



## **The Effect of Folktale-Based Comics on Traditional Ecological Knowledge Literacy about Non-rice Food Security**

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Traditional ecological knowledge (TEK) is knowledge of indigenous people's best practices in contact with nature gained through centuries of experience. One way to transmit the experiences is folktales about corn and vegetable planting in Tawangmangu Sub-district, Central Java, Indonesia. Today, young generations do not recognize the folktales and thus do not understand the important values implied in the stories about non-rice food security. This condition triggers the importance of literacy of folktales among local students. This study aims at investigating the effects of folktale-based comics on the level of students' mastery of TEK through quasi-experimental research. The population in this study includes fifth-grade elementary students in Tawangmangu. The experimental group was given treatment with folktale-based comics, while the control group received treatment with texts. The instrument used to measure the students' literacy level of TEK was a multiple-choice test with 38 items. The results have proven the significant contribution of folktale-based comics to the students' mastery of TEK, indicated by the large category of the Cohen test. Therefore, teachers are recommended to take advantage of educational comics to improve students' literacy in the local cultural wealth that is becoming extinct.

Keywords: literacy, traditional ecological knowledge, non-rice food security, folktales-based comics, ecological knowledge

## **INTRODUCTION**

Indonesia has a very abundant cultural heritage, both in the form of artifacts (tangible) and traditions (intangible) that live among indigenous people. One of them is traditional ecological knowledge (TEK). This knowledge is often termed indigenous knowledge, which refers to the concept of knowledge obtained through hundreds or even thousands of years of experience by indigenous people in direct contact with their environment (U.S. Fish & Wildlife Service, 2011; Mason, White, Morishima, *et al.*, 2012).

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Indonesia is also an agricultural country, so that this country is rich with traditional ecological knowledge about food. This was confirmed by a previous study conducted by Sudadi, Murtini, and Widyastuti (2016), which found that almost all folklores in Java have the theme of food security.

In many countries, several studies on TEK regarding food have been carried out, including those in the field of education. Some of them are research about TEK on food security in Kenya (Ratemo, Ogendi, Huang *et al.*, 2020); in Peru (Huambachano, 2019); in Ghana (Boafo, Saito, Kato *et al.*, 2016) and student literacy towards traditional food (Gartaula, Patel, Shukla, *et al.*, 2020). However, in Indonesia, the majority of study objects are directed at a general concept, namely local wisdom. Some research use that topic in character education (Agusman, Suyitno, & Pratiwi, 2018; Fitrahayunitisna & Zulvarina, 2017), literacy education (Indrianti, Khutobah, & Latif, 2017), as well as the adult education program (Laksono & Wahyuni, 2018). One of the considerations in the use of local wisdom in these studies come from an indication that cultural heritage is starting to become extinct. Thus, it can be stated that in Indonesia, many research on local wisdom have been carried out, but the specifics regarding TEK, especially those focused on food security, have not been done much.

One of the TEK about endangered food security is found in Tawangmangu Sub-district, Karanganyar Regency, Central Java Province. Most of the area is located at the foot of Mount Lawu with hilly terrain and sharp slopes. The annual rainfall in this area is quite high and the weather is cold. Nevertheless, Tawangmangu is an agricultural area with fertile soil. There are many elements of traditional ecological knowledge, such as folktales, traditional ceremonies, performing arts, traditional food, and agricultural systems. Uniquely, the elements of the knowledge are related to non-rice food security. Today, the local people keep carrying out various traditional ceremonies, especially *Dhukutan* and *Mondosiyo* (Setiawan, 2017). However, other elements have begun to be abandoned and forgotten, some of which are folktales, namely *Narotama* and *King Baka* (Sumarwati, Sukarno, Anindyarini, Lestari, 2020).

*Narotama* tells about the origin of planting corn, while *King Baka* recounts the history of planting vegetables. The two types of agricultural commodities are suitable to be planted in Tawangmangu because of the climatic characteristics and geographical conditions. The folktale of *Narotama* and *King Baka* are seen as a warning and teaching to future generations about choosing the right agricultural crops. These natural factors are thought to be the basis for *Narotama*'s invitation for people to cultivate corn and eat corn rice as well as *King Baka*'s invitation to grow vegetables (Sumarwati, Anindyarini, & Zuhri, 2019; Sumarwati, *et al.*, 2020). The loss of these folktales contributes to the younger generation's limited knowledge of the important lessons implied in it, particularly about non-rice food security. Meanwhile, the most dominant TEK is about rice food because the staple food in Indonesia is rice.

