



Field Trip and Its Effect on Traditional Ecological Knowledge Literacy During the COVID-19 Pandemic in Rural Primary School

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ABSTRAK

Pengetahuan ekologi tradisional (TEK) adalah praktik-praktik terbaik penduduk asli yang diperoleh melalui pengalaman berabad-abad dalam berkontak dengan alam. Kawasan pedesaan di Kecamatan Tawangmangu yang terletak di lereng Gunung Lawu, Indonesia kaya dengan TEK, seperti cerita rakyat, upacara tradisi, seni pertunjukan, sistem bertanam, dan sistem panen yang mulai ditinggalkan generasi muda. Pengajaran TEK dengan membawa siswa ke sumber belajar memungkinkan terjadi literasi pada aspek kognitif maupun afektif. Studi ini dilakukan untuk mengetahui efek pengajaran melalui field trip terhadap peningkatan literasi TEK siswa sekolah dasar setempat. Penelitian dilakukan melalui eksperimen kuasi dengan pretest-posttest non-equivalent control group design. Pembelajaran pada kelas eksperimen dilakukan di luar rumah dengan field trip dalam kelompok kecil (4-6siswa), sedangkan kelas kontrol dilakukan dengan sistem pembelajaran jarak jauh melalui WhatsApp dan siaran radio di rumah masing-masing siswa. Hasilnya menunjukkan terdapat pengaruh signifikan metode field trip terhadap literasi TEK, baik pada aspek kognitif maupun afektif. Analisis d Cohen's menunjukkan efeknya tergolong besar. Tingkat penguasaan materi TEK di kelas field trip secara signifikan lebih tinggi daripada di kelas non-fieldtrip. Selain itu, siswa di kelas fieldtrip juga menunjukkan sikap pro-lingkungan lebih tinggi daripada siswa di kelas non-field trip. Direkomendasikan agar pendidikan lingkungan atau budaya lokal diadakan melalui field trip dalam kelompok kecil untuk mengurangi kejenuhan siswa mengikuti pembelajaran jarak jauh pada masa pandemic di pedesaan.

ABSTRACT

Traditional ecological knowledge (TEK) is the best indigenous practice acquired through centuries of experience in contact with nature. The rural area in Tawangmangu District, located on the slopes of Mount Lawu, Indonesia, is rich in TEK, such as folklore, traditional ceremonies, performing arts, planting systems, and harvesting systems that are starting to be abandoned young. Teaching TEK by bringing students to learning resources allows literacy to occur in cognitive and affective aspects. This study was conducted to determine the effect of teaching through field trips on improving the literacy of local elementary school students in TEK literacy. The study was conducted through a quasi-experimental with pretest-posttest non-equivalent control group design. Learning in the experimental class is carried out outside the home with field trips in small groups (4-6 students), while the control class is carried out using a distance learning system via WhatsApp and radio broadcasts at each student's home. The results show a significant effect of the field trip method on TEK literacy, both in cognitive and affective aspects. d Cohen's analysis shows the effect is quite significant. The level of mastery of TEK material in the field trip class is significantly higher than in the non-field trip class. In addition, students in the field trip class also showed higher pro-environment attitudes than students in the non-field trip class. It is recommended that environmental or local cultural education be held through field visits in small groups to reduce student boredom following distance learning during the pandemic in rural areas.

1. INTRODUCTION

Rural communities in Indonesia generally have local wisdom which is their ancestral heritage. Local wisdom is a way of life that is inherited from one generation to another in the form of religion, culture, or customs. Among the local wisdoms in rural areas that play an important role for the community are those related to the natural environment (Khaerunnisa & Pamungkas, 2019; Putra et al., 2018). In ancient times, people have studied and adapted to the environment so that they are able to maintain life in harmony with nature. The best practices in adapting to nature acquired over the centuries are termed traditional ecological knowledge or TEK (Kristiawan, 2018; Santoso, 2017). The indigenous people generally use their own ways to manage the environment and such habits are called traditional ecological knowledge (Awi, 2013; Everett, 2011).

