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HOW IS THE IMPACT OF INSTRUCTIONAL LEARNING USING AN ETHNOSCIENCE APPROACH?; ANALYSIS OF THE CONTRIBUTION OF STUDENTS' CREATIVE THINKING SKILLS

Ahmad Khoiri[1], Budiyono Saputro[2], Qori Agussuryani[3], Miterianifa[4], Yetty Trisnayanti[5]
[1]Department of Physics Education, Faculty of Teaching Education, Universitas Sains Al-Qur'an, Wonosobo, Indonesia
[2]Faculty of Teaching Education UIN Salatiga, Central Jawa, Indonesia
[3]Department of Madrasah Ibtidaiyah Teacher Education, Faculty of Teaching Education, Universitas Sains Al-Qur'an, Wonosobo, Indonesia
[4]Department of Chemistry Education, Faculty of Teaching Education,Universitas Islam Sultan Syarif Kasim Riau Indonesia
[5]Natural Science Education, Universitas Sebelas Maret, Indonesia

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ABSTRACT

The instructional impact of learning using an ethnoscience approach is often ignored, even though its contribution to students' creative thinking skills is very much needed. The research aims to analyze the direct contribution to students' creative thinking skills. Quasi-experimental research method with pre-test post-test control group design. Data collection used a standardized TTCT (Torrance Test Creative Thinking) question instrument. The analysis technique uses the MANOVA F test. The results show that learning with an ethnoscience approach can contribute to student's creative thinking skills based on the MANOVA f test that all components are significant (Sig. < 0.05). Learning with an ethnoscience approach significantly influences each indicator of Fluency, Flexibility, Originality, Elaboration, and Redefinition with a P-Value of 0.000. The largest contribution is the R-squared value of 0.568 for the experimental class and 0.561 for the control class in the Originality indicator. The coefficient of determination is based on the R2 value (0.568)2: 0.32 x 100%: 32% of learning using an ethnoscience approach to creative thinking skills. Students' ability to develop original thinking has more dominant results compared to other indicators of creative thinking skills. Recommendations for the importance of learning design that considers students' learning needs and cultural backgrounds. The ethnoscience approach can provide students with opportunities to think contextually in solving problems so that creative thinking skills are easier to improve.

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Corresponding Author:
Ahmad Khoiri
[1]Universitas Sains Al-Qur'an, Wonosobo, Central Java, Indonesia
Email: akhoiri@unsiq.ac.id.

1. INTRODUCTION

Human Resource Development is the focus of the 21st-century learning process. Advances in science and technology and the presence of the Industrial Revolution 4.0 era have made the flow

of information and globalization increasingly unstoppable. When the younger generation, especially students, are not capable enough to adapt and have strong character, they will easily be carried away by the negative currents of this era of disruption (Kahfi et al., 2023; Rusnaini et al., 2021) so it is important to analyze the instructional impact of learning that emphasizes towards characters using a meaningful environmental approach, one of which uses learning with an ethnoscience approach.

Research conducted (Aji, 2017; Fitriani, 2016; Supriyadi et al., 2016) shows that the influence of ethnoscience learning includes 1) the positive influence of respect for regional culture on students' knowledge which is generated in integrated learning with daily life is called inculturation; 2) The process of assimilation and accommodation in student-centered learning will be effective. Furthermore, the ethnoscience learning approach is designing an integrated learning environment with community culture (Khoiri & Sunarno, 2019a). The contribution of ethnoscience provides opportunities for broader thinking in overcoming environmental problems. On the other hand, creative thinking skills are still low because the impact of learning is not paid enough attention.

Creative thinking skills are a form of fulfilling competency indicators in science learning as well as a form of integrated assessment that can improve creative thinking (Barak, M., 2009; Komariah et al., 2019; Nadhiroh & Latifah, 2020). The results of these skills are not yet optimal, so it is important to apply ethnoscience learning as a solution to the instructional impact.

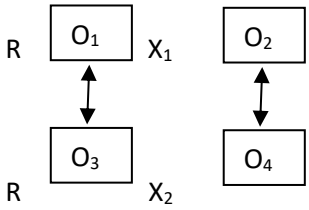
Consideration of an ethnoscience approach can make individuals increasingly master scientific concepts in culture because learning takes a contextual approach to the environment (Becker & Park, 2011). Cultural appreciation and science process skills can be improved through ethnoscience learning (Atmojo, 2012), increasing learning achievement (Okwara & Upu, 2017), and science knowledge (Sudarmin et al., 2014). Other appreciations in the form of curiosity, concern, and attention to traditions are increasing (Okwara & Upu, 2017). Ethnoscience learning trains students' habits in understanding native knowledge that they are not familiar with. Habits are in the form of introducing traditions and culture which are used as a source of knowledge and social values that are full of meaning in life.

Based on the importance of the contribution of ethnoscience learning in developing students' thinking abilities, one of which is creative thinking skills which have a direct instructional impact. So, research studies to identify meaningful learning contributions are very urgent to provide recommendations and references for the quality of contextual and meaningful learning.

