Ethnoscience Investigation in Primary Schools: Impact on Science Learning

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Abstract   This study aims to see whether there is a significant impact between ethnoscience and teacher pedagogic competence, because pedagogic competence is one of the competencies that must be possessed by every teacher, especially for elementary school teachers. Research using quantitative descriptive with a total sample of 220 respondents was obtained using cluster sampling techniques. The findings of this study are that the knowledge of ethics has an impact on the pedagogical competencies of elementary school teachers. By knowing ethnoscience, the teacher can teach better about learning by linking it to the surroundings, which is supported by the results of the ethnics' knowledge of teachers who have good categories and pedagogical competencies which are owned by the good teacher.

Keywords   Ethnoscience, Pedagogic Competence, Primary School, Teacher

1. Introduction

Education is a very important activity. With the education, humans can change behavior and knowledge for the better [1]. An educator is obliged to educate, teach and guide students to be better. Creating a comfortable and pleasant learning atmosphere is one of the tasks of the teachers and the teachers' professional knowledge, for that teacher needs to develop creativity in teaching. This is according to the National Education System Law No. 20 of 2003 article 40 point 2, educators, and education personnel should create an educational atmosphere that is meaningful, fun, creative, dynamic, and dialogical [2]. Innovative teachers must have pedagogical competence because teachers are required to have abilities both in the field of science and in the way they teach. Pedagogical competence is some teacher's abilities related to the science and art of teaching students [3]. With the ability that teachers have, teachers are expected to have the thought to progress creatively to develop learning. Teacher's pedagogic competence is the teacher's ability to manage lessons that complement the understanding and knowledge base of education that has academic and intellectual expertise [4].

The teacher is an important instrument in realizing good learning. Good learning can be supported by good teacher competence. By having good competence, the teacher can do his work in learning, such as handling situations in the classroom, flexible and adaptive in learning [5]. Teacher competencies that must be mastered are pedagogical, professional, personal and social competence. According to Law No. 14 of 2005 article 10 teacher competencies that are mandatory for teachers include pedagogic competence, personal competence, social competence and professional competence obtained through professional education [6]. Teachers who have good competence will produce students who are successful in learning. Pedagogical competence can be described as a teacher's ability and will to regularly apply the attitude, knowledge, and skills that promote student learning [7]; [8]; [9]. One of them is science learning that integrates local wisdom (indigenous science).

Character building starts from the family and community around the students themselves, so the teacher needs to pay attention to the learning model that will be used for students, so they can choose the environment, and the situation around them [10]; [11]; [12]; [13]; [14]. Ethno has the meaning of the nation, while science (science) means knowledge [15]. Indigenous science is the knowledge that is indigenous to a particular language and culture [16]. The diversity that exists around students can bring good or bad influence for students, especially on the character of students themselves [10]; [18]; [19]. Therefore

indigenous science learning and local wisdom are important for students. According to [20] which states that indigenous science research studies focus on culture which is defined as a model to explain the environment or social situation at hand.

The original science values in the area around students are very important to be applied in learning in schools because the ethnic values in the area around students are a reference for character building closest to students. In line with the opinion [21] which states that the alleged main causes and fundamental problems that cause the weak character of the nation are culture, especially human dignity, which is ignored. If culture-based learning is not applied to students, original science values will be lost which is a source of character building value in education. Because a scientific khasanah is based on nature, and nature teaches humans to look after one another. Doing learning that integrates with the environment will make it easier for students to learn a lesson. According to [22] which states that culture is the basis of the philosophy of education, while education is the main guardian of culture because the role of education shapes humans to be cultivated.

Therefore, this study aims to identify pedagogic competencies, ethnographic knowledge and the impact of ethnocentric knowledge on teacher pedagogical competence. The research questions are as follows:

1. What are the pedagogical competencies possessed by elementary school teachers?
2. How about indigenous science knowledge from elementary school teachers?
3. What is the impact of indigenous science on the pedagogical competence of elementary school teachers?

