VOLUME 7 No 2
JULY 2022

E-ISSN: 2622-3384
P-ISSN: 2527-9939

JURNAL MEdu Mangifera Edu

Developing knowledge-based leaflets and community attitudes about organic agriculture to improve students' ecological literacy

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ABSTRACT

This research aimed to produce knowledge-based leaflets and community attitudes about organic farming to improve students' ecological literacy. This research development was done based on the 4D model (Define, Design, Develop, and Disseminate) Data on community knowledge and attitudes about organic farming were obtained from questionnaires and interviews with 20 farmers. The data is implemented into leaflets. Leaflet validation was carried out by design experts, material experts, and science teachers. Limited trials to determine student responses were given to eight students. The score obtained from the validation by design experts is 49.5 or 82.5% (good). The validation results by material experts are 50.5 or 84% (good). The science teacher validation scored 45.25 or 90.5 (good). The trial by eight students obtained a percentage of 91.6% with a positive response. The results of the normalized gain score showed an increase in learning with an average score of 0.61 in the experimental class (high). The independent t-test is -4.058, at df 58, the significance value is 5%, t-table value is 2.00. Thus, it can be concluded that the leaflet developed is effective in increasing students' ecological literacy. At df 58, the significance value is 5%, and the t-table value is 2.00. Thus, it can be concluded that the leaflet developed is effective in increasing students' ecological literacy.

ARTICLE INFO

Keywords
Ecological Literacy, Leaflets, Organic Farming

Received
April 23, 2022

Revised
June 10, 2022

Accepted
May 20, 2022

Published
July 31, 2022

How to cite
Kastawi. K, Nur, S. H., & Abidin, Z. 2022. developing knowledge-based leaflets and community attitudes about organic agriculture to improve students' ecological literacy. *Jurnal Mangifera Edu*, 7(1), 33-45. https://doi.org/10.31943/mangiferaedu.v7i1.145

INTRODUCTION

Learning objectives will be easily achieved if the supporting facilities and infrastructure are properly available, including teaching materials that the teacher to students will deliver. Teaching materials are materials used to assist teachers or instructors in carrying out the learning process (Prastowo, 2012). Excellent and innovative teaching materials will help teachers learn, help students quickly master the material being taught and encourage student learning independence. One innovative teaching materials that attract students' interest is the leaflet.

Leaflets are well-designed printed materials using simple illustrations and language. As teaching materials, easy to carry everywhere, read at any time, and quickly distributed to students (Yulianti & Winarso, 2017). In addition, leaflets help students who do not have time to record

discussions or teacher explanations and attract their attention to study the exciting material and information because leaflets are helpful visual aids to help stimulate the sight senses (Yohana et al., 2020). The learning efficiency of the leaflets improves students' motivation and interest in learning (Rouet et al., 2017) while making it easier for students to understand the material (Tigo, 2017). Leaflet media education has a higher influence than audio-visual media education (Chaerunnisa, 2022). Leaflets are also very effective in conveying messages systematically, briefly, and concisely in the form of both writing and pictures. This media is very effective (can be read repeatedly) in conveying messages that are systematic, short, and concise (Meidiana et al., 2018). Its also able to attract students' interest in studying Natural Sciences.

Science teaching materials will be more exciting and more accessible for students to understand if they are developed based on local potentials close to their daily lives, for example, organic farming following environmental pollution learning materials taught in class VII SMP/MTs even semesters. Through learning using environmental pollution material leaflets, it is hoped that students' ecological literacy will increase so that they have sensitivity to various existing environmental issues and can plan actions to solve environmental problems around their homes (Prastiwi et al., 2020). An understanding of organic farming provides awareness of the severe environmental impacts of conventional farming. In line with the opinion of Surdianto & Sutrisna, (2015), the emergence of symptoms of damage and a decrease in environmental quality due to the use of artificial fertilizers and pesticides in agriculture.

