generic science skills test after the COVID-19 pandemic, are at a very good level. This is based on the magnitude of the results: the percentage of students' generic science skills is in the high category, namely 64%. While in the medium category and low category, only a few, namely 12% and 23%, so can be seen that the learning process of students offline after the COVID-19 pandemic in schools is running effectively. This is because the learning process is carried out face-to-face with the teacher, and practicum and observation processes can be carried out directly and with guidance from the teacher so that students can understand learning. In addition, practical activities and direct observations carried out in biology learning at schools after the Covid-19 pandemic trained students in generic science skills to be good. So it can be concluded that learning generic science skills for class X students at SMAN 1 Daha Utara has a high category after the Covid-19 pandemic.

CONCLUSION

The results of the students' generic science skills questionnaire test in biology learning in class X SMAN 1 Daha Utara are in the high category, referring to the research done. The researchers hope this research will serve as a useful resource for those interested in the general science skill profile of biology class X SMAN 1 Daha Utara students. Further studies are needed regarding the relationship between online learning processes and improving generic science skills to deepen the study of the correlation between generic science skills and the learning process.

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