Traditional ecological knowledge has a major contribution to the formation of the natural environment, ecology, biology, geology, and geography in the local area in the future (Alexander et al., 2019; Salampessy et al., 2017). However, TEK in various countries is suspected of being threatened with extinction for various reasons. The extinction of TEK in Uganda is due to the entry of foreign technology (Okello-Obura, 2018). In China for being undocumented (Turvey et al., 2018); in Fiji caused by urbanization factors (Cagivinaka, 2016); in Africa because of colonialization and unprotected factors, while in India because TEK is still an oral tradition. The phenomenon of the loss of traditional ecological knowledge also occurs in Indonesia by various factors. The local wisdom in Indonesia, including ecological knowledge, has been degraded due to globalization factors (Fitrahayunitisna & Zulvarina, 2017). Previous research suggest that traditional ecological knowledge in Eastern Indonesia has been forgotten by its owners because it has not been documented (Kurnilasari et al., 2018). Previous research found that the no longer applying custom in managing forests caused forest damage in Manggarai, East Nusa Tenggara due to modernization factors (Niman, 2019). All of these factors allow ecological knowledge which is the cultural heritage of our ancestors to become extinct, but according to (Niman, 2019), the core problem is that efforts to maintain this heritage have not been carried out.

One of the rural areas rich in TEK is Tawangmangu District in Karanganyar Regency, Central Java Province. It is located on the slopes of Mount Lawu which is popular with its natural attractions. Uniquely, all aspects of TEK are related to the preservation of non-rice food which includes the *Prabu Baka* folktale about the origin of vegetables, the *Narotama* folktale about the origin of planting corn, the clean ceremony of the *Mondosiyo* village and the clean ceremony of the *Dhukutan* village with offerings made from corn, and a traditional house equipped with a pogo 'a place to store vegetables and corn' (Sumarwati & Anindyarini, 2015; Wati et al., 2019). In addition, the Tawangmangu community also carries out the *Dhawuhan* tradition ceremony to maintain springs, maintain the cleanliness of the Pringgodani Cave area at the village clean ceremony, abstinence from entering the forest on the slopes of Mount Lawu, intercropping vegetable cropping systems, and the jogotirto irrigation system (Sumarwati et al., 2020). The gap in this research is that TEK is no longer implemented, which are good practices inherited from our ancestors today. In the past, the community strictly applied this traditional ecological knowledge, for example obeying the prohibition on encroaching on the forest on the slopes of Mount Lawu or above Grojogan Sewu. That way they can overcome food crises, drought disasters, and even avoid natural disasters -such as landslides and floods (Wati et al., 2019). However, recently, this custom is often violated, for example taking wood in the forest, resulting in the expansion of monkeys and wild boars into agricultural land and looting of vegetables and crops. Therefore, farmers are forced to replace their crop commodities so as not to lose money. In fact, so far the quality of Tawangmangu carrots and sweet potatoes is known to be superior so that they have high economic value. In addition, forest encroachment and the slopes of Mount Lawu are also the cause of landslides (Sumarwati et al., 2021). Another study found that the local cultural wealth about ecology in Tawangmangu which is endangered is the folktale of Prabu Baka and the folktale of Narotama about the origin of choosing vegetables and corn as agricultural commodities in Tawangmangu. This is suspected from the lack of local residents who know about the folktale (Sumarwati et al., 2021). In fact, the logic of the folktale is related to the climate and geographical character of the region (Purnama, 2017).