2. METHOD

Quantitative research design with a product trial design using an experimental group and a control (Pre-Test Post Test Control Group Design). The research design is presented in Figure 1.

Based on Figure 1, shows that the two groups are balanced (O1 is not different from O3 as proven by statistical tests), so the experimental group was given treatment with ethnoscience-based teaching materials, while the control group was taught with conventional teaching materials. The post-test score is to determine students' creative thinking and O4 is the post-test score for the control group. The results of the O2 value being significantly higher than O4 can mean that the product being developed is effective.



(1)

Figure 1. Pre-test post-test control group design

O_1: pre-test of the experimental group
O_2: post-test of the experimental group
O_3: pre-test of the control group
O_4: post-test of the control group
X_1: Ethnoscience-Based Teaching Materials
X_2: Conventional-Based Teaching Materials

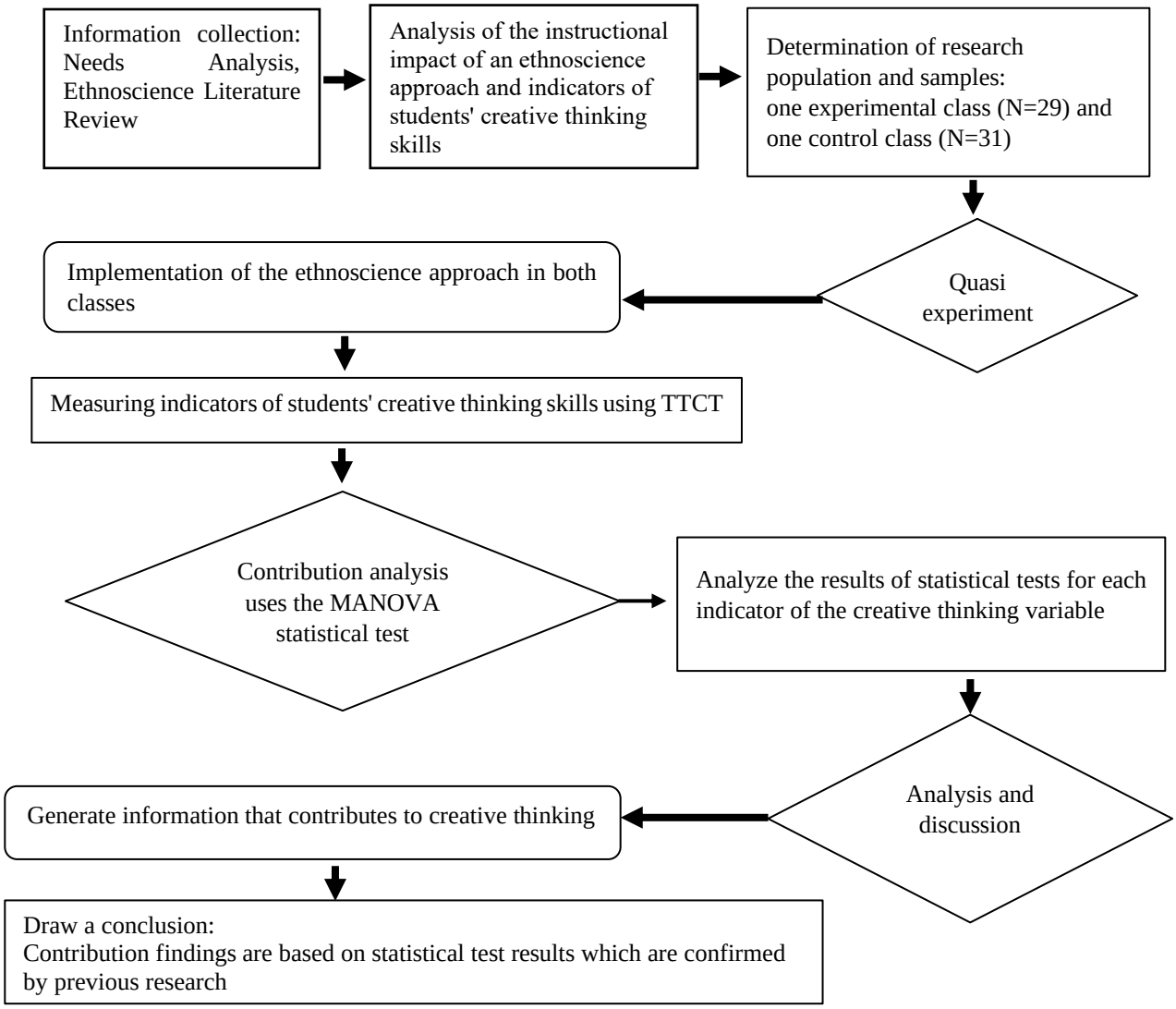


Figure 2. Research Procedure

The research population and sample used a purposive sampling technique, namely Mojotengah State High School 1, Wonosobo with a sample size of 29 students in the experimental

class and a control class of 31 students. The data collection method uses TTCT (Torrance Test Creative Thinking) questions with 5 indicators, namely Fluency, Flexibility, Originality, Elaboration, and Redefinition. There are 10 essay questions and observations on the implementation of learning using an ethnoscience approach. The data analysis technique uses the MANOVA F test to determine the contribution of each indicator to the creative thinking skills variable in each class.