Based on the observations and experiences of researchers as science teachers at Madrasah Tsanawiyah Negeri (MTsN) 4 Indramayu from 2017 until now, as well as the results of interviews with other science teachers, it is known that the teaching materials used so far are textbooks or textbooks. Leaflet teaching materials have never been made and used in learning. Erlina et al. (2021), suggest that the learning process is not only guided by textbooks. It is necessary to use supporting materials such as leaflets.

Research on the development of leaflets as teaching materials on different materials, subjects and levels of education has been carried out by several researchers, including; the development of leaflets-based learning as media for the structure and function of animal tissue is feasible (Wati et al., 2020). The leaflet is eligible and practical to be used in Japanese Colonialization teaching and learning process (Maryanti et al., 2019), *affect on activity and learning outcomes of students senior high school Bukit Kemuning in the subject matter of the human movement system* (Sari, 2013). *Meanwhile,* leaflets can improve student soccer performance (Harada et al., 2016). The use of leaflet media in learning the Missouri mathematic project can affect student learning independence (Rostina & Izzati, 2020), and improve student learning activities and mastery of the material coordination system (Afridah et al., 2018).

Some of the studies above focus on the effect of leaflets on improving learning outcomes, student performance, student learning independence, and student learning activities. No one has developed a leaflet based on local potential and its effect on students' ecological literacy. Therefore, this study intends to develop leaflet teaching materials based on knowledge and public attitudes

about organic farming in Indramayu Regency. This study aimed to determine the effectiveness of leaflet teaching materials on students' ecological literacy.

METHOD

The research method is using research and development method for leaflet development following the 4D model (Define, Design, Develop, Disseminate) developed by Thiagarajan and Semmel. The data source for developing the content (material) of the leaflet came from the validation results of design experts, material experts, science teachers, and limited trials by eight students, and the effectiveness of leaflets in increasing students' ecological literacy were obtained from the pretest and posttest given to the control and the experimental classes.

The population in this study were 20 organic farmers and students of MTsN 4 Indramayu class VII, which consisted of eight classes, namely VII A to VII H, with as many as 320 students. Then sampling was done to get samples of the experimental class and control class with a simple random sampling technique. Sampling results were obtained by VII C with 32 students as the experimental class and the control class from class VII B with 28 students. Data Collection techniques and instruments with observation, interview, questionnaire, validation sheet, and tests (pretest and posttest).

Leaflet development in this study uses the 4D model by Thiagarajan et al., (1974). The flow of the 4D model leaflet development can be seen in figure 1, the following development chart:

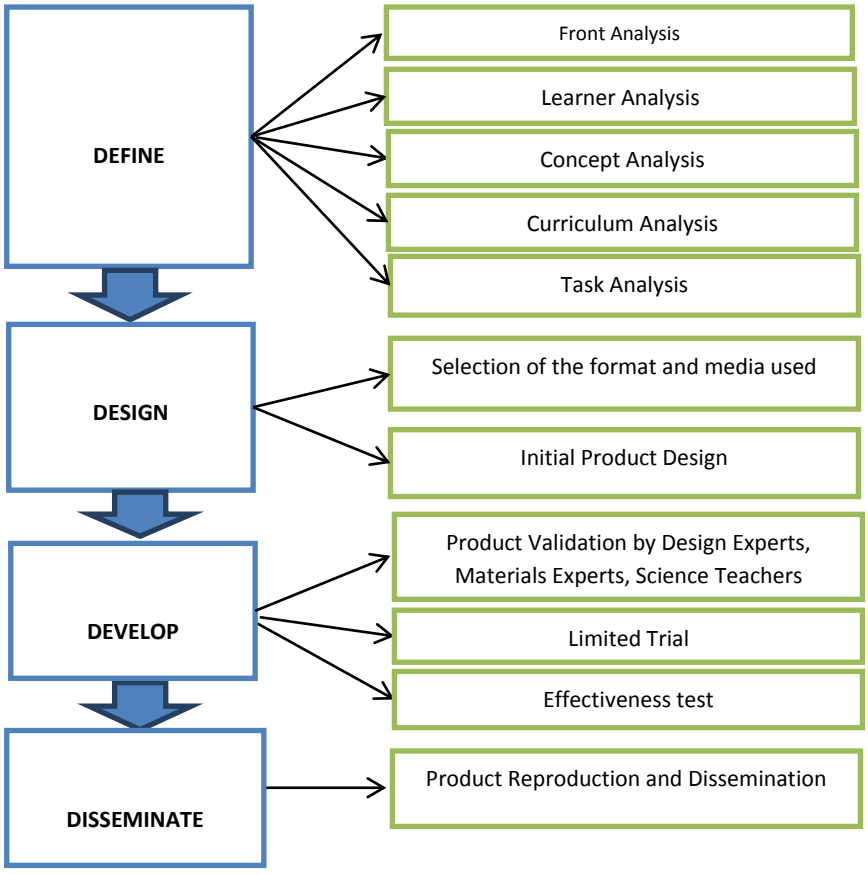

Figure 1. Leaflet development flowchart

The defining stage is the first stage of leaflet product development. At this stage, the learning conditions are defined and defined. Several analyses are carried out at the defined stage: front analysis, learner analysis, concept analysis, curriculum analysis, and task analysis. In this stage, use observation by researchers at the research location, namely organic farming in Ujungjaya Village, Indramayu Regency. Community knowledge and attitudes about organic farming in Indramayu Regency were measured by distributing questionnaires to 20 organic farmers.

The questionnaire contains 20 questions about organic farming which includes preparation before organic cultivation, implementation of organic cultivation, post-harvest processing, and environmental pollution.

The data from the public knowledge questionnaire about organic farming in Indramayu Regency were analyzed using formula (Arikunto, 2010).

$$P = \frac{f}{n} \times 100 \quad (1)$$

By the description of 'P' is the knowledge score, 'f' is the frequency of correct answers, and 'n' is number of question items. The level of community knowledge is grouped into high, medium, or low categorization according to the scale (Jaganathan et al., 2016) as shown in Table 1.

Table 1. Community knowledge level about organic farming in indramayu regency

Score (%)	Category
84 up to 100	Very high level
68 up to 84	High level
52 up to 68	Medium Level
36 up to 52	Low level
20 up to 36	Very low level

Farmers' attitudes about organic farming were analyzed using the Likert method. Then scores were calculated and grouped into two positive and negative categories.

Design is the stage of development in the form of design formats and learning media. Whereas, develop is a stage that aims to produce a product. The products developed in this research are leaflets based on the knowledge and attitudes of farmers about organic farming. Furthermore, leaflets are used as learning materials to improve students' ecological literacy. The development stage is carried out after the initial design is validated by design experts, material experts, science teachers, and students who provide an assessment of the feasibility and validity of the leaflets for use in learning. In this stage also validate of instruments test. The questionnaire was tested using the product moment test to find valid and invalid instruments. Measuring instruments can be trusted or relied upon to be known from their reliability index. The instrument reliability test for valid questions was tested using Cronbach alpha. The product development validation data are then analyzed using analytical techniques with the following formula (Fithriyah, 2013).

$$Q = \frac{X}{Xi}\ x\ 100\% \quad (2)$$

By the description of 'Q' is the score you are looking for, 'X' is the total number of respondents' answers in all points, Xi is the total ideal score in points, and 100 is the Constant

number. Meanwhile, as a basis for making decisions to revise teaching materials, is used the guidelines for scoring qualifications and the eligibility of leaflets for the results of questionnaires from experts, science teachers and students are shown in Table 2.

Table 2. Scoring criteria for expert validation questionnaire (design and material), science teacher, and limited trial based on likert scale

Value Scale (score)	Presentationse (%)	Qualification	Product Eligibility Criteria
5	90 – 100	Very good	No need for revision
4	80 – 89	Well	No need for revision
3	70 – 79	Enough	Revised
2	60 – 69	Not good	Need revision
1	< 60	Very less	Need to revise everything

In this stage also the students' ecological literacy was measured by the experimental method of pretest-posttest control group design was used. In this stage, pretest and posttest were used to obtain data on the effectiveness of leaflet teaching materials on the students' ecological literacy level. Student test results were analyzed by comparing the pretest and posttest scores. The increase that occurs before and after learning is calculated by the N-gain.