2. Materials and Methods

This research uses descriptive research method, whose primary purpose is to paint a picture using words or numbers and to present a profile, a classification of types, or an outline of steps to answer questions such as who, when, where, and how [23]. The descriptive approach is carried out because this study will look at the extent of knowledge of elementary school teacher indigenous science and pedagogical competence and see the impact of indigenous science on teacher pedagogical competence. The research used 220 samples consisting of 50 elementary teachers in Jambi City, 100 elementary teachers in Batanghari, and 70 elementary teachers in Muaro Jambi obtained using cluster sampling techniques. According to [24] in cluster sampling, two or more elements or two units or more are included in the sample at each sample location. The inclusion of two or more units/elements in each sample location intensified sampling efforts at each sample location. Cluster sampling was chosen because it can

facilitate research to collect data from a broad research area. Data collection in this study used multiple-choice question instruments and interviews. Data collection in this study used multiple-choice questions and interviews. The pattern of this study begins with a type of closed questionnaire in which the answer option has been determined. Multiple choices are a technique of collecting data in which participants or respondents fill in a question or statement then after being filled in completely, the researchers examine it [25]. Researchers provide multiple-choice questions to elementary school teachers with four answer choices. Multiple choice questions aim to look at the level of pedagogical competence and indigenous science of a teacher in elementary school education. Below is a categorization table of ranges of values for multiple-choice tests, there are four categories, which are very good, good, not good and very not good.

Table 1. Categorization of the range of MCQs in pedagogic competence and indigenous science

Category	Value Ranges
Very Not Good	0.0 – 25.0
Not Good	25.1 – 50.0
Good	50.1 – 75.0
Very Good	75.1 – 100.0

Data from multiple-choice test questions were analysed to be used as descriptive statistics. Then the researcher continues to collect data using structured interview instruments. Interviews are used to strengthen multiple-choice results.

3. Results

Teacher's pedagogic competence is seen from the mastery of the content of a material, mastery of innovation in learning media, mastery in terms of teaching techniques (models, methods, and strategies). The renewal in this study is more specific about the pedagogical competencies of a primary school teacher who must also be reviewed by language competency skills. Prospective primary school teachers must understand the study of language material, innovation, and learning strategies that must be used in language teaching.

Mastery of competence is very important for a teacher. Competence plays an important role for teachers in implementing learning well. [5] defines competence as the ability to perform tasks in certain situations, for example, class situations, flexibly and adaptively. At present the factor of pedagogic competence, professional teachers are very preferred, because according to the law a teacher must master 4 competencies. According to Law Number 14 of 2005 concerning Article 10 Teachers and Lecturers, namely teacher competencies as referred to in Article 8 include pedagogical competencies, personality

competencies, social competencies, and professional competencies obtained through professional education [6]. The renewal in this research is to strengthen the system of increasing competence in prospective teachers.

3.1. Pedagogical Competence

The following are the results of multiple-choice data to obtain data on the pedagogic competencies of the teachers in table 2.

From table 2, which came from 50 respondents from elementary school teachers in the city of Jambi for male teachers categorized very well with the number 4 and for women as many as 27 with a very good category, and after being processed and obtained the results using the SPSS program application, then, obtained for The results of pedagogical competence of teachers have a good category of 62.0% for 31 teachers out of 50 total teachers, very good at 22.0% for 11 out of 50 total teachers, not good at 10.0% for 5 out of 50 total teachers, and very poor 6.0% for 3 out of 50 total teachers. Of the 50 teachers in the city of Jambi has a Mean value of 65.0, a Maximum Value of 97, and a Minimum Value of 14. Then for teachers who are in Batanghari as many as 100

respondents are categorized both with a number of 18 for men and for women as much as 50, and after being processed and the results obtained using the SPSS program application, then, obtained for pedagogical competency results owned by teachers in Batanghari who have a good category of 68.0% for 68 teachers out of 100 total teachers, Very Good at 22.0% for 22 out of 100 total teachers, Not Good at 7.0 % for 7 out of 100 total teachers, and not very good 3.0% for 3 teachers out of 100 total teachers. Of the 100 primary school teachers in Batanghari has a Mean value of 64.0, a Maximum Value of 96, and a Minimum Value of 13. Then for teachers who are in Muaro Jambi as many as 70 respondents are categorized well with 13 for men and 29 for women, and after processed and the results obtained using the SPSS program application, then, obtained for pedagogical competency results owned by teachers in Muaro Jambi has a good category of 60.0% for 42 teachers from 70 total teachers, Very Good at 25.7% for 18 out of 70 total teachers, Not Good at 8.6% for 6 out of 70 total teachers, and not very good 5.7% for 4 out of 70 total teachers. Of the 70 primary school teachers in Batanghari have a Mean value of 66.0, Maximum Value of 96, and Minimum Value of 15.