Given how potential cultural wealth in the form of ecological knowledge inherited from ancestors, the next generation should try to preserve it. This is in accordance with UNESCO's call for all nations to maintain and revive their local wisdom (Hartini, S. et al., 2018; Matsun et al., 2019; Suastra et al., 2017). In this regard, an effort that many experts recommend is to integrate TEK in learning in schools. Therefore, in various countries TEK learning in schools has been carried out. For example, in Canada, Aboriginal indigenous knowledge has been included in the curriculum in schools for Aboriginal children (Kim, 2012), in Fiji (Cagivinaka, 2016). Following up on these recommendations, to maintain the sustainability of TEK in Tawangmangu it is necessary to integrate it in formal learning in schools, especially in local elementary schools (Taneo, 2017). The urgency of implementing a field trip to integrate TEK in learning in Tawangmangu is based on the following points. *First*, learning in elementary schools is thematic and there

are themes/subthemes about ecology and local culture. *Second*, elementary school teachers in Tawangmangu wish to apply the principles of literacy and character education based on local culture, but have difficulty realizing their learning because they do not understand local TEK well, while written materials are not yet available (Sumarwati et al., 2020). *Third*, the field trip method is appropriate to apply in traditional ecological knowledge learning so that students get material sources from "first hand" and get real experience related to the topic being studied. *Fourth*, learning outside the classroom in small groups is a positive choice during the Covid-19 pandemic in rural areas given the obstacles in online learning due to internet access factors, limited e-learning facilities, and student boredom studying at home

The novelty of this research lies in the focus of the study, namely TEK which is part of local wisdom. In Indonesia, research on local wisdom, including its integration in education, has been widely carried out. Research on this topic, among others, studied its use as a literacy education medium (Indrianti et al., 2017). while other researchers studied its use in education. Environment (Wibowo et al., 2012). The other research groups use local wisdom as a source of character education values in schools (Agusman et al., 2018). However, the focus of research on local wisdom on ecological elements has not been widely held. Likewise, research on the application of field trips in learning has also been carried out. For example, for learning to write descriptive texts, learning to write poetry, speaking, and environmental education (Marini & Retnoningsih, 2016; Nurhaedah & Pagarra, 2017; Sanita et al., 2020; Widodo, 2019). However, the application of field trips for specific environmental studies on traditional ecological knowledge has not been widely addressed. This will certainly support the eco literacy movement and also support government policies, namely the School Literacy Movement, one of which is by instilling eco-literacy in children

2. METHOD

Testing the effect of field trips on increasing TEK literacy in cognitive and affective aspects was carried out through experiments with *pretest-posttest non-equivalent control group design*. The population of this research is elementary school students in Tawangmangu District. The experiment was conducted on 5th grade students from two elementary schools. Each school is taken one class (intact group). One class as the experimental group and one class as the control group. The experimental group was grade 5 from SD Negeri 3 Tawangmangu, while the control group was SD Negeri 1 Tawangmangu. The number of students in both classes is 27 people each. The distance between the experimental school and places that become a source of learning is between 200 – 2000 meters. The characteristics of the two classes are sought to be equal in terms of school qualifications, which are both at medium level, distance between schools and learning resources, number of students, and have never received local TEK materials. TEK materials are grouped into six materials for six treatments. One treatment is held for one learning day. Field trips were held in three locations, namely Nglurah, Pancot, and Kalisoro Village. In accordance with the applicable curriculum, learning is carried out in an integrated thematic manner. This means that learning is carried out by integrating various competencies from several subjects based on one theme in one day of learning so that students can learn a basic concept holistically. For this research, TEK material is integrated into Indonesian, social science, science, and art subjects

To measure the level of mastery of TEK material (cognitive domain) a multiple choice test instrument was developed. To measure the attitude of pro-TEK (affective domain) a questionnaire was developed. The cognitive aspect here refers to the level of mastery of the six TEK materials, while the affective aspect is limited to the pro-TEK attitude, namely providing support for the sustainability of TEK and the willingness to participate in maintaining the sustainability of TEK. Tests and questionnaires were given before and after treatment via google form. The multiple choice test developed includes six TEK materials with 4 answer choices. Each correct answer is given a score of 1, while the wrong answer is given a score of 0 so that the test score range is 0-40. Before being implemented, 57 test items were tested to measure their validity and reliability. From the measurement of the validity of the items with the product moment, it shows that 40 items are valid, where the coefficient $r_0 = 0.48$ to 0.72 , while $r_t = 0.361$. From the measurement of the reliability of the test with KR-21, the coefficient $r = 0.68$ or > 0.60 , so that it is declared reliable. Examples of questions developed from 6 TEK materials are presented in Table 1.