Disseminate stage is the assessment results and suggestions from the validator are used as input for revising the leaflet. Furthermore, at this stage, the revised leaflet product is reproduced and distributed to be used in science learning activities in schools/madrasahs.

RESULTS AND DISCUSSION

1) Community Knowledge and Attitudes about Organic Agriculture in Indramayu

Respondents in this study are farmers who live in Ujungjaya Village, Widasari District, Indramayu Regency and are members of an Eco-friendly farmer group. This farmer group is a farmer organization that pioneered organic farming in Indramayu Regency. The number of farmers who became respondents was 20 people. Characteristics of respondents that are of concern in this study include age, education, and farming experience.

The youngest respondent is 35 years old, and the oldest is 71. Most respondents are between 40-60 years old, namely 55%, and the least are respondents aged 40 years 15% and 65 years 30%. Respondents belong to the category of adults who are still productive. According to Subagio & Manoppo (2012), the young age category if it is less than 39 years old, the middle category is between 39-52 years, and the old category is more than 52 years old. A person's age is closely related to physical, and mental conditions, willingness to work, and responsibilities needeed to optimise one's performance. In addition, the perception and mindset of a person toward an object are also influenced by age. Along with increasing age, knowledge is improving (Glewwe & Muralidharan, 2016). Increasing information about an object makes one thing that can shape a person's attitude (Tormala & Rucker, 2018).

Respondent's education is Elementary School (SD) 25%, Junior High School (SMP) 20%, High

School (SMA) 15%, Diploma three (D3), 5% and Bachelor (S1) 25%. Education includes important characteristics related to a person's mindset. Highly educated farmers will have a better mindset than those with low education. According to Ntshangase et al. (2018), education and positive perceptions of farmers significantly affect agricultural conservation.

Knowledge is not only obtained through formal education, but also through experience. Respondents' experience in farming is quite good, i.e. 80% have experience in farming ten years, and the remaining 20% have experience < 10 years. The more experience they have the more information and knowledge they have about organic farming. The results of questionnaires and interviews revealed that people's knowledge and attitudes about organic farming in Indramayu Regency are presented in Figure 2 and Figure 3.

Community knowledge about organic farming in Indramayu Regency is in the medium to the high category, and their attitude is also positive. Their knowledge and attitudes about organic farming are obtained from the activities of Eco-friendly farmer groups and practical experience while running organic farming. The three characteristics of the respondents as described above, significantly affect the knowledge and attitudes of farmers about organic farming.

