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Gender analysis in measurement materials: Critical thinking ability and science processing skills

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ABSTRACT

This study aims to determine whether there is a relationship and difference between science process skills and students' critical thinking skills based on gender. This type of research is descriptive quantitative research. The instruments used observation sheets and essay test questions. The sampling technique used was purposive sampling with samples of 90 students. The data analysis technique used by the researcher was descriptive statistics of Pearson Correlation and ANOVA tests. The results obtained were that the science process skills of students at SMPN 2 Batanghari were classified as good and dominated by female students with a percentage of 80.4%. Critical thinking skills were dominated by female students with a percentage of 32.6% (very critical). Then, there was a significant relationship between science process skills and students' critical thinking skills. Then, in the ANOVA test, male and female students' p-values of science process skills and critical thinking skills were less than 0.05. Therefore, there was a difference between the scientific process and the critical thinking skills of female and male students. This research is expected to contribute to schools and further research to improve learning methods that support critical thinking and science process skills.

INTRODUCTION

The practical activity becomes a process of scientific inquiry in physics learning that emphasizes the process aspect (Siswanto et al., 2016). Measurement materials aim to encourage students to have good learning outcomes and to understand and possess skills, meaningful theory, and experience (Jufrida et al., 2019; Matondang et al., 2021; Rosdianto & Teeka, 2019; Yolvianysah et al., 2021). Practical activities involving students directly are much better in increasing mastery of concepts and impact the absorption process of long-term memory. Long-term memory is very helpful for developing students' abilities, especially in improving academic quality (Dewi & Sadia, 2013; Sari et al., 2015; Musdalifah, 2019). From practicum activities, a teacher can see students' science process skills because, in practicum activities, students carry out activities that are indicators of science process skills (Sari et al., 2017; Servitri & Trisnawaty, 2018; Siswanto, et al., 2016).

Science process skills are an important aspect that students must possess because process skills are one of the things contained in the 2013 curriculum (Simamora et al., 2020). Science process skills refer to aspects of skills and knowledge that can create a meaningful learning (Ambrosio, 1985; Ambross et al., 2015). There are 16 indicators of science process skills, namely observing, communicating, classifying, measuring, inference, predicting, identifying variables, making tables, making graphs, identifying relationships between variables, data collection, and processing, research analysis, forming hypotheses, identifying variables operationally, designing experiments and conducting experiments (Rezba et al., 2007; Darmaji et al., 2019; Solé-Llussà et al., 2019; Mutlu, 2020). Science process skills are believed to be able to train students' critical thinking skills (Matondang et al., 2021; Yolvianysah et al., 2021).

Thinking skills need to be trained for students to be able to face 21st-century learning. Critical thinking skills are high-order thinking skills that involve activities such as; analyzing, synthesizing, considering, creating, and applying new knowledge to real-world situations (Berg, 2004; Darhim et al., 2020; Khaldun et al., 2019; Redhana, 2012; Rosidin et al., 2019). People with critical thinking skills can find, understand, and express statements by analyzing logical, rational, and reasoning thinking in the decision-making process (Arini & Juliadi, 2018; Shaw et al., 2020). According to Ennis (1985) dan Tanti et al., (2020), the indicators of critical thinking skills are as follows; elementary clarification, basic Support, inference, advanced clarification, strategy and tactic. Critical thinking and science process skills are closely related (Chen et al., 2021; Fitriani et al., 2021; Putri et al., 2021).

Science process skills involve students in direct experiments, so students can be trained in thinking and understanding concepts (Kurniawan, et al., 2019). When students can understand concepts, provide simple and advanced explanations, analyze arguments and conclude, then the student can have critical thinking skills (Dewi et al., 2017; Kholilah et al., 2020).

The relevant research was conducted by Chen et al., (2021), who only described the results of critical thinking skills. Furthermore, research only identifies that practicum activities can improve science process skills and critical thinking skills. Research by Kurniawan et al., (2020) only examines the relationship between science process skills and critical thinking skills. Gender can be called a differentiating factor in one's abilities, such as learning in the classroom (Heeg & Avraamidou, 2021; Ikonen et al., 2019; Sultan et al., 2020). Based on research (Bhagat & Chang, 2018; Daher et al., 2021; Gulacar et al., 2019), female students are more active than male students. However, male students are more talented in science than female students (Bustami et al., 2020; Ikonen et al., 2019; Lee & Kung, 2018).