Furthermore, the research procedures carried out based on collecting initial information, and analyzing the instructional impact of learning using an ethnoscience approach are presented in Figure 2.

3. RESULTS AND DISCUSSION

MANOVA F test results using SPSS 25.0 for each indicator variable of creative thinking ability using ethnoscience (A) and conventional (B) approaches. Presented in Table 1.

Tabel 1. Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Fluency_A	220.662[a]	1	220.662	76.028	.000	.567
	Fluency_B	200.913[b]	1	200.913	47.366	.000	.450
	Fleksibility_A	121.119[c]	1	121.119	31.746	.000	.354
	Fleksibility_B	128.917[d]	1	128.917	31.425	.000	.351
	Originality_A	243.481[e]	1	243.481	76.368	.000	.568
	Originality_B	199.938[f]	1	199.938	36.262	.000	.385
	Elaboration_A	279.239[g]	1	279.239	44.041	.000	.432
	Elaboration_B	289.550[h]	1	289.550	49.194	.000	.459
	Redefinition_A	41.713[i]	1	41.713	10.415	.002	.152
	Redefinition_B	34.847[j]	1	34.847	6.110	.016	.095
Intercept	Fluency_A	9460.662	1	9460.662	3259.620	.000	.983
	Fluency_B	8526.713	1	8526.713	2010.200	.000	.972
	Fleksibility_A	9586.719	1	9586.719	2512.772	.000	.977
	Fleksibility_B	7924.650	1	7924.650	1931.759	.000	.971
	Originality_A	10869.815	1	10869.815	3409.330	.000	.983
	Originality_B	9810.605	1	9810.605	1779.310	.000	.968
	Elaboration_A	9001.506	1	9001.506	1419.703	.000	.961
	Elaboration_B	8544.216	1	8544.216	1451.635	.000	.962
	Redefinition_A	10172.113	1	10172.113	2539.886	.000	.978
	Redefinition_B	9178.847	1	9178.847	1609.335	.000	.965
Model	Fluency_A	220.662	1	220.662	76.028	.000	.567
	Fluency_B	200.913	1	200.913	47.366	.000	.450
	Fleksibility_A	121.119	1	121.119	31.746	.000	.354
	Fleksibility_B	128.917	1	128.917	31.425	.000	.351
	Originality_A	243.481	1	243.481	76.368	.000	.568

	Originality_B	199.938	1	199.938	36.262	.000	.385
	Elaboration_A	279.239	1	279.239	44.041	.000	.432
	Elaboration_B	289.550	1	289.550	49.194	.000	.459
	Redefinition_A	41.713	1	41.713	10.415	.002	.152
	Redefinition_B	34.847	1	34.847	6.110	.016	.095
Error	Fluency_A	168.338	58	2.902			
	Fluency_B	246.020	58	4.242			
	Fleksibility_A	221.281	58	3.815			
	Fleksibility_B	237.933	58	4.102			
	Originality_A	184.919	58	3.188			
	Originality_B	319.795	58	5.514			
	Elaboration_A	367.744	58	6.340			
	Elaboration_B	341.384	58	5.886			
	Redefinition_A	232.287	58	4.005			
	Redefinition_B	330.803	58	5.704			
Total	Fluency_A	9764.000	60				
	Fluency_B	8896.000	60				
	Fleksibility_A	9868.000	60				
	Fleksibility_B	8233.000	60				
	Originality_A	11202.000	60				
	Originality_B	10248.000	60				
	Elaboration_A	9553.000	60				
	Elaboration_B	9080.000	60				
	Redefinition_A	10414.000	60				
	Redefinition_B	9517.000	60				
Corrected	Fluency_A	389.000	59				
Total	Fluency_B	446.933	59				
	Fleksibility_A	342.400	59				
	Fleksibility_B	366.850	59				
	Originality_A	428.400	59				
	Originality_B	519.733	59				
	Elaboration_A	646.983	59				
	Elaboration_B	630.933	59				
	Redefinition_A	274.000	59				
	Redefinition_B	365.650	59				

a. R Squared = ,567 (Adjusted R Squared = ,560)
b. R Squared = ,450 (Adjusted R Squared = ,440)
c. R Squared = ,354 (Adjusted R Squared = ,343)
d. R Squared = ,351 (Adjusted R Squared = ,340)
e. R Squared = ,568 (Adjusted R Squared = ,561)
f. R Squared = ,385 (Adjusted R Squared = ,374)
g. R Squared = ,432 (Adjusted R Squared = ,422)
h. R Squared = ,459 (Adjusted R Squared = ,450)
i. R Squared = ,152 (Adjusted R Squared = ,138)
j. R Squared = ,095 (Adjusted R Squared = ,080)

Based on Table 1, the contribution of ethnoscience learning modeling is analyzed (Figure 3), Intercept for each indicator (Figure 4), Modeling (Figure 5), distribution of MANOVA test error data (Figure 6) and R-Squared (Figure 7).