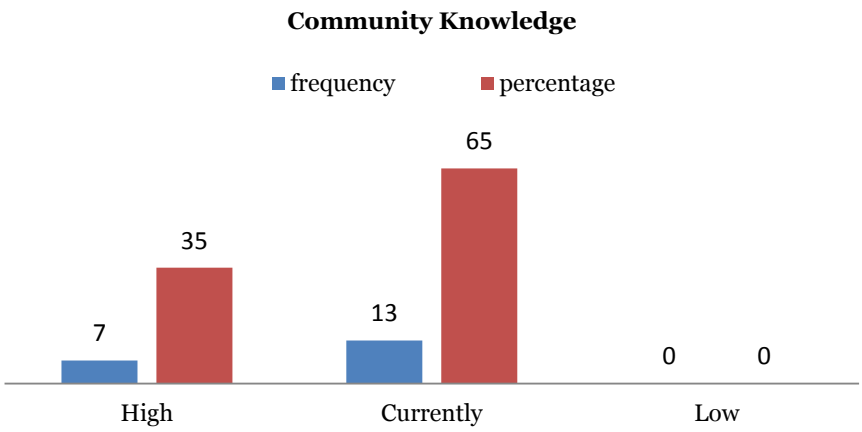

Figure 2. Community knowledge about organic agriculture

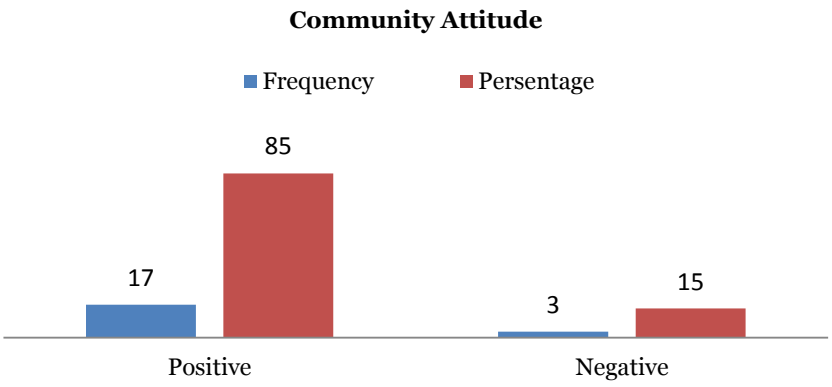

Figure 3. Community attitudes about organic agriculture

In line with Islam & Islam (2020), the respondent's experience in organic farming, and organic farming training showed a significant positive relationship with knowledge. In addition, farming experience and organic farming experience showed a significant positive relationship with their attitude towards organic farming.

In addition to education and experience, one's knowledge is influenced by age, information, socio-cultural and economic, and environmental factors. The higher the education, the more information received, and the higher the knowledge (Lafuente-Ruiz-de-Sabando et al., 2018). Age is the dominant factor that affects citizens' knowledge level (Aminrad et al., 2013). Knowledge and sources of information have a relationship with a person's behaviuor (Ahmed et al., 2018). The knowledge that farmers must have in developing organic farming so that Aliansi Organik Indonesia (2013), explains their product increase, namely land management, seed selection, planting preparation, planting process, plant maintenance, fertilization, pest and disease control, harvest processing, and post-harvest processing.

Attitude has an important influence on behaviour. Izzati & Mulyana (2019), said that attitude is a determinant of behaviour because attitude is related to perception, personality, feeling, and motivation. Attitudes and perceptions are essential in studying organizational behaviour because individual behaviuor is based on their perception of reality. Gerbi & Megerssa (2020), argues that misunderstanding farmers' knowledge is fundamental in popularizing a system or agricultural product. Knowledge and attitudes of farmers about organic farming must always be considered, evaluated and improved. This knowledge is vital so that more and more farmers adopt and implement organic farming along with the increasing popularity of organic products among consumers.

2) Development of Science Leaflets Based on Knowledge and Public Attitudes about Organic Agriculture

Farmers' knowledge and attitudes about organic farming in Indramayu Regency are then implemented in a learning material product in the form of leaflets (Figure 4 and Figure 5). The material discussed in the leaflet is environmental pollution for class VII SMP/MTs.

The first design expert gave a validation value of 75%, meaning that the leaflet was entirely valid, but had to be revised before being used in learning. Three criteria are considered less valid and must be revised, namely, the determination of the typing layout and color 60%, the consistency of the use of spaces, the title and typing of the material 60% and the accuracy of the image placement 60%. While the second design expert gave a validation value of 90%, meaning that the leaflet was valid and did not need to be revised. The average value of the two experts is 82.5%, meaning that it is valid and suitable for use with a note of making revisions as suggested by the validator.

The first and second material validators assessed that the material contained in the leaflet was valid with a value of 85% and 83%, respectively, meaning that the material (content) of the leaflet was valid and suitable for use in science learning activities. Even so, the first validator assessed that there was one criterion that was considered less valid, namely the criteria for the

suitability of references used following with the field of science 60%.