Table 2. Result of Multiple-choice teachers Pedagogic Competence

	Classification					Mean	Min	Max	%
	Interval	Female	Male	Category	Total				
Jambi City	0.0 – 25.0	1	2	Very Not Good	3	65.0	14	97	6.0
	25.1 – 50.0	2	3	Not Good	5				10.0
	50.1 – 75.0	27	4	Good	31				62.0
	75.1 – 100	8	3	Very Good	11				22.0
	TOTAL	38	12		50				100
	Classification					Mean	Min	Max	%
	Interval	Female	Male	Category	Total				
Batanghari	0.0 – 25.0	2	1	Very Not Good	3	64.0	13	96	3.0
	25.1 – 50.0	5	2	Not Good	7				7.0
	50.1 – 75.0	50	18	Good	68				68.0
	75.1 – 100	17	5	Very Good	22				22.0
	TOTAL	74	26		100				100
	Classification					Mean	Min	Max	%
	Interval	Female	Male	Category	Total				
Muaro Jambi	0.0 – 25.0	3	1	Very Not Good	4	66.0	15	96	5.7
	25.1 – 50.0	4	2	Not Good	6				8.6
	50.1 – 75.0	29	13	Good	42				60.0
	75.1 – 100	13	5	Very Good	18				25.7
	TOTAL	49	21		70				100

3.2. Ethnoscience Knowledge

The following are the results of multiple-choice data to obtain data on the ethnoscience knowledge of the teacher's in table 3.

From table 3, which came from 50 respondents from elementary school teachers in the city of Jambi for male teachers categorized very well with the number 6 and for women as many as 28 with very good categories, and after being processed and obtained the results using the SPSS program application, then, obtained for the results of ethnics knowledge possessed by teachers who have a good category of 68.0% for 34 teachers out of 50 total teachers, very good at 22.0% for 11 out of 50 total teachers, not good at 6.0% for 3 out of 50 total teachers, and very poor 4.0% for 2 out of 50 total teachers. Of the 50 teachers in the city of Jambi has a Mean value of 66.0, a Maximum Value of 95, and a Minimum Value of 20. Then for teachers who are in Batanghari as many as 100 respondents are categorized both with a number of 15 for men and for women as much as 50, and after being processed and the results obtained using the SPSS program application, then, obtained for the results of ethnics knowledge possessed by teachers in Batanghari who have a good category of 65.0% for 65 teachers out of 100 total teachers, Very Good at 23.0% for 23 out of 100 total teachers, Not Good at 8.0 % for 8 out of 100 total teachers, and very poor 4.0% for 4 out of 100 total teachers. Of 100 primary school teachers in Batanghari has a Mean value of 66.5, a Maximum Value of 94, and a Minimum Value of 19. Then for teachers who are in Muaro Jambi as many as 70 responses are categorized both with 11 for men and 30 for women, and after processed and the results obtained using the SPSS program application, then, obtained for the results of ethnographic knowledge possessed by teachers in Muaro Jambi who have a good category of 58.6% for 41 teachers out of 70 total teachers, Very Good at 27.1% for 19 out of 70 total teachers, Not Good at 10.0% for 7 out of 70 total teachers, and very poor 4.3% for 3 out of 70 total teachers. Of the 70 primary school teachers in Batanghari have a Mean value of 67.0, Maximum Value of 96, and Minimum Value of 21.

Table 3.   Result of Multiple-choice in ethnoscience knowledge

	Classification					Mean	Min	Max	%
	Interval	Female	Male	Category	Total				
Jambi City	0.0 – 25.0	1	1	Very Not Good	2				4.0
	25.1 – 50.0	1	2	Not Good	3	66.0	20	95	6.0
	50.1 – 75.0	28	6	Good	34				68.0
	75.1 – 100	8	3	Very Good	11				22.0
	TOTAL	38	12		50				100
	Classification					Mean	Min	Max	%
	Interval	Female	Male	Category	Total				
Batanghari	0.0 – 25.0	2	2	Very Not Good	4				4.0
	25.1 – 50.0	5	3	Not Good	8	66.5	19	94	8.0
	50.1 – 75.0	50	15	Good	65				65.0
	75.1 – 100	17	6	Very Good	23				23.0
	TOTAL	74	26		100				100
	Classification					Mean	Min	Max	%
	Interval	Female	Male	Category	Total				
Muaro Jambi	0.0 – 25.0	2	1	Very Not Good	3				4.3
	25.1 – 50.0	4	3	Not Good	7	67.0	21	96	10.0
	50.1 – 75.0	30	11	Good	41				58.6
	75.1 – 100	13	6	Very Good	19				27.1
	TOTAL	49	21		70				100

3.3. The Impact of Ethnoscience on Teacher Pedagogical Competence in Elementary Schools

The results of the impact of ethnographic knowledge on the teacher's pedagogical competence can be seen in table 4.

