Proceeding books:
The 2nd International Conference of Education on Science, Technology, Engineering, and Mathematics (ICE-STEM 2020)

Profile of science process skills of class x high school students in Sragen district based on the teaching experience of teachers

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ABSTRACT

The research aimed to determine the profile of science process skills, to know mastery aspects of science process skills, and to know profile of science process skills in terms of the teaching experience of teachers. This research was a descriptive qualitative survey method research. The research population was grade X students from six high schools in Sragen Regency, Central Java Province. The sample was 198 students and 6 biology teachers. Data collection on science process skills with confirmatory tests and teacher interviews. The results show that science process skills in Sragen Regency are in the moderate category with an average of 19.22 out of a total score of 32, the highest mastery of aspects science process skills are communicating and predicting, while the lowest aspects are identifying variables, collecting and processing data. There is a relationship between the profile of science process skills in Sragen Regency with teaching experience.

Keywords: Profile of science process skills, teaching experience, teachers

INTRODUCTION

The demands and challenges that exist in the 21st century have an impact on changes in learning patterns that exist in education in Indonesia. Education must be able to develop competent human resources who have competitiveness. There are six competencies to face the challenges of the 21st century that must be developed through education, namely the ability to think critically and solve problems, the ability to communicate and work together, the ability to create and renew, the literacy of information and communication technology, the ability to learn contextually and the ability of information and media literacy [1].

Education in Indonesia has not reached the six competencies of the 21st century optimally. This is proven by the results of the 2018 PISA survey and the 2015 TIMSS. According to the results of the 2018 PISA survey, students' scientific ability in Indonesia only has a score of 396 and is ranked 69th out of 71 countries surveyed by PISA. Meanwhile, according to the 2015 TIMSS survey results which showed the achievements of Indonesian science earned a score of 397. Indonesia ranked 36th out of 39 countries surveyed by TIMSS. This means that on average Indonesian students in the field of science are only able to recognize some fundamentals of science but have not been able to apply complex and abstract concepts, and the ability to think of high-level Indonesian students is still low.

Science, including biology, is one that has a significant role and opportunity to prepare qualified and competent human resources. Biology is not only characterized by a collection of knowledge in the form of facts, concepts, or principles, but also is characterized by the existence of scientific methods, scientific work, values, and scientific attitudes [2]. The scientific processes involved in learning biology are known as science process skills. Science process skills are scientific skills that allow students to discover new concepts themselves. The science process skills are needed by students because they can develop students' thinking abilities and creativity in learning. Besides, students will actively develop and apply their abilities to solve problems according to their capacity and level of thought development [3].

Science process skills are divided into two, namely basic science process skills which include the ability to observe, predict, conclude, group, communicate, and take measurements. While integrated science process skills include identifying variables, making hypotheses, analyzing investigations, making data tabulations, identifying variables, planning and conducting investigations [4].

The implementation of learning science process skills is inseparable from the role of the teacher who is a learning planner and implementer in schools. The teacher is one of the main factors determining the success of science process skills possessed by students. Through teachers, science process skills are introduced and developed by students in biology learning [5]. Based on the results of research [6] shows that the longer the teacher teaches the more professionalism and teaching ability increases. These factors are assumed to be influential in teachers implementing science process skills-based learning.

Teachers can improve their skills in carrying out science process skills-based learning through participation in training, discussions, seminars, research, certification, and participation in MGMP activities. The activity gives teachers knowledge of how learning and assessment of science process skills should be taught to students so that students master science process skills.

This study aims to analyze the mastery of class X science process skills reviewed based on the teaching experience of teachers. The teacher is a planner for learning activities based on science process skills for students. Class X is the first-class level in senior high education so that information on science process skills in class X is very important as an evaluation material.

This research is important because so far it has not been known with certainty the science process skills of high school students in Sragen District. In addition to describing the science process capability profile of the students, they also analyzed the relationship between the teaching experience of teachers variable and the profile of the science process skills of class X students. The results of this study are expected to be the main information for the Education Office in Sragen District to prepare students for the 21st century.