Table 1. Characteristic of TEK Content and Test

Types of TEK	Materials	Sample of Questions in the Test	Total Items
Folktales	- the origin story of the corn plant - the origin story of the vegetables plant	- Why after the residents planted and consumed corn according to <i>Narotama's</i> orders, there were no more deadly disease outbreaks?	6

Types of TEK	Materials	Sample of Questions in the Test	Total Items
Agricultural system	- Plant selection - Intercropping - Irrigation of terraced land - Harvest method - Harvest management	- What was the purpose of <i>Prabu Baka</i> asking the gods to turn his body into various vegetable plants?	12
		- What are the considerations of farmers in choosing plants?	
		- Why do farmers apply the intercropping system?	
		- How to irrigate terraced farmland?	
		- Why will monkeys plunder crops if the trees on the slopes of Mount Lawu are cut down?	
Performing arts	- <i>Reog Pancot</i> attractions	- How can wild boar damage crops?	4
	- <i>Gamelan thok prol</i> music	- What are the considerations of farmers in choosing crops that are harvested first in intercropping farming?	
Traditional ceremony	- <i>Dhukutan</i> village clean ceremony	- How to store garlic harvest?	6
	- <i>Dhawuhan</i> water guarding ceremony	- What is the difference between <i>reog Pancot</i> and <i>reog</i> from other regions?	
Traditional food	- Corn rice	- What musical instruments are played on the <i>gamelan thok prol</i> ?	6
	- Corn cake	- What is the purpose of holding the <i>Dhukutan</i> village clean ceremony?	
Herbal medicine	- Utilization	- What is the importance of holding a <i>Dhawuhan</i> water guarding ceremony?	6
	- <i>tempuyung</i> leaves,	- How to make corn rice?	
	- <i>semanggi</i> leaves, and <i>baru cina</i> leaves	- How to make <i>gandhik</i> cake?	
		Total	40

Initially, the questionnaire which was developed using the Guttman scale, which provides answer choices of the YES/NO dichotomy, contains 32 items. Before being implemented, the questionnaire was tested on 25 5th grade students whose characteristics were equivalent to the sample, then tested its validity and reliability. From the validity test conducted by three experts, 24 items were declared valid. From the reliability test with Cronbach's Alpha, the coefficient $r_0 = 0.74$ (reliable). Thus, the score range for the pro-TEK questionnaire is 0 – 24. This research was conducted during the implementation of distance learning due to the COVID-19 pandemic. However, during the implementation of the treatment, Tawangmangu District had the status of a yellow zone so that it was possible to do learning outside the home by implementing health protocols. Learning in the experimental group was carried out through field trips in small groups (4-6 people) alternately, while the control group was carried out using conventional methods, namely learning at home through the WhatsApp (WA) platform and local radio. There are two kinds of data analysis, namely descriptive statistical analysis and inferential statistical analysis. Descriptive analysis was carried out by calculating the mean, median, mode, variance, and standard deviation of the pretest, posttest, and gain score data. Inferential statistical analysis was performed using the independent sample t-test formula to determine whether there was a significant difference in the level of TEK literacy between the experimental and control groups. After that, the Cohen effect size test was carried out to measure the magnitude of the treatment effect. Before applying inferential statistics, the prerequisite tests for normality and homogeneity were carried out. Calculations were performed using SPSS 20.