Therefore, based on some of the studies above, many studies have discussed science process skills and critical thinking skills and the relationship between them. However, there has been no research linking the science process and critical thinking skills, and no one has seen how they differ when viewed by gender. Therefore, what is new in this research is that this research identifies the relationship between science process skills and critical thinking skills and looks at the differences analyzed based on the gender of students.

Based on the description above, the purpose of this study is to find out whether there is a relationship between science process skills and critical thinking skills at SMPN 2 Batanghari and to be able to see the difference between science process skills and critical thinking skills of class VII 1, 2, and 3 students.

METHODS

Quantitative research is research that conducts studies on samples, populations, research instruments, data collection, statistical analysis, and experimental methods (Mauliza & Nurhafidhah, 2018; Tanti et al., 2020). The design of this research was the descriptive quantitative research design through experimental methods. The type of experiment used by the researcher was quasi-experimental with posttest only control group design. It is said to be a quasi-experiment because there are still many variables that cannot be controlled. The only control group design is a research design using only a posttest. The results are analyzed to see the success of the research (Payadnya & Jayantika, 2018).

Quantitative research data comes from observations or distributed test questionnaires (Mauliza & Nurhafidhah, 2018). Quantitative data collection techniques in this study were the observation sheet instrument of science process skills and essay test instruments which consisted of five items. In assessing the observation sheet, the researcher was assisted by 15 observers. In the experiment, the researcher held practical activities to assess science process skills in several sessions and at the end of the activity, students were given an essay test sheet that included indicators of critical thinking skills. According to research by Rini (2022), the intervals for the categories of critical thinking and science process skills are shown in Table 1.

Table 1. Category of Science Processing Skills and Critical Thinking Ability

Science Process Skills		Critical Thinking		Gender
Interval	**Category**	**Interval**	**Category**	
33 – 57,75	Poor	0,0 – 5,4	Very Not Critical	
57,76 – 82,51	Low	5,5 – 10,4	Not Critical	Male
82,52 – 107,27	Good	10,5 – 16,4	Critical	
107,28 – 132,03	Excellent	16,5 – 21,5	Very Critical	

Source: (Rini, 2022)

Science process skills are also tested based on indicators of basic and integrated science process skills. Here the researchers adjusted the indicators and the syllabus for natural science subjects in junior high school so that researchers only took three indicators of basic science process skills and three indicators of integrated science process skills. According to research by Rini (2022), the intervals for the category of science process skills based on indicators of basic and integrated skills are shown in table 2.

Table 2. Category of Basic and Integrated Science Processing Skills

Indicator	Category				Gender
	Poor	**Low**	**Good**	**Excellent**	
Observation	7 – 12,3	12,4 – 17,7	17,8 – 23,1	23,2 – 28,5	
Measuring	7 – 12,3	2,4 – 17,7	17,8 – 23,1	23,2 – 28,5	Male and Female
Conclusion	6 – 10,5	0,6 – 15,1	15,2 – 19,7	19,8 – 24,3	
Doing experiments	8 - 14	14,1 – 20,1	20,2 – 26,2	26,3 – 32,3	
Collect and organize data	1 – 1,8	1,9 – 2,7	2,8 – 3,6	3,7 – 4,5	Male and Female
Compile data table	4 - 7	7,1 – 10,1	10,2 – 13,2	13,3 – 16,3	

The sample is part of the population members taken through certain characteristics that represent the population (Lestari et al., 2017). The sampling technique used by the researchers was purposive sampling. Purposive sampling is appointing a sample based on the researcher's criteria. Meanwhile, the sampling criteria are based on school accreditation; the school is a public school; researchers can still reach the location, and the sample required is class VII students. Based on these criteria, the samples in this study were 90 students of classes VII 1, VII 2, and VII 3 at SMPN 2 Batanghari.