According to the TEK local experts, until the period of 1970s, more than 50% of Tawangmangu residents consumed corn rice. However, since the government's food sufficiency program was persistent, people who previously consumed non-rice food

gradually made rice as their staple food, which became the main focus of the program. In the 1990s, people stopped consuming corn rice as staple food. The rice and cakes made from corn were only provided as the offerings in traditional ceremonies, such as the *Dhukutan* and *Mondosiyo* village clean ceremonies. Unluckily, this contributes to younger people's perception that corn rice is a traditional food that serves as 'devil food', and thus, many families prohibit their children to consume corn rice and other food made from corn (Sumarwati, *et al.*, 2020). Based on these facts, these misconceptions need to be corrected, either by reviving the existence of folktales.

The extinction of TEK can be linked to the consequences of globalization, technology, modernization, migration, and the education system (Harisha, Padmavathy, & Nagaraja, 2016; Oteros-Rozas, Ontillera-Sánchez, Gómez-Baggethun, *et al.* 2013; Berkes, Colding, & Folke, 2000). The Millennium Ecosystem Assessment (2005) identified the loss of knowledge has had various impacts. The main thing is the global environmental change and the management of ecosystem services. Even Baggethun, Corbera, and Reyes-Garcia (2013) found that global warming is the result of people's ignorance of TEK. Therefore, researchers in the world recommend that TEK is handed across generations to prevent the extinction of such knowledge through various efforts, one of which is integrating the knowledge in school learning materials (Cagivinaka, 2016; Armstrong, Kemmerer, & Vergun, 2007). Therefore, to maintain the sustainability of TEK in Tawangmangu, one of the strategies is to teach it in formal schools.

Because the local people are no longer familiar with the folktales, the *Narotama* and *King Baka*, they are a new thing to their children. Therefore, to facilitate students' understanding of the folktales components and other TEK materials, effective learning media are needed. In this regard, Kim, Jang, Shin, *et al.* (2012) recommended that the material be conveyed through comic because it can attract students' interest in learning and facilitate them to grasp the essence of new learning materials. This idea is also supported by research of Syarah, Yetti, Fridani, *et al.* (2019) which showed in comics make it easier for students to feel the of all characters due to environmental destruction. In other words, students can remember the messages on preserving the environment.

Comics are regarded as an effective media to deliver materials learning. Jacobs (2007) says that comics are more than words, communicating messages through images. Comics are referred to as multimodal text characterized by a combination of logics put together through several modes, such as images, text, color, (Lauer, 2009). Referring to Bruner's theory, Cabahug (2012) confirms the use of images includes a technique of representing experiences at the iconic level using text (symbolic level) so that the information conveyed is more concrete.

The study of local wisdom for educational purposes that centers on ecological aspects will encourage the ecological literacy movement, which becomes one of the government's targets in the School Literacy Movement Program (Wiedarti & Kisyani-Leksono, 2016: 2). In addition, the comics produced in this study can support one of the school literacy programs, 'one child, one book'. Nevertheless, studies on TEK of non-rice food security are limited. If these studies are done, they will support the government's programs, particularly on food diversification. This is following

Government Regulation Number 43 of 2015 regarding the *Badan Ketahanan Pangan* 'Food Security Agency' (2018), which encourages Indonesian people to implement diverse food consumption.

Referring to various theoretical studies and previous empirical data, it is suspected that comics developed based on folktales in Tawangmangu is effective as a medium for TEK learning about non-rice food security. Therefore, this study aims to determine the effect of the use of folktales-based comics on the level of traditional ecological literacy regarding non-rice food security in elementary school students. The novelties of this study lie in the specific scope of local wisdom on ecological issues and the topic of non-rice food security.

### **Research questions**

1. Is there a significant effect of using folktale-based comics on the level of traditional ecological literacy about non-rice food security?
2. To what extent is the effect of using folktales-based comics on students' traditional ecological literacy levels?