Table 4.   Independent sample t-test for ethnographic knowledge of pedagogic competence

	t	Df	Mean	Std.Deviation	95% confidence interval	
					Lower	Upper
Ethnoscience Knowledge of pedagogic competence	21.943	220	4.0906	.24321	20.236	.7120
	21.943	128.067	3.2033	.30015	19.935	.9615

From table 4 it can be seen that the value obtained (t arithmetic) with the value of t table. T-table values can be found in the t table with a significant value of 0.025 (2-sided test) with a degree of freedom (df) 200. In this study, the result for t table is 1.97658. Whereas, the value of t arithmetic can be seen in table 4 (column t) which is 21,943. The hypothesis testing criteria is the value of no rejection of H0 [37]. So, it can be concluded that there is a significant impact on indigenous science knowledge with the teacher's pedagogical competence. It can be seen from Table 4 that the average value of student interest is 4.0906, which means it can increase the teacher's ethnocentric knowledge in learning.

4. Discussion

According to Act No. 16 of 2007 point 1 that Pedagogical Competence of teachers must understand the characteristics of students from physical, moral, social, cultural, emotional and intellectual aspects [26]. This shows that in carrying out learning the teacher must integrate the cultural values and social-cultural backgrounds of the students. This means that teachers are required to carry out learning that must follow the cultural and social-cultural values of students. Knowing the culture and science-culture of students means that the teacher has fulfilled the demands of pedagogical competencies that must be mastered by the teacher. Knowledge of good teacher indigenous science can support the implementation of effective learning. The teacher's role consisting of various roles is composed of culture. This implies facts and the environment when determining how the teacher's role is developed and influences how to solve in different cultures, communities, and geographical environments. Thus, it is difficult to offer a resolution that addresses the role of teachers without considering cultural, geographical and social differences [27]; [28]. Having poor ethnic knowledge shows that the teacher has not mastered pedagogical competence well. The teacher has not been able to make the cultural background of students as part of learning in the classroom. Prospective teachers must understand the concept of learning in elementary schools obtained from the college period. Prospective teachers must get adequate practice and simulation, because elementary school is the

first step for prospective teachers to build their knowledge. Primary school is the first step where a child meets the school experience. The elementary school acts as a base for students to acquire future knowledge to study later and give children the necessary learning habits, children need to spend this period in the environment and good conditional [29]; [30].

In addition to the multiple-choice data on pedagogical competence, researchers also sought ethnographic knowledge possessed by primary school teachers, which had a dominant outcome both in all teachers sampled. According to [31] the focus in constructivist approaches is to develop and enhance students' understanding by connecting new information to pre-existing knowledge. Constructivism posits that learners create knowledge from new information in the light of their previous experiences since each learner brings a distinct background of experience [32]. Constructivism is a rich source of epistemological offers that can generate insights to conceptualize hypermedia tools along with specific guidelines to discuss this tool [33]. Constructivism is a phenomenon that is published in various teaching contexts [34]. Constructivism leads to encourage students to implement to choose their value [35]. This states that the ethnic knowledge of elementary school teachers in the Batanghari Regency is included in the good category. As an educator, the teacher must be able to understand the culture that is around students to be taught to their students. Over thousands of years, humans have had to learn to adapt to culture as a tool to survive in environments that are overwhelmed by resources and often change [36].

Seeing from the results of the table 4, if the teacher has good ethnographic skills, the teacher can teach students well. If the teacher has a low ability of indigenous science then the teacher cannot teach well, consequently, the students do not know their own culture and cannot filter the incoming foreign culture that is not under Indonesian cultural habits. If it's like that learners will lose their national identity. [38] defines cultural identity "as one's understanding of multi-layered, interdependent and out of sync social status interactions, language, race, ethnicity, values, and pervasive behavior and almost that affect all aspects of our lives. If students do not have a cultural identity then students will not know the cultural possess itself. [39] Over thousands of years, humans have had to

learn to adapt culture as a tool to survive in environments that are overwhelmed by resources, and often change. expanding the agenda for the study of social inequality by focusing on what we call cultural processes [39] Students cannot preserve the national culture which should be a guideline for students because the purpose of learning by linking ethno values around students themselves is that students know the value of local wisdom around them, then students are expected to be able to maintain and preserve the value of local wisdom so that it still exists and is not displaced by outside cultures. Furthermore, students remain grounded in the values of local cultural wisdom in the area around students as a reinforcement of the character of students so as not to lose identity because students are the next generation of the nation who has obligations and responsibilities to maintain and preserve the nation's cultural values in Indonesia.

5. Conclusions

From the results of research that has been done, teachers have good pedagogical abilities, which is also supported by scientific knowledge possessed by teachers who have good results, when teachers have pedagogic abilities and good scientific knowledge, it will have a good impact on teachers in teaching a learning, one of the indigenous science because indigenous science teaches a learning that connects with the surrounding environment.

Acknowledgements

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