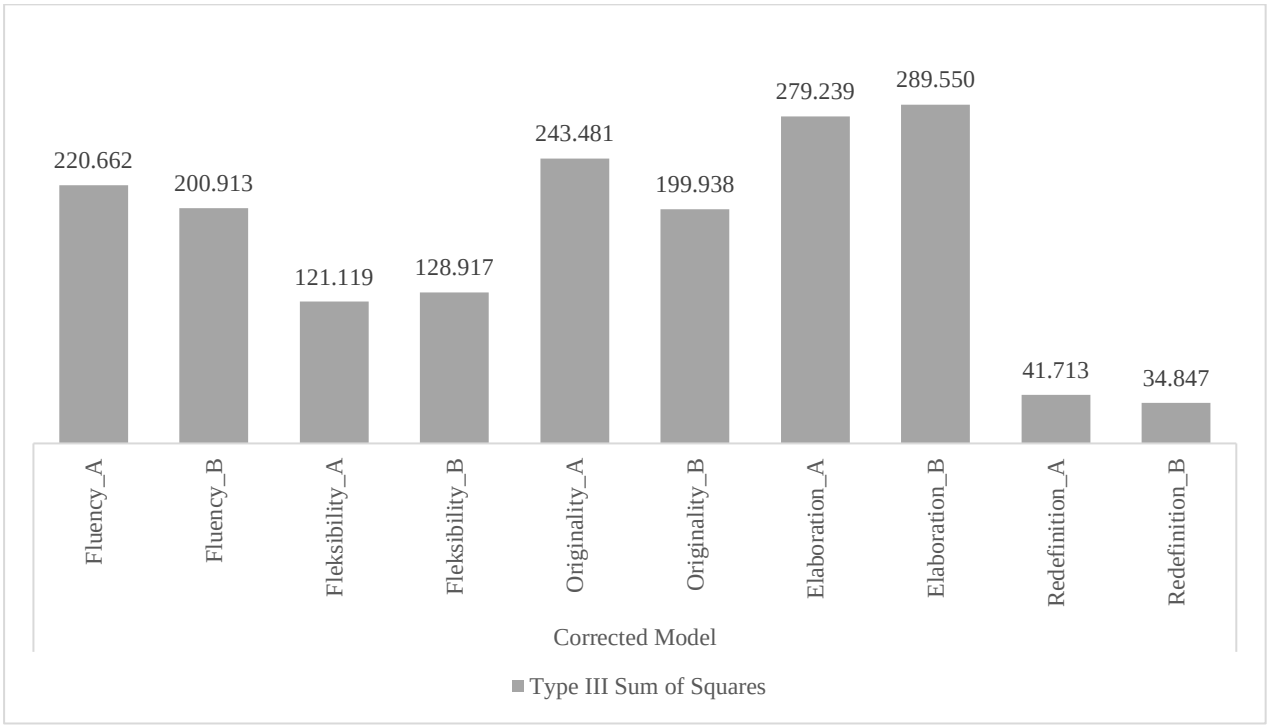


Figure 3. Contribution of learning modeling using an ethnoscience approach based on the sum of squares or the contribution of each indicator of creative thinking