### **Literature Review**

#### **Folktales as an important element of TEK in Tawangmangu**

Traditional ecological knowledge (TEK) is specific to particular locations and is distinct from other locations. Therefore, according to Berkes, *et al.* (2000), TEK is a collection of knowledge, practices, and beliefs about the relationship of living things with their changing environment through a process of adaptation passed down from generation to generation. When related to the problems on food security, TEK represents knowledge, practice, and belief related to its preservation, whether it is about the origin of food, farming procedures, harvesting procedures, pest management, harvest management procedures, and strategies to overcome drought. These elements are also contained in the traditional ecological knowledge of the Tawangmangu community (Sumarwati *et al.*, 2019). Among these elements, the most central is the folktales of the origin of plants, namely *Narotama* and *King Baka*.

*Narotama* tells about a commander, named Narotama, who became a pioneer in planting corn and processing it as food. Before Narotama arrived at the area, the local people planted rice on their land and always failed to harvest the crop, and thus, they suffered from a food shortage that caused many people to starve to death. They did not realize that the land in Tawangmangu was not suitable for planting rice. Then, Narotama introduced them to the idea of planting corn and process the yields into food. Because of Narotama, people could finally realize the condition and were no longer in food scarcity.

The story of *King Baka* recounts about a king who ate people. One day, a hermit named Putut Tetuka voluntarily sacrificed himself to be the king's meal. Because Putut Tetuka had supernatural power, King Baka could not eat him, and they were even involved in a fight. Finally, Putut Tetuka managed to defeat the evil king. Before dying, King Baka realized his mistake and wanted to make up for this by donating all parts of his body for the welfare of all people. His body immediately turned into various types of vegetables

and crops, such as cabbage, carrots, potatoes, straw onions, garlic, bananas, purple sweet potatoes, and cassava (Sumarwati *et al.*, 2019). For local people, Narotama and King Baka were seen as meritorious figures so that they held traditional ceremonies to honor them. *Dhukutan* village clean tradition ceremony to commemorate Narotama's wedding day and *Mondosiyo* village clean tradition ceremony to commemorate the death of King Baka. In addition, at other traditional ceremonies, the names of the two figures are mentioned in prayers

### **Comics as an environmental educational media**

In general, comics are defined as pictorial stories. According to McCloud (2001), comics are images or other symbols that are juxtaposed (arranged close together or side by side) in a certain order to convey information and achieve an aesthetic response from the readers. As learning media, comics function to convey learning materials (Waluyanto, 2005). In this context, learning refers to the communication process between students and learning resources so that comics must meet the principles of education.

According to Lutfifati (2011), comics can be divided into two categories, namely comic strips, and comic books. Comic strips are a form of comics that consist of several sheets of column frames, with serial stories, published in a daily newspaper or magazine, while comic books are comics presented in books. The comics used in this study belong to comic books because they are presented in the form of books that contain several pages. These educational comics are benefitted to convey materials about the environment, particularly traditional ecology.

Researchers from various countries have conducted studies on the use of comics in environmental education. Topkaya and Dogan (2020) found that the use of educational comics has a major influence on increasing awareness of environmental problems among students in Turkey. The study by Negrete (2013) reported that comics are very effective in communicating environmental problems in a large and diverse population such as in Mexico, including in groups with low literacy levels, which are very difficult to achieve through other means. Looking at the effectiveness of comics in environmental education, it is expected that comics are effectively used as the media for learning TEK and are developed based on the folktales about the history of corn and vegetable planting in Tawangmangu.

Essential education on the environment is handed to students to increase their knowledge of the environment (Borchers, Boesch, Riedel *et. al.*, 2014). Environmental knowledge provided through formal education can support attitudes towards the environment (Janmaimool & Khajohnmane, 2019) since thorough knowledge on this matter can improve students' participation in environmentally-friendly actions and environmental-care practices (Topkaya & Dogan, 2020). Caring for the environment is an attitude and action that can prevent damage to the natural environment, as well as develop the efforts to manage natural damage that has occurred (Fua, Wekke, Sabara, *et al.* 2018).

## METHOD

### Design

This study applies a quasi-experimental method with a *post-tests only design with non-equivalent groups* (Cook & Campbell, 1979). The experimental group received treatment with folktale-based comics about TEK of non-rice food security, while the control group was provided treatment with folktale-based texts. Both experimental and control groups were given only post-test. Design visualization is presented in Table 1.

Table 1

The quasi-experimental Design

Experimental	X	O
Control		O

### Samples

The population in this study was fifth-grade students of thirty-two elementary schools in Tawangmangu Sub-district. Although the materials of local culture had been taught to students since grade four, the materials of TEK had not been provided, particularly using comics. Two schools were selected as the samples, including SD Negeri 4 Tawangmangu and SD Negeri 1 Nglebak. Through lottery, SD Negeri 1 Nglebak was assigned as the experimental group, while SD Negeri 4 Tawangmangu was the control group. The number of students at SD Negeri 1 Nglebak is 29 while at SD Negeri 4 Tawangmangu is 27, so both groups are balanced.