Then, the data obtained was analyzed and calculated through the IBM SPSS Statistic 23 software with descriptive statistics and parametric inferential statistics in the form of assumption testing and hypothesis testing (Syahrial et al., 2019). Descriptive statistics calculate the minimum value, maximum value, mode, mean, median, and frequency (Santoso, 2018; Syahrial et al., 2019; Syaiful et al., 2020). Meanwhile, the inferential statistical test in this study used the correlation test and the ANOVA test by going through the correlation prerequisite test, which included a normality test and linearity test, while the

ANOVA test had to go through a prerequisite test which included a normality test and homogeneous test (Sianturi et al., 2015; Smith & Larson, 2016; Tentama & Abdussalam, 2020; Tentama & Arridha, 2020). Interpretation of data for normality, linearity, and homogeneity tests: The data is said to be normal, linear, and homogeneous if the significance value is greater than 0,05. The data is said to be abnormal, not linear and not homogeneous if the significance value is less than 0,05 (As'ari, 2018; Kurnia et al., 2016).

According to Hulu and Sinaga (2019) and Setiya et al. (2020), decision-making in the Pearson correlation test is as follows; (1) If the significance value is lower than 0.05, there is a significant correlation between the two variables; (2) If the significance value is > 0.05, there is no significant correlation between the two variables. When viewed from the Pearson correlation (r) grouping, the basis for making correlational decisions is as follows (Setiya et al. 2020); (1) The correlation is very weak in the range of 0,00–0,20; (2) The correlation is classified as weak in the range of 0,21 – 0,40; (3)The correlation is quite strong in the range 0,41 – 0,70; (4) The correlation is classified as very strong in the range 0,71 – 0,90; (5) The correlation is classified as very strong in the range of 0,91 – 0,99; (6) The correlation relationship is classified as very strong at a value of 1.

The decision-making criteria in the ANOVA test is that if the p-value is lower than 0.05, there is a significant difference (Hariningtyas, 2015; Imam, 2011). The design procedures carried out in this study are shown in Figure 1.

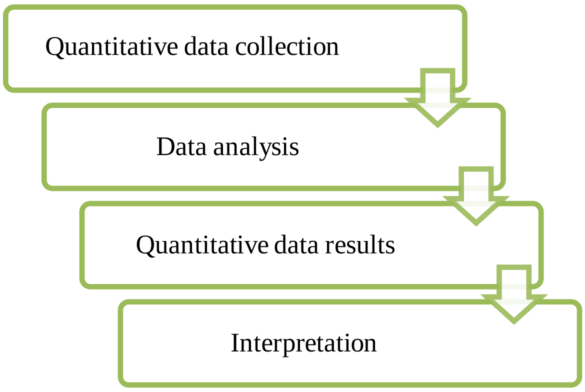

Figure 1. Research Procedure

RESULTS AND DISCUSSION

Results

The results of the description of students' science process skills can be seen in table 3.

Table 3. Description of Students' Science Process Skills

Interval	Category	Mean	Median	Modus	Min	Max	%	Gender
33 – 57,75	Poor						-	
57,76 – 82,51	Low						-	Male
82,2 – 107,27	Good	103,23	105	105	90	113	77,3	
107,28 – 132,03	Excellent						22,7	
33 – 57,75	Poor						-	
57,76 – 82,51	Low						-	Female
82,2 – 107,27	Good	103,33	104	106	92	116	80,4	
107,28 – 132,03	Excellent						19,6	

Table 3 shows the description of students' science process skills, where the first highest score of male science process skills is good with a percentage of 77.3%, and female students' science process skills are also good with a percentage of 80.4%. Meanwhile, the second highest score in the excellent category with the percentage of science process skills for male students is 22.7%, and for female students is 19.6%, with an average of 103.23 for male students and an average value of 103.33.

Students' science process skills are divided into two types, namely basic science process skills and integrated science process skills. In this study, the researcher adjusted the syllabus and also the material indicators for class VII on the measurement material. The researchers took three indicators consisting of observation, measurement and conclusions. Thus, the appropriate indicators of science process skills were obtained, namely, basic science process skills. Meanwhile, in integrated science process skills, researchers take indicators of conducting experiments, collecting and organizing data and compiling tables. And the percentage of mastery of basic and integrated science process skills is shown in tables 4 and 5.