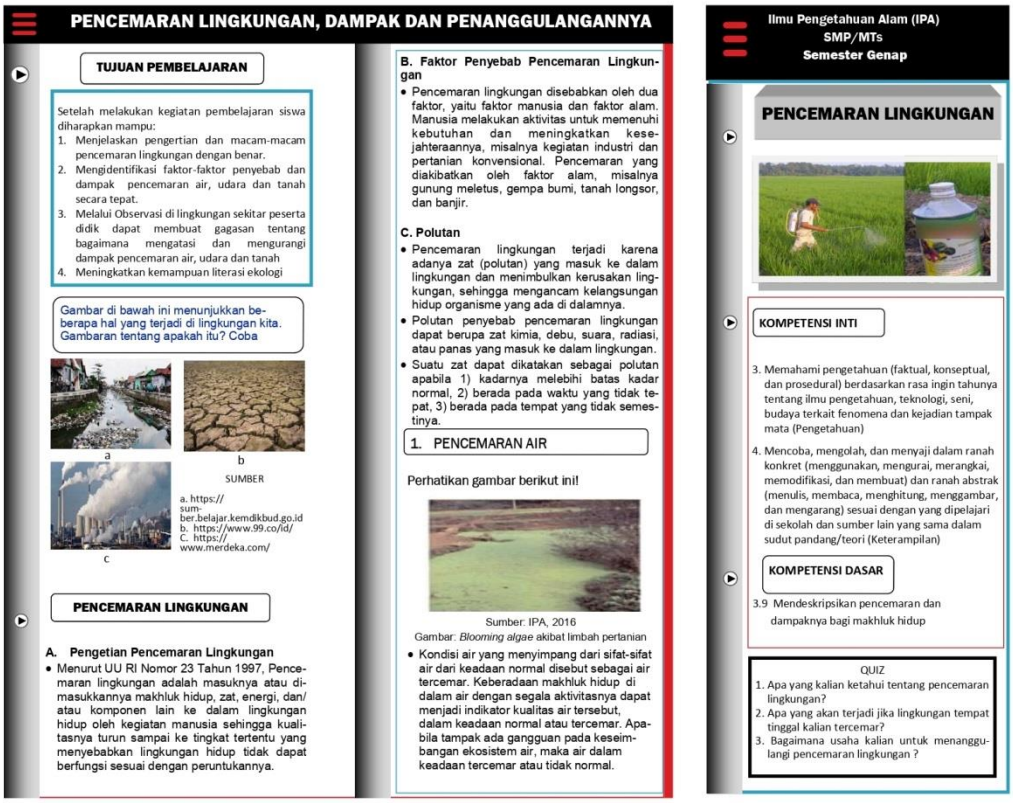

Figure 4. Front page leaflet

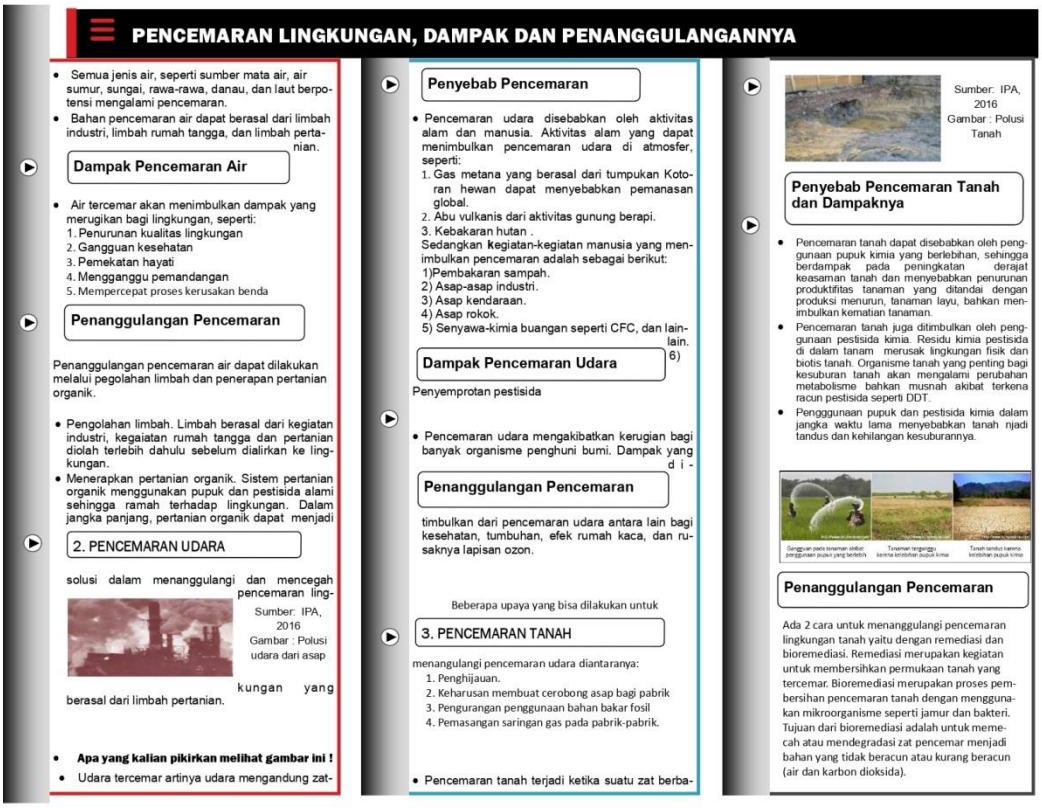

Figure 5. Backyard leaflet

While the second validator assesses that two criteria are not valid and need to be revised, namely the validity or validity of the content scientifically and the suitability of the references used under the respective fields of science 60%. The average value of the two experts is 84%, meaning that the leaflet is valid and suitable for use with a note of making revisions as suggested by the validator.

Four science teachers as leaflet validators assessed 90%, 82%, 96%, and 94%, respectively. The average teacher assessment is 90.5%, meaning that according to four science teachers the leaflet is considered valid and suitable for science learning activities. Two science teachers assessed the criteria for clarity of summary of 60% and clarity of the order of presentation of material in 60% of categories that were not valid and needed to be revised.

Based on a limited trial of eight students, it showed that 91.6% of students gave a positive response to the validity of the science leaflet product. In addition, all students (100%) want leaflet products to be used in science learning, especially environmental pollution materials. The results of the analysis show that 92.5% of students are interested in the physical appearance of the leaflet. They hope that in learning science, environmental pollution materials use leaflets to help improve ecological literacy. As many as 97.5% of students considered those leaflet products were beneficial in the science learning process.