### Materials and Instruments

Both types of media used for treatments have the same features of narrative and linguistic elements. The teaching materials covered TEK on non-rice food security and presented through four series of comics and text. The first and second series were based on *Narotama* folktale, while the third and fourth series were based on *King Baka* folktale. That was presented in Figure 1.

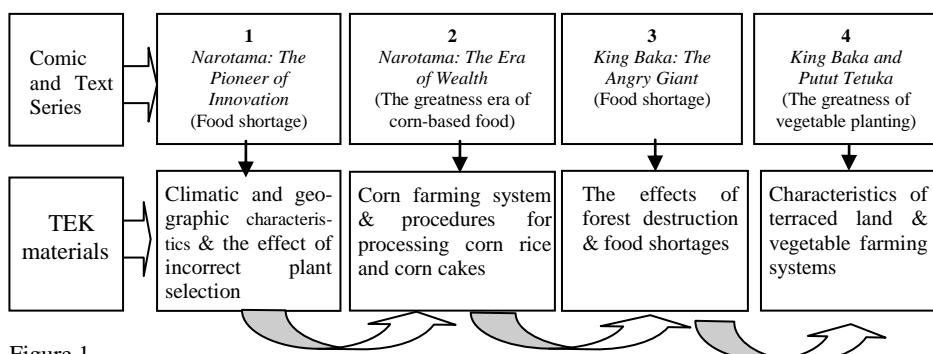


Figure 1  
Distribution of TEK materials in four series of materials

The instrument used to measure the students' literacy level of traditional ecology was a multiple choice test. Each question was provided with four choices of answers. Before being used to collect data, the instrument was assessed for validity and reliability. First, a content validity test was conducted by three experts, with the result that 38 of the 50 items were declared feasible. Then, these items were tried out to members of the population outside the samples of study. From the correlation of the try out results and the criterion score, the coefficient of concurrent validity is 0.713. From the analysis with the Kuder-Richardson 21, the reliability coefficient is 0.676. According to Tuckman (1999), the validity and reliability coefficient is at least 0.60. Thus, the test instrument used to collect the research data was valid and reliable.

The posttest was carried out using the paper and pencil test. Each correct answer is given a score of 1 and incorrect answers are given a score of 0, so the range is 0 - 38. The substance of the test includes four traditional ecology materials taught to students, both through comics and texts. The traditional ecology material that was experimented on was not only taught to the experimental and control groups, but also to all fifth-grade students in Tawangmangu Sub-district. Details of materials and samples of test are shown in the Table 2.

Table 2  
Characteristic of TEK materials and tests

Folktales	Materials	Sample of Questions in the Tests	Total
<i>Narotama</i>	Comic – text 1		10
	- Characteristics of local climate and geography - The impact of improper cropping	- Why were so many people infected by the disease? - Why did Narotama decide to stay in Nglurah Village?	
	Comic – text 2		10
	- How to plant corn - How to make corn rice	- Why did Narotama ask residents to grow corn? - How do I make corn rice?	
<i>King Baka</i>	Comic – text 3		9
	- The impacts of environmental damage - Effect of cropping cessation	- What happened after King Baka destroyed the forest when he was in anger? - What happened after many farmers died due to King Baka's cruel action?	
	Comic – text 4		9
	- Plant selecting system - Vegetable and crop farming	- Why did King Baka ask his people to plant vegetables? - What were the crops suitable for intercropping farming?	
Total			38

## Procedure

According to the curriculum, learning in elementary schools uses an integrated thematic system, which combines several subjects under one theme. For fifth grade, there are nine themes. Each theme includes 3 sub-themes and one sub-theme becomes the topic of six lessons (six days learning). This experiment was carried out for 4 weeks with 12 meetings and used the following themes, *our friends' environment* and *events in life*. An example of an integrated learning procedure for one lesson is presented in Table 3.