Table 4. The Percentage of Mastering Basic Science Process Skills in Practicum

Indicator	Category				Gender
	Poor (%)	Low (%)	Good (%)	Excellent (%)	
Observation	0	2,3	97,7	0	Male
Measuring	0	0	63,6	36,4	
Conclusion	0	0	27,3	72,7	
Observation	0	0	100	0	Female
Measuring	0	0	65,2	34,8	
Conclusion	0	0	34,8	65,2	

Table 4 explains the mastery of basic science process skills, which include observation, measurement, and conclusion. The highest score is on the observation indicator with the percentage of male students' observation skills is 97.7% in the good category and 100% in the good category for female students' observation skills. The second highest score is found in the concluding indicator with the percentage of mastery of conclusion skills in male students is 72.7% in the excellent category and the percentage of skills in female students is 65.2% in the excellent category. Meanwhile, the indicators measuring both male and female students are categorized as good, with the percentage of mastery being 63.6% and 65.2%, respectively.

Table 5. The Percentage of Mastering Integrated Science Process Skills in Practicum

Indicator	Category				Gender
	Poor (%)	Low (%)	Good (%)	Excellent (%)	
Doing experiments Collect and	15,9	4,5	54,5	25,0	Male
organize data	0	18,2	52,3	29,5	
Compile data table	0	0	56,8	43,2	
Doing experiments Collect and	10,9	17,4	45,7	26,1	Female
organize data	0	6,5	56,5	37,0	
Compile data table	0	0	65,2	34,8	

The students' integrated science process skills can be seen in table 5, where the first highest score is found in the indicator of compiling data tables with the percentage of mastery of male students of 56.8% in the good category and mastery of compiling data tables for female students of 65.2% in the good category. The second highest score is mastery on the indicators of collecting and organizing data, the percentage of male students is 29.5% in the excellent category, and the percentage of mastery of female students is 37.0% in the excellent category. Meanwhile, there are still students who are not skilled in conducting experiments. For male students, the percentage of students who are not skilled in conducting experiments is 15.9% in the poor category. In comparison, female students who are not skilled in conducting experiments are 10.9% in the poor category.

Then, an essay test of students' critical thinking skills was carried out, the data was processed through a scoring rubric and analyzed through descriptive statistical tests, and the results were obtained in table 6.

Table 6. Description of Students' Critical Thinking

Interval	Category	Mean	Median	Modus	Min	Max	%	Gender
0,0 – 5	Very Not Critical						-	Male
5,5 – 10,5	Not Critical						15,9	
11 – 16	Critical	13,16	13	12	8	18	72,7	
16,5 – 21,5	Very Critical						11,4	
0,0 – 5	Very Not Critical						-	
5,5 – 10,5	Not Critical						2,2	Female
11 – 16	Critical	15,11	15	14	10	19	65,2	
16,5 – 21,5	Very Critical						32,6	

Table 6 above shows that 72.7% of male students are in the critical category, while 65.2% of female students are in the critical category. The average score for male students is 13.6, and for female students is 15.11. However, 32.6% of female students were more critical than male students.

Table 7. The result of the Normality Test

	Class	Sig.	Distribute	Gender
	VII 1	0,181	Normal	Male
SPS	VII 2	0,340	Normal	
	VII 3	0,137	Normal	
	VII 1	0,380	Normal	Female
SPS	VII 2	0,744	Normal	
	VII 3	0,151	Normal	
	VII 1	0,240	Normal	Male
CTA	VII 2	0,889	Normal	
	VII 3	0,292	Normal	
	VII 1	0,573	Normal	Female
CTA	VII 2	0,596	Normal	
	VII 3	0,257	Normal	

Table 7, it can be concluded that the data on science process skills and students' critical thinking skills for both male and female students in classes VII 1, 2, and 3 are normally distributed, where the data is more than 0.05.

Table 8. The Result of the Linearity Test

		Sum of Square	Mean Square	F	Sig.	Gender
SPS *Class	Deviation from Linearity	31,437	31,437	1,943	0,171	Male
SPS*Class	Deviation from Linearity	16,803	16,803	1,028	0,316	Female
CTA*Class	Deviation from Linearity	145,650	145,650	0,944	0,337	Male
CTA*Class	Deviation from Linearity	250,391	250,391	2,162	0,149	Female

Table 8 shows that the science process skills of male and female students are linear, where the p-value is more than 0.05, which indicates that the science process skills are linear. Likewise, the critical thinking ability data of male and female students got a significance value of 0.337 and 0.149, respectively, which means the data is more than 0.05 and meets the linearity requirements so that the data can be said to be linearly related.