RESEARCH METHOD

This research uses quantitative descriptive methods using survey methods. This research was conducted in six high schools in Sragen District which were selected based on the teaching experience of class X teachers, namely SMA N 1 Sragen, SMA N 2 Sragen, SMA N 3 Sragen, SMAN 1 Gondang, SMA N 1 Plupuh, SMAN 1 Gemolong. The population of this study was students of class X in six high schools in Sragen District and six class X teachers selected. Student and teacher research samples were taken by cluster sampling technique with a total sample of 198 class X students and 6 biology teachers.

Data collection techniques in the form of test and non-test instruments. The test instrument was in the form of a confirmatory test of science process skills on biology as many as 32 questions given to class X students and non-test instruments in the form of an interview sheet and questionnaire to find out the teacher's teaching experience given to class X teachers.

The data analysis technique used to determine the value of the mastery of science process skills is to analyze the answer data by manually checking. If the correct answer gets a score of 1 and if the wrong answer is given a score of 0. The maximum score obtained is 32 while the minimum score is 0. The score data obtained is then average and is used to analyze the profile of the whole sample with categories [7].

Table 1. Science process skill profile categories

Categories	Science process skill scores
Low	0 – 10.66
Medium	10.67 – 21.33
High	21.34 - 32

This category is useful for interpreting the level of mastery of students' science process skills. While the percentage of mastery of science process skills is calculated by the calculation formula [8].

NP = $R/_{SM}$ x 100%

Information:
NP = percentage value of science process skill mastery in every aspect
R = true total score of every aspect
SM = maximum score on every aspect of science process skills

The percentage of values obtained by students for each aspect of science process skills is grouped into criteria [8].

Table 2. Criteria for mastery of each aspect of science process skills

Percentage (%)	Criteria
86 – 100	Very high
76 – 85	High
60 – 75	Medium
55 – 59	Low
≤ 54	Very low

The results of science process skills scores were analyzed descriptive statistics to get the average score, standard deviation, lowest score, highest score, and the number of samples in each rombel (study group), especially to see trends and the distribution of science process skills profiles in general. The relation of teachers' teaching experience can be known by comparing the results of the average score of science process skills obtained by students reviewed based on the teaching experience of biology teachers in class X high school.

RESULTS AND DISCUSSION

The results of this study describe the field conditions empirically through quantitative data in the form of written test results. Data on the measurement results of the science process skills of students in SMA Sragen District in table 3.

Table 3. Results of science process skills test for class X students in Sragen District.

Codes	Schools	N	$\bar{y} \pm s$	Max	Min	Categories
A	SMAN 1 Sragen	32	23,62 ± 3,20	30	18	High
B	SMAN 2 Sragen	32	21,90 ± 2,57	26	16	High
C	SMAN 3 Sragen	34	15,20 ± 2,18	18	11	Medium
D	SMAN 1 Gondang	36	17,81 ± 2,81	20	14	Medium
E	SMAN 1 Plupuh	30	15,43 ± 1,89	18	12	Medium
F	SMAN 1 Gemolong	34	21,38 ± 1,81	24	16	High
	Total	198	19,22 ± 2,41	30	11	Medium

Information:
N = number of students taking the test
Min = lowest score
Max = highest score
$\bar{y}$ = average score
s = standard deviation

Table 3 explains the profile of class X science process skills in Sragen District high school which is classified as medium, shown by the average score of 19.22 from a total score of 32. Students who score 30 indicate students have high science process skills, meaning that students have mastered the process skills science, while students who score 11 show that students have moderate science process skills, meaning that students have enough mastery of science process skills. This means that learning biology can develop science process skills in class X students but is not optimal and evenly distributed because there is a difference between the highest and lowest scores which is quite far i.e. 19. The standard deviation obtained by 2.41 indicates that the general profile of science process skills in Sragen District High School is quite varied, seen in SMA A has a higher standard deviation than other high schools, this means students in SMA A have more mastery of science process skills than students from other schools. The ability of high school students' science process skills should be already high, considering that according [9] based on Piaget's theory high school students are at the formal operational stage. This means students can think abstractly in developing ideas and thoughts to solve biological problems. But the fact that the varied scores in several high schools in Sragen District show the uneven level of students' ability in science process skills. According to [10], science process skills are still less than optimal for students, one of which is caused by teachers who teach more concepts in the learning process through the transfer of knowledge and examples that students tend to memorize so students cannot develop their science process skills with maximum.
The results of research on the percentage of mastery of aspects of science process skills in class X SMA Sragen District are in table 4.