Table 3  
Learning procedure

Subjects	Folktale-based comics	Folktales-based text
Indonesian	Reading comics - identifying what, where, when, who, why, and how - retelling	Reading text - identifying what, where, when, who, why and how - retelling
Social Sciences	Reading comics - identifying the geographical characteristics of Tawangmangu - mapping its effects on the agriculture, economy, social, culture, and transportation.	Reading text - identifying the geographical characteristics of Tawangmangu - mapping its effects on the agriculture, economy, social, culture, and transportation.
Natural Sciences	Reading comics - Analyzing the relationship between ecosystem components - mapping the effect of incorrect crop selection and environmental damage	Reading text - Analyzing the relationship between ecosystem components – mapping the effect of incorrect crop selection and environmental damage

## Data analysis technique

The data were analyzed using two techniques, descriptive and inferential statistical analysis. In descriptive analysis, the data were presented by determining the percentage, average score, mode, and standard deviation. In inferential statistical analysis, the data were analyzed using the independent sample *t-test* formula to measure the significant differences in the level of students' mastery of traditional ecological knowledge on non-rice food security. Before the hypothesis testing with inferential statistical analysis was performed, the pre-requisite normality, homogeneity, and balance tests were carried out. The calculation is done using SPSS version 16. A Cohen effect size test was also performed to measure the magnitude of the effects of the provided treatments.

## FINDINGS

The percentage of students completing the test with correct answers presented in Table 4 and the students' mastery levels of TEK are presented in Table 5. Table 4 summarizes that the number of students in the experimental group who answered the questions in series 1, 2, 3, and 4 correctly was higher than in the control group. It was also shown that the experimental and control group could answer more questions in the first and the third series than in the second and the fourth series. Table 5 showed the considerable



different post-test score ranges of both experimental and control groups. The experimental group scores ranged between 22 and 35, while the control group score ranged between 16 and 30. The mode of the experimental group was 32, with 10 students providing correct answers, and the mode of the control group was 24, where seven students gave proper responses. Based on the percentage in Table 4 and the mean scores that were presented in Table 5, it was obvious that the students in the experimental group outperformed those in the control group.

Table 4  
The comparison of students' performance in post-tests

Folktales	Materials/ Number of items	Samples of questions	Correct answers on all items	
			Experimental group	Control group
<i>Narotama</i>	Comic-text 1 (10 items) - Characteristics of climate and geography of Tawangmangu - The impact of improper cropping	- Why did King Airlangga and Narotama stop in Tawangmangu? - Why were so many people infected by the disease?	79.31%	70.37%
	Comic-text 2 (10 items) - How to plant corn - How to make corn rice	- Why did Narotama ask residents to grow corn? - How do I make corn rice?	62.06%	55.56%
<i>King Baka</i>	Comic-text 3 (9 items) - The impacts of environmental damage - Effect of cropping cessation	- What happened after King Baka destroyed the forest when he was in anger? - What happened after many farmers died due to King Baka's cruel action?	75.86%	59.26%
	Comic-text 4 (9 items) - Plant selecting system - Vegetable and crop farming	- Why did King Baka ask his people to plant vegetables? - What were the crops suitable for intercropping farming?	55.17%	40.74%

Table 5  
Summary of the descriptive statistics analysis results

Group	Experimental group (Folktales-based comics)	Control group (Folktale-based text)
N	29	27
Lowest score	22	16
Highest score	35	30
Mean	31.66	25.48
Mode	32	24
Std. Dev.	4.14	3.72

Before inferential statistical analysis was performed, pre-requisite tests including normality, homogeneity, and balance tests, were conducted. The normality was measured with the Shapiro-Wilk statistics test and the results are summarized in Table 6.

Table 6  
The results of the normality test

Group	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Experimental group	.137	29	.174	.938	29	.087
Control group	.096	27	.200*	.960	27	.377

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 6 demonstrates that the significance value of the experimental group reached 0.87, and that of the control group was 0.377. Both groups achieved significance values that were higher than 0.05, and therefore, the data were considered normally distributed.

The homogeneity was measured with the Levene's test and the results are presented in Table 7.

Table 7  
The results of the homogeneity test

Score	df1	df2	Sig.
Levene's Statistic			
3.841	1	54	.059

The significance value yielded from Levene's test was 0.059. Data are homogenous if the significance value obtained is or exceeds 0.05. Therefore, the data are declared homogenous.

To measure the balance of the ability of students in the experimental group and control group before receiving treatments, a *t*-test was performed to the data obtained from the local culture formative tests. The tested materials covered local tourist attractions, local souvenirs, and the types of occupation of Tawangmangu residents. The results of the balance test are presented in Table 8.