The validation results show that the leaflet is valid and feasible to use with several revisions and suggestions for improvement. Lepiyanto & Pratiwi (2015), conveyed that if a product is declared good by the validator, it must continue improving according to several experts' advice. Design experts suggest revising the layout, image placement and colors. An attractive design will encourage students' interest in reading the product. Accordance to Su & Cheng (2015), a good learning product can attract the attention and interest of students to take advantage of it. The existence of the media helps students understand the learning material presented.

Material experts suggest that the presentation of environmental pollution material on leaflets is adapted to the agricultural context based on references that are in accordance with scientific principles. The principles used to determine the learning material are suitability, constancy, and sufficiency (Sabarudin, 2018).

3) The Effectiveness of Leaflets on Students' Ecological Literacy

After revisions were made as suggested by design experts, materials experts, and science teachers, they were implemented in learning activities. Then tested the effectiveness of leaflets in improving students' ecological literacy. The effectiveness test was carried out on the application of the product to the quality of learning in the two sample classes that acted as the experimental and control classes. Knowledge-based science leaflets and community attitudes about organic farming can be seen from its effectiveness in increasing students' ecological literacy.

The effectiveness test was carried out on 32 students of class VII C as the experimental class using science leaflet products and in class VII B as many as 28 students as the control class with conventional learning. The effectiveness of science leaflets on students' ecological literacy was

measured by comparing the average normalized gain scores. The ecological literacy pretest and posttest scores can be seen in Figure 6 and Figure 7.