Table 9. Result of Homogeneity of Variances Test

	Sig.	Criteria	Gender
SPS	0,265	Homogen	Male
SPS	0,056	Homogen	Female
CTA	0,897	Homogen	Male
CTA	0,573	Homogen	Female

Table 9 shows that the p-value of the science process skills of male students is 0.265, and the science process skills of female students are 0.056. From this significance value, it can be seen that the students' science process skills meet the requirements of more than 0.05, meaning the data is homogeneous. Likewise, the significance value of the critical thinking ability of male and female students is 0.897 and 0.573, respectively, which means that the value is more than 0.05 and homogeneous.

Table 10. The Result of the Correlation Test

		SPS	KBK
SPS	Pearson	1	0,965**
	Correlation		0,000
	Sig. (2-tailed)	90	90
	N		
CTA	Pearson	0,965**	1
	Correlation	0,000	
	Sig. (2-tailed)	90	90

Table 11. The Result of the ANOVA Test

		Sum of Square	Mean Square	F	Sig.	
SPS	Between Group	210,111	105,056	6,494	0,004	Male
	Within Group					
	Between Group	663,240	16,177			
	Within Group					
		113,329	56,664	3,467	0,0040	Female
SPS		702,849	16,345			
CTA	Between Group	1118,657	559,329	3,624	0,036	Male
	Within Group					
	Between Group	6328,502	154,354			
	Within Group					
		991,431	495,716	4,280	0,020	Female
CTA		4980,308	115,821			

Based results of the ANOVA test, researchers can see differences in student scores. Then, the researchers conducted a further *scaffe* test to find out the differences in the science process skills of males in classes VII 1, 2, and 3 and the differences in science process skills of female students in classes VII 1, 2, and 3. The results are shown in Table 12.

Table 12. Multiple Comparisons Science Process Skills Sceffe

(I) Class	(J) Class	Mean Difference (I - J)	Sig.	
VII 1	VII 2	-4,214*	0,021	
	VII 3	-4,855*	0,010	
VII 2	VII 1	4,214*	0,021	Male
	VII 3	-0,641	0,916	
VII 3	VII 1	4,855*	0,010	
	VII 2	0,641	0,916	

(I) Class	(J) Class	Mean Difference (I - J)	Sig.	
VII 1	VII 2	3,102	0,131	
	VII 3	3,622	0,056	
VII 2	VII 1	-3,102	0,131	Female
	VII 3	0,520	0,936	
VII 3	VII 1	-3,622	0,056	
	VII 2	-0,520	0,936	

Table 12, it is explained that the science process skills of male students in class VII 1 against class VII 2 and VII 3 have significant differences. In contrast, the science process skills of male students in classes VII 2 and VII 3 have no significant differences. This can be seen from the p-value, which is more than 0.916. Meanwhile, the science process skills of female students in classes VII 1, VII 2, and VII 3 are not so significant because the significance value exceeds the value of 0.05.

Table 13. Multiple Comparisons Critical Thinking Sceffe

	(J) Class	Mean Difference (I - J)	Sig.	
VII 1	VII 2	-2,104	0,895	
	VII 3	-11,899*	0,047	Male
VII 2	VII 1	2,104	0,895	
	VII 3	-9,795	0,128	
VII 3	VII 1	11,899	0,047	
	VII 2	9,795	0,128	
VII 1	VII 2	-10,048	0,053	
	VII 3	-10,126*	0,043	Female
VII 2	VII 1	10,048	0,053	
	VII 3	-0,078	1,000	
VII 3	VII 1	10,126*	0,043	
	VII 2	0,078	1,000	

Table 13 shows that the critical thinking abilities of male students with significant differences are classes VII 1 and VII 3, with a p-value of 0.047. It means that 0.047 is smaller than 0.05, so it can be concluded that the critical thinking ability of male students in classes VII 1 and VII 3 is significantly different. Meanwhile, when viewed from female students, only class VII 1 and VII 3 significantly differ with a p-value of 0.043.