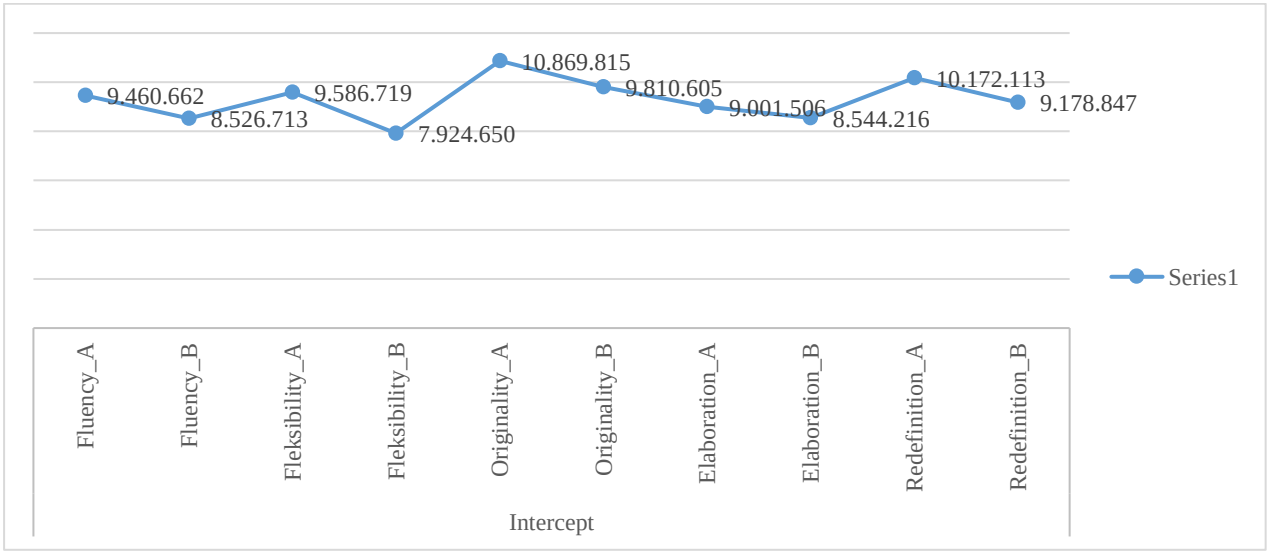


Figure 4. Intercept for each indicator of students' creative thinking skills

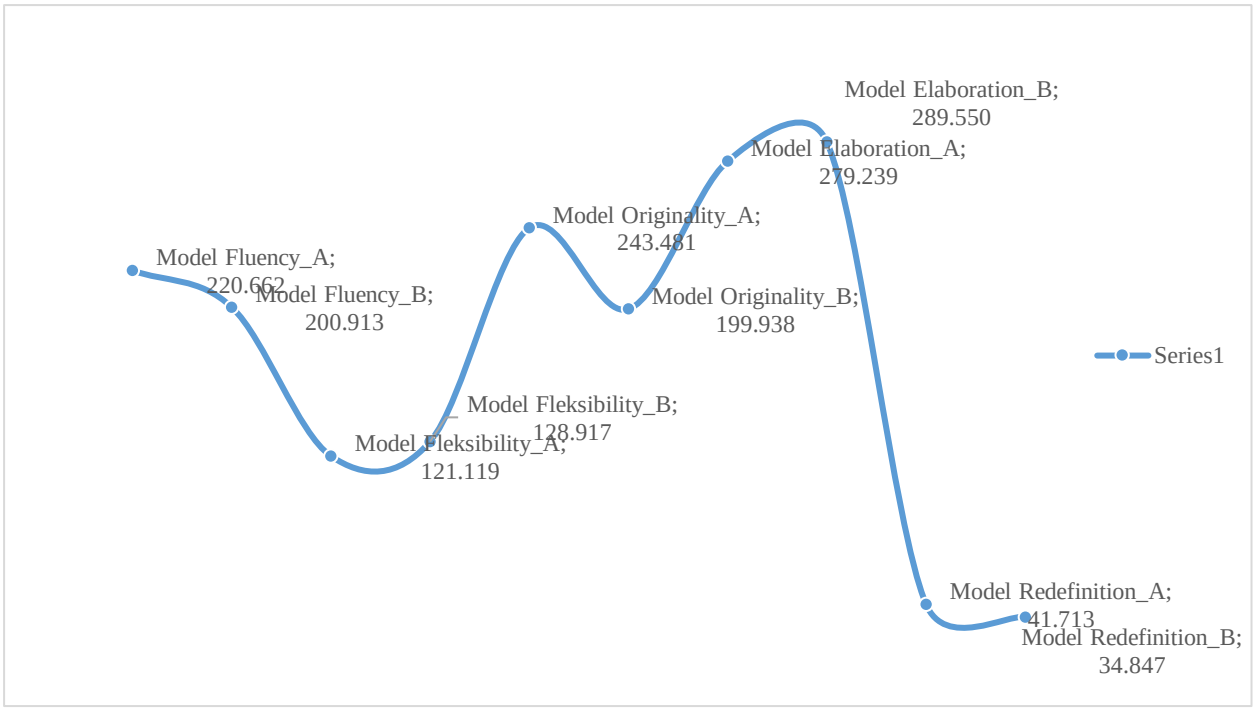


Figure 5. Modeling Ethnoscience Learning

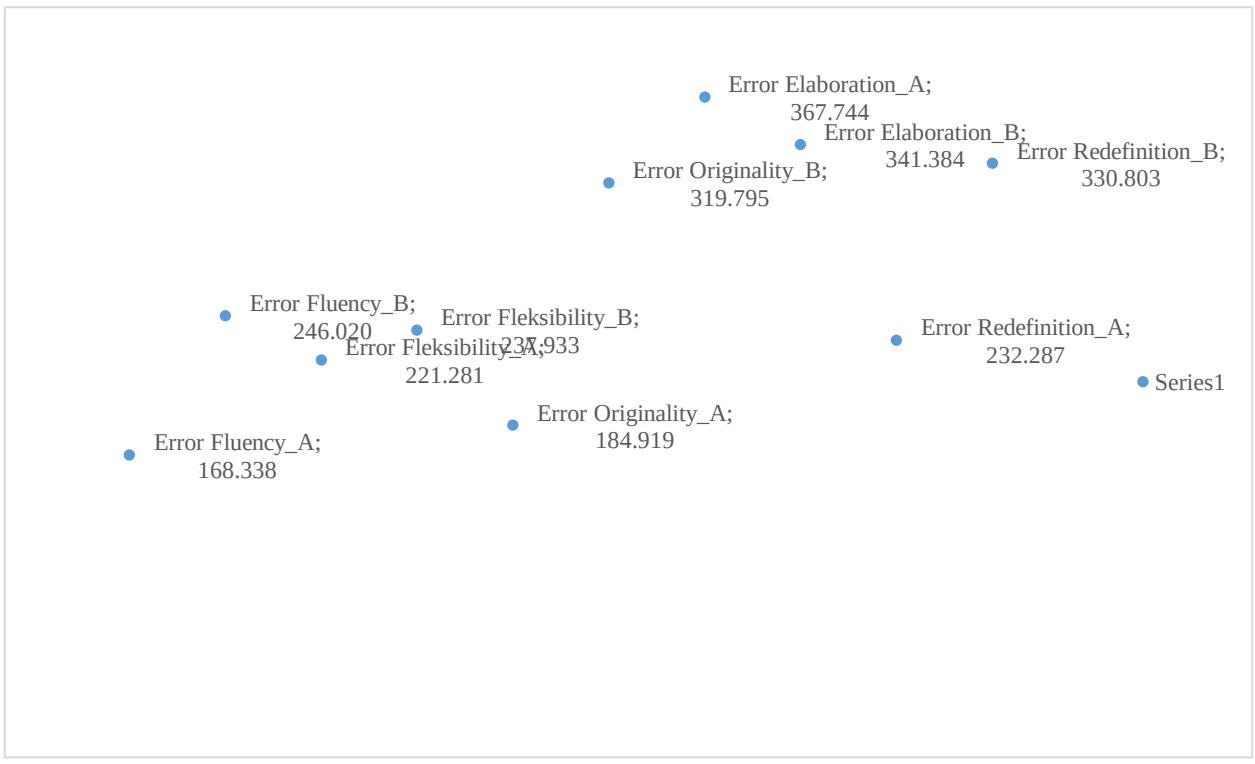


Figure 6. MANOVA Test statistical data error

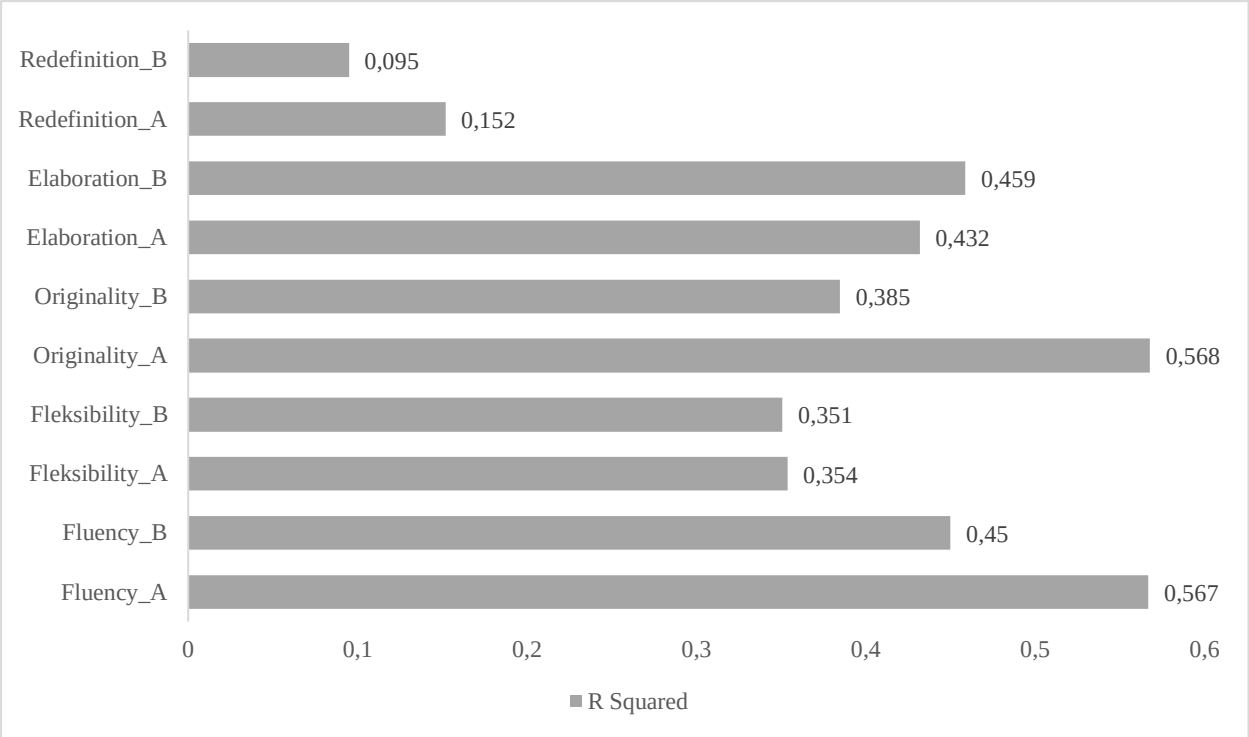


Figure 7. R-Squared for each indicator of students' creative thinking skills

Based on the data in Table 1, each row shows the test results of the influence of one independent variable, namely work, on each dependent variable. From the results above, look at the value in the "Sig." column. all components are significant if the Sig value. < 0.05. Learning with an ethnoscience approach significantly influences each indicator of Fluency, Flexibility, Originality, Elaboration, and Redefinition with a P-Value of 0.000, which means H0 is Rejected or H1 is Accepted. Figure 7 shows the contribution of indicators based on the largest and dominant R-squared value of each indicator spread. Points a, b, c, d, e, f, g, h, i, and j are signs of contribution value for reading statistical results. Based on the data, it shows that the R squared value is the largest at point e, namely 0.568 for the experimental class and 0.561 for the control class on the Originality indicator. Students' ability to think with originality requires scientific reconstruction efforts which are not easy. The habit of thinking from an individual perspective without reducing scientific meaning is indeed difficult, it has been proven that students developing their thinking skills are still not optimal. The coefficient of determination is based on the R^2 value $(0.568)^2$: 0.32 x 100%: 32% real contribution of the originality indicator, meaning that other indicators are much lower. The importance of analyzing the instructional impact that contributes to developing creative thinking skills must be designed optimally. The results of this research are confirmed by other research which shows the contribution of the influence of ethnoscience learning to empower creative thinking skills and at the same time increase students' social and environmental awareness (Khoiri et al., 2023; Khoiri, Irma Sukarelawan, et al., 2022; Khoiri & Haryanto, 2018).