3. RESULT AND DISCUSSION

Result

In accordance with the applied quasi-experimental research design, namely pretest-posttest non-equivalent control group design, so that the measurement of cognitive and affective aspects was carried out twice, namely pretest and posttest in the experimental and control groups. From the pretest and posttest

data on cognitive aspects, it shows that there is an increase in the mastery of TEK by students, both in the experimental and control groups. Likewise, descriptive data on the affective aspect showed that the average posttest score for the pro-TEK attitude of the experimental and control groups was greater than the pretest. Thus, it can be stated that there is an increase in pro-TEK attitudes in both groups. However, in terms of the gain score comparison, the experimental group was higher than the control group, both in cognitive aspects (mastery of TEK material) and affective aspects (pro-TEK attitudes). Thus, the TEK literacy level of the class that applies field trip learning is superior to that of the non-field trip class. When viewed from the mean gain score in Table 7 data, the difference between the experimental and control groups in the cognitive aspect is 4.04 (from 18.74-14.70), while in the affective aspect, the difference is 2.7 (from 9.33 – 6.63). Thus, the difference in the mean gain score in the affective aspect is smaller than in the cognitive. This can be related to the data in Table 8 which shows that the difference in the percentage of pro-TEK attitudes between the experimental and control groups for certain materials is not too large. Even for the folktale material, the pro-TEK attitude of the control group was as high as that of the experimental group (above 90%).

Before testing the hypothesis with inferential statistical analysis, normality and homogeneity tests were carried out on the gain score. Judging from the magnitude of the significance coefficient (Sig.) which is all greater than 0.05, the results of the normality test using the Kolmogorov-Smirnov formula show that the experimental and control group data on cognitive and affective aspects are normally distributed. The results of the homogeneity test with the Levene Test also show that the experimental and control group data on cognitive and affective aspects are homogeneous because the significance coefficient is greater than 0.05. Thus, the gain score data in both classes can be followed up with hypothesis testing. In this study there are two null hypotheses, namely (1) there is no significant effect of field trips on TEK literacy on cognitive aspects and (2) no significant effects of field trips on TEK literacy on affective aspects of elementary school students in Tawangmangu. From the results of the hypothesis test of the field trip effect on increasing mastery of TEK by grade 5 elementary school students, the coefficient $t_0 = 4,001$ with a significance level of 0.000. It shows the significance is smaller than 0.05 so that the null hypothesis is rejected. This means that there is a significant effect of the procurement of field trips on increasing the mastery of TEK. The results of the hypothesis test of the field trip effect on increasing pro-TEK attitudes obtained $t_0 = 3.317$ with a significance level of 0.002 or less than 0.05. Thus, there is a significant effect of providing field trips on increasing pro-TEK attitudes in students as well.

To measure the magnitude of the effect of the field trip on TEK literacy, both in the cognitive and affective aspects, then the effect size test was carried out using the Cohen d formula. From the effect size test on the cognitive aspect, an index of 1.09 was obtained. Based on Cohen's d statistical criteria, the index value is above 0.8 and below 2.0 which is included in the large category. The effect size on the affective aspect obtained an index of 0.69. Based on Cohen's d statistical criteria, the index is at the medium level. Thus, the effect of the field trip method on mastery of TEK material is categorized as large, while the pro-TEK attitude is categorized as medium. Judging from descriptive statistics, the results of the study show that the performance of the class taught by the field trip method is better than the non-field trip class. This happened in the mastery of TEK material (cognitive), as well as pro-TEK (affective) attitudes. In addition, judging from the average gains core between the field trip and non-field trip classes, the average difference in the cognitive aspect is greater than the affective aspect. This phenomenon can be related to the percentage of students in both classes who show the same pro-TEK attitude in the folktale material. Judging from the hypothesis test, the results showed that there was a significant effect of the procurement of field trips on increasing the mastery of TEK and pro-TEK attitudes which were held in small groups during the COVID-19 pandemic by implementing health protocols. In addition, from the effect size test, information is obtained that the effect of field trips on the level of mastery of TEK material is categorized as large, while the effect on the level of pro-TEK attitudes is medium.

Discussion

The existence of a significant effect of field trips on improving cognitive aspects of TEK material is in line with previous studies on various subjects. The one year after the field trip, many students still remembered the environment they had seen (Fauziah et al., 2020; Hattingh & Downing, 2020; Widiyanti et al., 2017). The field trips help students score higher in art education than those who do not. Field trips can make a positive contribution to student achievement in the field of science (Whitesell, 2016). The results of the research showed that there was a significant increase in students' knowledge of ecosystems between before and after the field trip (Jose et al., 2017). There was a positive effect of field trips on increasing knowledge about history in participants (Taneo, 2017).