Table 4. Percentage of mastery of various aspects of science process skills in class X high school students of Sragen District.

Codes	Aspects	Percentage of mastery (%)	Categories
A.	Observing	76	High
B.	Communicating	83	High
C.	Classifying	62	Medium
D.	Measuring	76	High
E.	Concluding	48	Very low
F.	Predicting	78	High
G.	Identifying variables	43	Very low
H.	Making a table	63	Medium
I.	Making a chart	63	Medium
J.	Describing between variables	76	High
K.	Collecting and processing data	40	Very low
L.	Analyzing research results	54	Very low
M.	Constructing a hypothesis	52	Very low
N.	Establishing operational variables	76	High
O.	Arranging experiments	68	Medium
P.	Carrying out an experiment	52	Very low

Information
Very high = very good at mastering science process skills
High = good at mastering science process skills
Medium = enough to master the science process skills
Low = lack of knowledge of science process skills
Very low = very little knowledge of science process skills

Based on table 4 the highest mastery of science process skills is the communication aspect 83%, and the prediction is 78%. This proves students master the science process skills well in communicating and predicting aspects. In the communicating aspect, following the results of the biology teacher interview that the learning process in the classroom uses more discussion and presentation methods. According [11], the discussion method makes students creative, active and skilled both in thinking and skilled in gaining knowledge. Based on this the teacher's habit of using the discussion method can develop students' communication skills. While predicting skills are skills in predicting the results to be obtained in an experiment. This proves that teachers do quite often do practical activities so that students' ability to predict is good.

Very low mastery of science process skills is an aspect of identifying the 43% variable, gathering and processing 40% data. This proves that students are very lacking in science process skills in aspects of identifying variables, collecting and processing data. The aspect of identifying variables is still low due to the lack of recognition and training to distinguish variables by teachers. Based on the results of the interview the practicum activities are already equipped with practical manuals made by the teacher, and students just do the practicum according to the guidelines of the book, so the ability to distinguish variables is still less than optimal. Meanwhile, the skills to collect and process data are still very lacking because in practicum activities students are accustomed to groups so that they tend to only rely on other group members to collect or process data, so these skills are less than optimal. The difference in teacher teaching experience to the ability of science process skills is shown in table 5.

Table 5. Profile of science process skills in class X SMA Sragen District based on teachers' teaching experience

Codes	Schools	Teaching Experience	N	$\bar{y} \pm s$	Max	Min	Categories
A	SMAN 1 Sragen	28	32	23,62 ± 3,20	30	18	High
B	SMAN 2 Sragen	24	32	21,90 ± 2,57	26	16	High
F	SMAN 1 Gemolong	21	34	21,38 ± 1,81	24	16	High
C	SMAN 3 Sragen	17	34	15,20 ± 2,18	18	11	Medium
E	SMAN 1 Plupuh	9	30	15,43 ± 1,89	18	12	Medium
D	SMAN 1 Gondang	5	36	17,81 ± 2,81	20	14	Medium

Information:
N = number of students taking the test
Min = lowest score
Max = highest score

ȳ = average score
s = standard deviation

Table 5 shows that teachers who have taught more than 20 years, namely SMA A, B, F, have high science process skills in their students, whereas teachers who have less than 20 years of teaching namely SMA C, E, D have high science process skills. Is on the students. The longer the teacher teaches the more frequent activities in the form of training, and MGMP and the more experience they have so that it also has an impact on the learning process in the classroom. According to [12], the process of learning biology is a system whose components cannot be separated namely raw input (students), instrumental input (curriculum, teacher, learning resources, media, methods, learning infrastructure), environmental (environment) and output (output results).

CONCLUSIONS

Based on the results of research on "Profile of Science Process Skills of Class X High School Students in Sragen District Based on The Teaching Experience of Teachers" it can be concluded that the science learning process of high school grade X students in Sragen District was in the moderate category with an average value of 19.22 out of a total score of 32, mastery aspects of the science process fields on the subject of the highest level of high school class X students in Sragen is communicating and predicting. The lowest aspects are identifying variables, acquiring and processing data, there is found the relationship between the profile of science process skills with the teaching experience of biology teachers.

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