3.1. Instructional Impact of an Ethnoscience Approach

Instructional impact is the expected learning achievement directly based on learning objectives. The instructional impact of the ethnoscience approach is students' creative thinking skills. The contribution of the ethnoscience approach based on the COREA syntax (Confrontation,

Observation, Reconstruction, Explanation, Application) has different impacts on indicators of students' creative thinking skills (Fluency, Flexibility, Originality, Elaboration, Redefinition). The fluency indicator is increased by the Confrontation syntax when students are required to understand controversial issues and ask various questions. The flexibility indicator is increased in the students' observation syntax to explore and explore ethnoscience with SSI, students can accommodate ideas flexibly based on environmental information sources using an ethnoscience approach. Originality indicators are increased in the syntax of reconstruction and explanation, assimilation, and accommodation processes that generate new ideas from students constructively. New ideas that emerge within students must be proven correct in explanatory activities.

The reduced explanation stage of generalization activities reflects the inquiry-based learning model. Elaboration indicators contribute to explanation syntax through proof of concept by verifying the data that has been obtained. Redefinition indicators contribute to application syntax when students redefine what is learned through creative, meaningful, and contextual learning outcomes in students' lives.

The creative thinking process goes through the stages of preparation, incubation, illumination, and verification to solve problems. This means for students to develop previously possessed knowledge and skills to meet the demands of reconstructing science. The creative thinking process is a combination of logical thinking and divergent thinking. Divergent thinking is used to look for ideas to solve problems, while logical thinking is to verify ideas into creative solutions (Uloli et al., 2016; Yuanita & Yuniarita, 2018). Ethnoscience, an approach to the study of physics with an SSI strategy, can be taken to empower creative thinking skills in solving various problems.