Figure 1. Identify Characteristics of Intercropping Systems

The effectiveness of field trips is caused by several factors and the main one is to make the object being studied concrete. The important role of field trips, namely helping students connect the theory and reality learned (Nurmaliah et al., 2018; Yossa, 2015). In connection with this research, the intercropping vegetable farming system is not easy for students to understand. There are several vegetable plants that are similar in shape, namely leeks, spring onions, and garlic leaves, making them difficult to distinguish. Likewise, celery and carrots have similar leaf shapes. By observing directly on agricultural land (Figure 1) and asking farmers, the concept of intercropping agriculture becomes easy to understand. This finding is in line with research that field trips allow the process of changing students' perceptions of the abstract environment to become concrete (Güler & Afacan, 2013; Wong-Parodi & Rubin, 2021). This phenomenon also supports the statement that field trips are a way to make it easier for students to remember the objects they are learning through what they feel, see, hear, smell, touch and remember about places and emotions (Arrobas et al., 2020; Hamidi & Zhao, 2020). Field trips create opportunities for students to actively explore subject matter in real contexts, apply theory in practice, and meet professionals who can answer their questions.



Figure 2. Exploring the Traditional Vegetable Harvesting System

In addition to functioning to make the material being studied concrete, field trips also make it easier for students to understand new information related to TEK material (Meschini et al., 2021; Panzer-Krause, 2020). This can be related to the results of research that according to local TEK experts, TEK in Tawangmangu such as folktales, traditional ceremonies, and vegetable farming systems are starting to be forgotten by the owner community so that they do not understand the meaning and messages contained in it (Sumarwati & Anindyarini, 2015). Therefore, in this study, field trip activities focused on, among other things, material about the traditional chili harvest management system which had only been known to chili farmers (Figure 2), the history of a large tree that was believed to have been the residence of folktale figures so it was sacred and no cutting is allowed (Figure 3), as well as statues at the Menggung Site which actually depict the characteristics and positions of the characters in the Narotama folktale (Figure 4). The object is familiar to students, but they do not know the information or meaning in it. Therefore, through field trips, students can collect information about the object being studied so that they can increase their knowledge. This has the effect of increasing mastery of TEK material compared to distance learning classes (non-field trips). Field trips can serve as an introduction to new concepts or provide experiences that reinforce ideas introduced in class (Cheng & Tsai, 2019; Riegel & Kindermann, 2016).



Figure 3. Telling Stories in Folktale Settings



Figure 4. Explore the Menggung Site

Another finding from this study is that among the six TEK materials, the folktale material received the highest support from the experimental group. The high support for the material not only came from the experimental group, but also from the control group. This shows that students in both groups have a high interest in local folktale, namely the Myth of Narotama (the story of the origin of the corn plant) and the Myth of Prabu Baka (the story of the origin of the vegetable plant). The two folktales contain a message that geographically and climatologically, the Tawangmangu area is only suitable for growing vegetables and pulses, not suitable for planting rice, so that high support will secure the sustainability of the TEK. This phenomenon indicates that however, children like folktale or fairy tales, whether they are listened to through field trips or non-field trips. This finding reinforces several previous research results that basically children have a high interest in fairy tales so that they are effectively used as learning media.

4. CONCLUSION

The results of this study prove that there is a significant influence on the provision of field trips in small groups on traditional ecological knowledge literacy (TEK) in Tawangmangu by local elementary school students during the COVID-19 pandemic, both in cognitive and affective aspects. The effectiveness of the field trip on the cognitive aspect was marked by an increase in mastery of higher TEK material in the experimental group compared to the control group whose learning was carried out using a remote system through WhatsApp Group and local radio broadcasts. The effectiveness on the affective aspect was shown by the higher pro-TEK attitude of the experimental group as well.

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