Discussion

Practicum activity is an effective learning method for improving science process skills and critical thinking skills. According to the research results by Kahar (2018), learning methods that use practical activities significantly influence student motivation and learning success. In this study, researchers conducted a science experiment using calliper measurements, especially in the field of physics. From this experiment, the researcher wanted to see the students' science process and critical thinking skills of class VII 1, 2, and 3 students. Based on research data, table 3 describes the science process skills of SMPN 2 Batanghari class VII 1, 2, and 3 students are classified as good. The percentage of female students in the good category is 80.4%, while the male students are 77.3%. Then in the excellent category, the percentage of female students was 19.6%, while male students were 22.7%. Based on the facts in the field, female students have a high curiosity and enthusiasm compared to male students.

Then, the researchers also grouped the students' basic science process skills indicators and integrated science process skills used on the observation sheet. The description results were obtained in table 4 and table 5. Based on table 4, the students' basic science process skills were observing, measuring, and concluding. From these data, the highest value is found in the observation indicator, where the percentage of male students' science process skills in observing is 97.7%. In comparison, the female students' science process skills in observing are 100% in the good category. For science process skills, indicators measuring both male and female students are 63.6% and 65.2% with good categories. There are several reasons why the indicator of mastery of science process skills in measuring activities is lower than other indicators, including because in one group, not all students take measurements. Still, only a few representatives are tasked with taking measurements. This makes measuring indicators tend to be low compared to other indicators.

Then, the researcher looked at the integrated science process skills, which included indicators for compiling data tables, collecting and organizing data, and conducting experiments. The results were obtained in table 5. data with the percentage of mastery of male students is 56.7%, while the percentage of mastery of female students is 65.2% with each category is good. Then, if you look at the indicators of conducting experiments, the average student is still not skilled in conducting experiments. The percentage of mastery of indicators of conducting experiments on male students is 15.6% in the poor category. In comparison, the mastery of conducting experiments on female students is 10.9% in the poor category. This is because, in each group, some are not in charge of taking measurements, impacting the indicators of conducting experiments.

Table 6 shows critical thinking skills, which include indicators; Elementary Clarification, Basic Support, inference, Advanced Clarification, Strategy, and Tactic. The critical thinking ability of the seventh-class students of SMPN 2 Batanghari is classified as critical, but female students are more dominant, namely 32.6%, which is categorized as very critical compared to male students. Based on the observer's direct observation, male students tend to be quiet and not enthusiastic in doing practicum, which impacts filling out the test questions. In addition, many male students still do not analyze the questions and tend to copy their friends' answers, resulting in students' answers tending to be the same.

In the next step, researchers want to know the relationship between students' science process skills and critical thinking skills and see the differences in science process skills of male and female students in classes VII 1, VII 2, and VII 3, as well as differences in critical thinking abilities of male and female students in class. VII 1, VII 2, and VII 3. So the researcher must test the assumptions first. The assumption test of the correlation test is that the data must be normally distributed and linear, while the assumption test of the ANOVA test is that the data must be normally distributed and homogeneous (Hariningtyas, 2015).

Table 7, table 8, and table 9 show that the data obtained by the researcher has been normally distributed, linear, and homogeneous. This information can be seen in tables 8, 9, and 10, which show that p-values are both in the normality, linearity, and homogeneity tests on science process skills for male and female students in classes VII 1, VII 2, and VII 3 is greater than 0.05. So, the data can be said to be normal, linear, and homogeneous. This decision-making is seen from the basis of the decision on the terms of normality test, linearity test, and homogeneity test. The data can be said to be normal, linear, and homogeneous if the p-value is greater than 0.05 and can be said to be not normal, not linear, and not homogeneous if the p-value is less than 0.05 (As'ari, 2018; Kurnia et al., 2016). After confirming that the data has met the assumption test, the next step is to conduct a correlation test to see the relationship between the two variables.

Table 10 shows that the p-value of science process skills and students' critical thinking skills is 0.000; 0.000 is lower than 0.05. According to Hulu & Sinaga (2019) and Setiya et al. (2020), if the significance value is lower than 0.05. It means that there is a significant correlation between the two variables. The Pearson correlation (r) value in Table 11 was 0.965, which means that the Pearson correlation value is in the very strong category (Hulu & Sinaga, 2019; Setiya et al., 2020). It can also be concluded that science process skills are closely related to students' critical thinking skills. This is reinforced by research conducted by Dewi et al. (2017).