The impact of learning in realizing creative potential, achieving personal goals, and responsibility for social life in society. Creative thinking or divergent thinking based on strategic environmental information. The process of discovery and investigation with many possible answers to problems. Students' answers emphasize the quantity, accuracy, and diversity of answers that can be given to a problem, showing that students can develop creative thinking skills (Khoiri, 2021; Khoiri et al., 2021).

3.2. Achievement of Creative Thinking

Students' creative thinking achievements based on test questions have increased after using the ethnoscience approach. The results show that environmental learning resources using an ethnoscience approach can accommodate students' creative thinking habits. The indicator of formulating ideas in solving problems is part of creative thinking skills for analyzing scientific phenomena through ethnoscience studies such as the "Dieng Plateau" which was developed in physics learning (Diki, 2014). Environmental observation activities using thermometers, conducting experiments on "Endemic Carica Trees". Students' thinking fluency in observing temperatures on the Dieng Plateau in three different locations. Students' thinking activities are to identify temperature differences that cause the Endemic Carica Tree to grow. The unique thing is that the carica plant only grows in the Dieng location, even though it is equally cold, it cannot produce carica fruit which requires a specific temperature. The difference in the natural boiling point of Sikidang Crater water and ordinary water which boils because it is heated. Controversial

issues are an important factor in designing ideas to find solutions to the problems they experience, so that students' creative thinking and positive attitudes toward the environment can be improved (Şener et al., 2015) & (Kutlu & Gökdere, 2015).

Creative ideas emerge through the learning discovery process which allows students to explore sources of information. Strategic sources of information on environmental issues make learning more meaningful and contextual. Ethnoscience as a learning nuance provides students with knowledge and character to appreciate regional culture (Arlianovita et al., 2015; Fitriani, 2016; Vitasurya, 2016).