Table 8  
The results of the balance test

<i>t</i> -test	Degree of freedom	Alpha	<i>t</i> -table	<i>t</i> -obs.	Conclusion
Experiment & control group	54	0.05	1.674	1.53	Ho is accepted (the data are balanced)

The results of the balance test showed the coefficient of *t*-obs. =1.53 which was smaller than *t*-table= 1.674. It showed that there is no significant difference in students' initial ability between the experimental and the control group.

Since the data of both groups were proven normally distributed, homogenous, and balance, the inferential analysis was conducted on the data and the hypotheses were further tested. The null hypothesis ( $H_0$ ) of this study was "there is no difference in the level of students' mastery of TEK in the experimental group and control group". The results of hypothesis testing that was done using a *t*-test are displayed in Table 9.

Table 9  
Summary of the hypothesis testing

<i>t-test</i>	Degree of freedom	Alpha	<i>t-table</i>	<i>t-obs.</i>	Conclusion
Experimental & control groups	54	0.05	1.674	5.849	H <sub>0</sub> is rejected

The results of hypothesis testing summarized in Table 6 show that the *t-obs.* is higher than the *t-table*, signifying a significant difference in the level of mastery of TEK on non-rice food security between the students in the experimental group and control group. The students in the experimental group performed better than those in the control group. In conclusion, folktale-based comics are more effective than folktale-based texts.

The effect size of materials was calculated by using Cohen's formula as follows.

$$d = \frac{M_{group1} - M_{group2}}{\sqrt{(SD^2_{group1} + SD^2_{group2})/2}}$$

$$d = \frac{31.66 - 25.48}{\sqrt{(3.72^2 + 4.14^2)/2}}$$

$$d = \frac{6.18}{\sqrt{(13.84 + 17.14)/2}}$$

$$d = \frac{6.18}{\sqrt{30.98/2}}$$

$$d = \frac{6.18}{\sqrt{15.49}}$$

$$d = \frac{6.18}{3.94}$$

$$d = 1.57$$

From Cohen's effect size test, an index of 1.57 was obtained. The index value was above 0.8, which was large category (Cohen, 1988). Therefore, the folktale-based comics greatly affected the students' understanding of traditional ecological knowledge, and with an index that was more than 1.5, the effect would be greater if the treatment was continued.

## DISCUSSION

The findings of this study indicate that there is a significant effect of folktales-based comics on the level of traditional ecological literacy regarding non-rice food security. That is, the measurement of the effect size shows the effect level of using comics is very large. The effectiveness of the comic book based on the folktales is not only proven by the results of hypothesis testing, but also by the results of descriptive data. The scores of students learning TEK using the folktales-based comics were higher than students learning with folktales-based texts. These advantages are found in the post-test results for all (four) comic series. Thus, the research results confirm the previous research on the effectiveness of comics as a learning medium.

The research result of Topkaya and Simsek (2016) found that comics have a positive effect on the improvement of students' academic achievement. More specifically, Khoii and Forouzesh (2010) concluded that comics can improve students' reading skills. Megawati and Anugerahwati (2012) confirmed that the use of comics can improve students' ability to produce narrative texts. Winarto *et al.* (2018) concluded that comics are effective for conveying educational values. Moreover, Vasileva and Golubev (2019) mentioned that comics can encourage students to develop critical thinking.

Further analysis of the factors underlying the effectiveness of folktale-based comics on the students' understanding of TEK yields a result that picture is the major factor supporting the excellence of comics. This is in line with the statement by Sudjana and Ahmad (2002) that words alone are not enough to make children understand the content of a story and pictures alone can only convey the sequences of the story. Interaction between visual and verbal presentation can clarify both the message and the sequence of the story. This study confirms that folktale-based comics provided to the experimental group are more effective than texts provided to the control group since comics present visual and verbal interactions to students. Ratminingsih, Budasi, and Kurnia (2020) found that with pictures, students can understand the characters and settings portrayed in storybooks, and with words, they can understand the message more easily.

It can be said that the combination of images and texts presented in folktale-based comic help students apprehend the structures of the stories and the materials on traditional ecology. When students did not know the image of a character named *King Baka* who was introduced as a king, the picture of a tall giant with fangs could give the idea of what the king looked like. This is in line with the view that the visual mental model built by readers is connected to the visual information from an image provided in the text (Ratminingsih, *et al.*, 2020). Moreover, during the reading activities, when students could not grasp the meanings of words or expressions, the pictures provided in the comics guided them to catch the ideas. This is supported by O'Neil (2011) who asserts that in visual literacy, there is an interaction that is so-called reinforcement, which means that images assist the readers by providing details or descriptions, and thus, they can develop their understanding of the story because the pictures help them to understand the words.