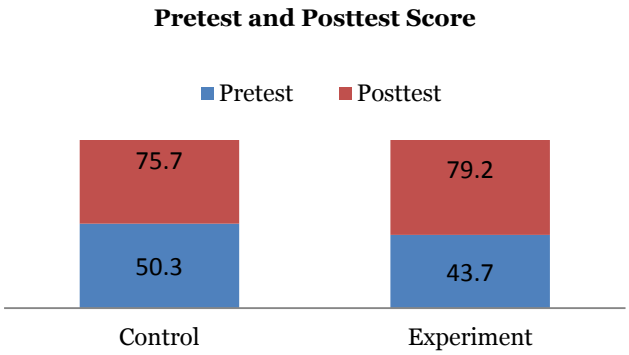

Figure 6. Pretest and posttest results

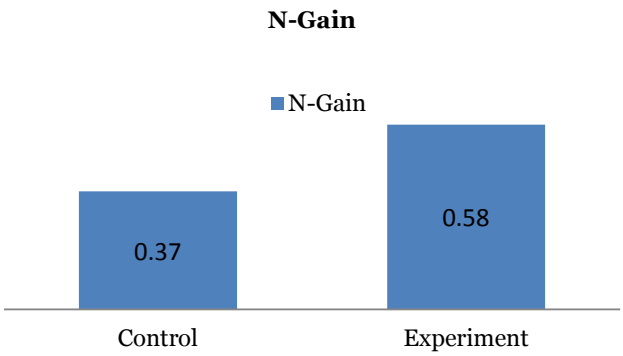

Figure 7. Results of normalized gain score analysis

Based on Figure 6 shows an increase in the pretest and posttest scores in the experimental class and control class. The increase in the experimental class using science leaflets for environmental pollution was 34.4, while the control class used conventional learning and the worksheets teachers usually used 20.9. Figure 7 shows the gain score in the experimental class is higher than the control class with gains in the experimental class using science leaflets of 0.58 in the medium category and 0.37 in the control class with conventional learning in the low category.

The significance of the effectiveness of science leaflets determined by a t-test was carried out. Before the t-test is performed, the normality and homogeneity of variance tests are first performed as requirements for the t-test analysis. Based on the results of the posttest normality test using the Kolmogorov-Smirnov formula from the control group, it was found that D_{max} was 0.211 and $D_{critical}$ was 0.252. While in the experimental class, D_{max} is 0.182 and $D_{Critical}$ is 0.242. From the calculation of the normality test for the control class, $D_{max} < D_{Critical}$ is $0.211 < 0.252$ and for the experimental class $D_{max} < D_{Critical}$ is $0.182 < 0.242$. Based on these data, it can be said that the two classes have normally distributed data.

Testing the homogeneity of the control class and experimental classes' post-test data resulted

in the F_{count} value of 1.018 while the $F_{critical}$ value of 1.905. Based on the calculation of the homogeneity of the posttest data for the control class and the experimental classes, the value of $F_{count} < F_{critical}$ is 1.018 < 1.905 with a significant level of = 0.05. Based on the data above, $F_{count} < F_{critical}$, it is called as that the two classes have homogeneous data. Based on the analysis of the data from the two classes above, the hypothesis testing in this study can be analyzed using the t-test.

Furthermore, to see whether there is a statistically significant difference between the experimental and the control classes, an independent sample t-test was performed. Based on the results of manual calculations, the value of the t-count is -4.058. While the critical value with degrees of freedom 28 + 32 - 2 = 58 and a significance level of 0.05 is 2.00. The value of t_{count} -4.058 < $t_{critical}$ 2.00 thus there is a significant difference between the control and experimental classes. The results of the independent t-test using the excel application also found that the P-value was 0.004 < from 0.05, meaning that there was a significant difference.

CONCLUSION

Based on the results of research and discussion in the previous chapter, in accordance with the formulation of the problem and research objectives, the researchers concluded that the knowledge and attitudes of the community about organic agriculture in Indramayu Regency were very good. Developing science leaflets on environmental pollution based on farmers' knowledge and attitudes about organic farming is suitable for science learning. Using science leaflets on environmental pollution materials based on farmers' knowledge and attitudes about organic farming effectively increases students' ecological literacy.

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