3.3. Limitations of learning using an ethnoscience approach

3.3.1. Ethnoscience learning requires more time allocation

Ethnoscience learning requires more study time compared to conventional models. Ethnoscience learning cannot be implemented for all physics topics or material, but only certain topics that are relevant to ethnoscience studies. The material chosen was "temperature and heat" for class Adjusting to learning during the new normal period is a new challenge to overcome problems in controlling study time. The learning response determines the time allocation that has been determined, so careful planning is needed to be implemented, especially in science reconstruction activities.

3.3.2. Not all students can accept and understand ethnoscience and social issues

Based on the post-test assessment of creative thinking questions, there are still 10%-15% of students who have not yet completed studying temperature and heat, identified by answering questions that are directly related to contextual environmental issues. Knowledge will be transformed by describing based on experience, verification, and data reduction to complete concepts into scientific knowledge. The limitations of students' thinking as a reconstructive effort are categorized into five groups (Fitria & Wisudawati, 2018) which are presented in Figure 8.

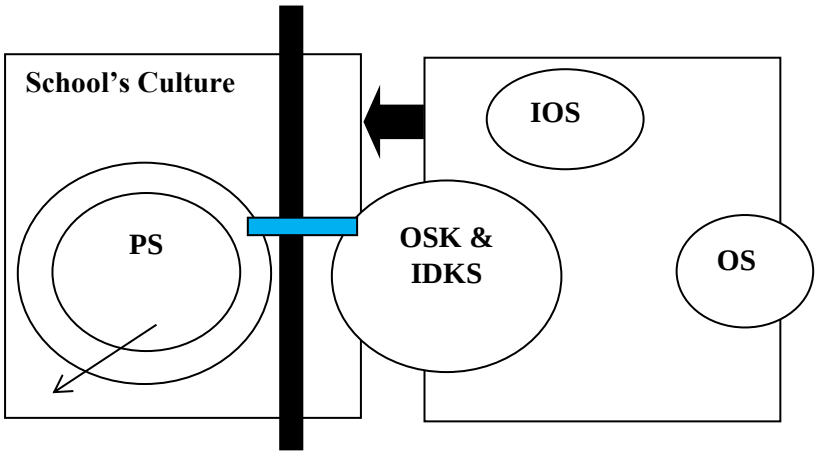


Figure 8. The process of reconstructing original science

PS: Potential Scientist Students are a group of students who can easily cross cultures without boundaries between scientific science and students' daily culture. 2) OSK: Other Smart Kids is a group of students who recognize science as a foreign culture. 3) IDKS: I don't

Know Student students experience serious problems but try to study them continuously, the result is only memorizing concepts instead of understanding them. 4) OS: Outsiders are an isolated group who are unable to cross cultures because of the strength of students' daily culture, and 5) IOS: Inside Outsiders, a group of students who experience discrimination, it is impossible for 100% of students to become Potential Scientist Students because of the different student and school backgrounds. important reasons for accommodating student learning needs. (Khoiri, Sukarelawan, et al., 2022).

3.3.3. Learning loss in ethnoscience learning

Learning loss in ethnoscience learning is that information-based inquiry learning that is difficult for teachers to control is the reason skills are not optimal, there are still students who have not completed it, and the reconstruction and explanation process still requires teacher guidance (Amelia et al., 2021; Khoiri, 2016; Khoiri & Sunarno, 2019b, 2019c).

The contributions, instructional impacts, and limitations of ethnoscience learning can be used as recommendations for further research, but in principle, the research results show differences in results and direct contributions to the development of students' creative thinking skills. This is confirmed by research results. Ethnoscience learning influences learning outcomes, including; 1) there is a positive influence of appreciation for regional culture, meaning that the inculturation learning process always links culture in harmony with students' lives; 2) the process of assimilation and accommodation into student-centered learning is effective (Supriyadi et al., 2016). The ethnoscience approach aims to produce modified learning model products with information on community culture through ethnoscience studies. The aim of the ethnoscience approach to developing scientific skills requires an understanding of the culture of the people of Wonosobo Regency (Khoiri et al., 2023; Khoiri, Irma Sukarelawan, et al., 2022; Khoiri & Haryanto, 2018).

4. CONCLUSION

Learning with an ethnoscience approach can contribute to student's creative thinking skills based on the MANOVA f test that all components are significant (Sig. < 0.05). Learning with an ethnoscience approach significantly influences each indicator of Fluency, Flexibility, Originality, Elaboration, and Redefinition with a P-Value of 0.000. The largest contribution is the R-squared value of 0.568 for the experimental class and 0.561 for the control class in the Originality indicator. The coefficient of determination is based on the R^2 value $(0.568)^2$: 0.32 x 100%: 32% of learning using an ethnoscience approach to creative thinking skills. Students' ability to develop original thinking has more dominant results compared to other indicators of creative thinking skills. The ability of originality determines having ideas that cannot be imitated by other students and having a different perspective on ethnoscience studies, this is very relevant to the ability of students who have different cultural backgrounds to reconstruct indigenous science from society into scientific science. So this research provides recommendations for the importance of learning design that considers students' learning needs and cultural backgrounds. Students' learning needs and interests as a measure of learning success in realizing meaningful learning.

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