Pictures help students comprehend the main elements of folktales (characterization, setting, and plot) and materials on TEK. The majority of students in the experimental group did not come from families with a farming background, but the results of the test depict that they had a good to a very good understanding of agricultural systems, including the concept of intercropping systems, bottom-up irrigation on terraced fields, and rotational harvesting. The data presented in Table 4 show that the number of students in the experimental group who successfully provided correct answers to questions in each series of comic was greater than that in the control group. This finding strengthens the outcomes of other studies that comics can serve as a bridge to introduce knowledge to students, either beginner or advanced students (Carney & Levin, 2002). The pictures provided in comics allow students to directly see what the characters are talking about and hence helping them remember the contents.

Images can visualize the events and characters, help students to understand the teaching materials and foster students' learning motivation and other positive attitudes. Observation of the experimental class proved that the students were enthusiastic and happy when reading comics. This is related to the information obtained from the teacher that learning with comics was a new activity for them because the illustrations provided in the comics that were previously not found in textbooks, triggered them to pay full attention to the learning activities. This finding is in tune with the statement of Csabay (2006) that one of the strongest benefits of using comics for teaching is the focus of attention and its ability to motivate students to bring a lively atmosphere into the classroom. If a class is fun and interesting, students will be more enthusiastic to study. The positive effect of comics, particularly in motivating students to learn, is also reported by Syarah *et al.* (2019), in the experimental class, the interest of children, including those who could not read, in reading and issues on marine conservation increased because of the use of comic. Recent research conducted by Topkaya and Dogan (2020) even confirms that with comics, students have a positive perspective on learning, both in the cognitive and affective aspects.

It was also found that the students in the experimental group could answer more questions in the first and the third than in the second and the fourth comic series. This is attributed to the materials presented in each series. The first and the third comics are dominated by fictional events that present the main parts of the stories (introduction of characters, settings, and the emergence of conflicts). The second and fourth comics present a lot of non-fictional events that contain materials related to traditional ecological knowledge. The effect of comic storylines is in line with the finding in the study by Megawati and Anugerahwati (2012) that comics can be effective media because they are unique and present teaching materials distinctively with narrative elements.

This experimental study succeeded in depicting the significant effect of comics in improving the students' literacy level on the materials of traditional ecological knowledge. However, this study has several limitations that require improvements in further studies. First, the students' mastery level of materials in TEK is varied in the initial parts (dominated by fictional events) and the second parts (dominated by non-fictional events), showing that the second parts of comics are not optimal. Therefore, these comics require revision before they are distributed and used in learning activities. Second, as summarized in Table 4, the students' mastery level of the materials presented in *Narotama* comic was better than that in *King Baka* comic. This exemplifies that evaluation and revision are required to improve the quality of *King Baka* comic narrative development. This strategy is highly essential because the second parts of comics provide opportunities to include more elements of ecological knowledge. If this strategy is fulfilled, the comics resulted in this study can function as ecological educational comics or eco-comics (Vasileva & Golubey, 2019) to foster the readers' awareness of the environment, which in the end, supports the eco-literacy program. It supports the assumption that the societies' level of knowledge on the environment is correlated with their views and behaviors in treating nature (DeWitt & Osborne, 2007).

## CONCLUSION AND SUGGESTION

The results of this study indicate that folktales-based comics have a significant contribution to students' mastery of traditional ecological knowledge about non-rice food security. By utilizing images and narrative elements optimally, information and new concepts about non-rice food security issues is easier to understand and attract students' interest. This research implies that by learning through comic media, students have a lot of their traditional ecological knowledge about non-rice food security. With a good level of TEK literacy it allows students to correct misperceptions about food made from corn which is labeled as "devil food". Furthermore, it allows government programs on food diversification to be achieved. In addition, the implications of the research results also enable the realization of the sustainability of TEK in Tawangmangu which is starting to be abandoned by its owners. Therefore, seeing the achievement of students who access TEK material through comics is higher than text, it is recommended that text media should be equipped with images, especially in the delivery of new concepts such as about food security.

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