Next, the researcher tested multiple comparisons of science process skills to see the differences in students' science process skills based on gender, specifically between first and other classes. Researchers conducted the ANOVA test, and the results are in table 11. Based on table 11 p-value of male students' science process skills is 0.004, and female students' science process skills are 0.0040, the p-value of male students' critical thinking skills is 0.036, and the significance value is 0.036. the critical thinking ability of female students is 0.020. From these data, it can be seen that p-values less than 0.05, which means that there is a difference in the value of students' science process skills and students' critical thinking skills (Hariningtyas, 2015; Imam, 2011).

Table 12 explains that the science process skills of male students in class VII 1 significantly differ from male students in classes VII 2 and VII 3. In contrast, the science process skills of male students in classes VII 2 and VII 3 are no different. This can be seen from the significance value of 0.916. Meanwhile, the science process skills of female students in classes VII 1, VII 2 and VII 3 are not so significant because the p-value exceeds the value of 0.05. Then, in table 13, the critical thinking ability of male students in classes VII 1 and VII 3 have a significant difference, where the p-value is 0.047. It means 0.047 is smaller than 0.05, so it can be concluded that the critical thinking ability of male students in classes VII 1 and VII 3 is a significant difference. Meanwhile, when viewed from female students, only VII 1 and VII 3 have a significant difference with a p-value of 0.043.

Science process skills are very important for students. Learning based on direct experience will imprint long-term memory in children (Dewi & Sadia, 2013; Jufrida et al., 2019). In addition to science process skills, some abilities must be developed at the secondary school level, namely critical thinking skills. There is a reason why science process and critical thinking skills in higher education are low, namely due to the absence of training or practicum at the previous high school level (Darmaji et al., 2019). Therefore, a practicum in developing science process skills in junior high school is very important because the secondary school level is the basis for developing good skills. However, there is a weakness in developing science process skills in junior high schools, namely the material indicators in the syllabus, which only cover basic learning so that all indicators of students' science process skills cannot be measured.

Critical thinking is one of the four skills students must have in facing the 21st century (Markhus & Hidayatullah, 2021; Nawawi, 2017). Critical thinking ability is not an innate ability but an ability that must be trained from an early age. Interactive learning can improve students' critical thinking skills (Makhrus & Hidayatullah, 2021; Nurazizah et al., 2017). Practicum activities can train students' critical thinking skills. The students' conceptual understanding and critical thinking since junior high school are the biggest challenges for teachers in educating students because science material in junior high schools greatly determines students' knowledge for the next level (Makhrus et al., 2018; Markhus & Hidayatullah, 2021). The critical thinking ability of each student will also be different from one another. Therefore, continuous practice is needed through practicum activities (Fakhriyah, 2014; Markhus & Hidayatullah, 2021).

If students already have these two important factors in themselves, then the ability or student learning outcomes also have a big influence (Tanti et al., 2020). Critical thinking skills are useful in decision-making, education, and everyday problem-solving (Carvalho et al., 2015; Chen et al., 2021; Dewi et al., 2017; Markhus & Hidayatullah, 2021; Sutiani et al., 2021).

CONCLUSION AND SUGGESTION

There is a significant influence between science process skills and students' critical thinking skills. Based on the analysis of the data obtained by the researchers, it can be concluded that the average science process skills of students at SMPN 2 Batanghari are classified as good. Likewise, the critical thinking skills of seventh-class students of SMPN 2 Batanghari are classified as critical. In the ANOVA test, it can be seen that there are differences in science process skills and critical thinking skills for male and female students in classes VII 1, 2, and 3. This is due to differences in the enthusiasm and enthusiasm of male and female students during practicum activities.

This research is expected to contribute to schools so that they can implement practicum activities in the learning process, which aims to train and improve science process skills and critical thinking skills. Meanwhile, future researchers suggest conducting the same research but using indicators of science process skills that have not been covered in this study.

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AUTHORS CONTRIBUTIONS

AA find ideas and develop theories. DD, and DA develop the background and present theories on research methods. EF and AA take the data and analyze the findings of the data. DD and DA present the results in the discussion section.

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