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Development of teaching materials with agricultural insight to introduce of agriculture in primary school students

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ABSTRACT

Agriculture is one of the supports for national food needs, so it must continue to be preserved. Unfortunately, nowadays, the sustainability of agriculture is increasingly worrying. Many young people are no longer interested in becoming farmers or working in the agricultural sector. A solution like this must be immediately sought so that regeneration is maintained. This research aimed to develop teaching materials with agricultural insight to introduce of agriculture in primary school students in Indonesia. The research used the research and development (R&D) method. Development was carried out using the Borg and Gall model, including: research and informing collecting, planning, preliminary development, and preliminary field testing and main product revision. The research results indicated that: i) the teaching material that was successfully developed was in the form of a textbook entitled "I love agriculture". This book contains ten materials on agricultural, and ii) the test results showed that the agricultural-oriented teaching materials are of good quality. From the product eligibility test involving material experts and media experts, the average assessment score was 86.25%, while the average assessment score from students reached 85.25%. This research implied that students could get to know and love agriculture through learning activities at school.

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1. INTRODUCTION

The current sustainability of agriculture in Indonesia is worrying. Many young people are no longer interested in working in the agricultural sector [1]. The younger generation's interest in agriculture from 2014 to 2019 tends to decline [2]. The farming profession is only dominated by men, whose average age is 54-65 years [3]. The Indonesian Central Statistics Agency stated that in 2011, 29.18% of young people chose the farmer profession, which continued to decline to 19.18% in 2021 [4].

The younger generation is reluctant to pursue the farming profession because they feel that the income is minimal, it is difficult to obtain ownership of agricultural land, and there is a lack of availability of part-time jobs. Apart from that, the cause of the decline in the interest of the younger generation in pursuing a career in agriculture is the lack of knowledge [3]. Children's knowledge about agriculture is shallow [5], especially those who live in urban environments. This phenomenon is a serious problem for the sustainability

of agriculture in Indonesia, even though Indonesia is one of the largest agricultural and maritime countries in the world [6], [7], where agriculture is a strategic sector in national development. A researcher on food and agriculture organization (FAO) food issues, said that no country can get out of the poverty line without the support of a productive agricultural sector [3]. It means that agriculture is an economic sector that needs attention, not only as a pillar of the national economy but with a mission to provide food for the population. Indonesia has advantages in the agricultural sector. Its natural wealth is very abundant. Indonesia has fertile and prosperous land. Therefore, solutions must be immediately sought for these problems so that the regeneration and sustainability of agriculture in Indonesia can be well maintained.

The huge agricultural potential in Indonesia requires qualified and professional human resources in the agricultural sector. Agricultural knowledge intelligent service technology is seen as a fundamental solution to address the challenges of organizing and utilizing agricultural information, improving the quality and yield of agricultural products [8]. In addition, a review of agricultural literacy studies underscores the important role of formal education in encouraging agricultural literacy among school-aged children, so innovative strategies are needed [9].

Education and age are very important for the sustainability of farmers' resources who can produce quality agricultural commodities. Digital transformation is indeed reshaping agricultural knowledge, encouraging increased connectivity between people and technology, and increasing transparency, although this raises management challenges [8]. Introducing the potential of agriculture to school-age children is a significant opportunity to increase their interest, awareness, and development in the future. Providing agricultural insight to children can facilitate understanding and concern for nature and the surrounding environment [3]. Learning about agriculture at school age will increase children's interest and love for agriculture from an early age. Agriculture-based learning programs can equip children with knowledge of the importance of agriculture and basic skills such as caring for, watering, and planting plants [3].

The introduction of agriculture to school-age children will be effective if it is structured and contained in the form of teaching materials. Agricultural materials and themes must be included in teaching materials so implementation can be well-directed and controlled. Teaching materials can provide direction and goals regarding everything the teacher wants to achieve [10]. Teaching materials are learning plans that contain content, various learning instructions, and expected results [11]. Therefore, this research aims to develop agricultural-oriented teaching materials as a medium for introducing and instilling love of agriculture in students through learning at school.

2. METHODS

This research used the research and development (R&D) method. This method was chosen because it was used to produce products and test their suitability [12]. The product developed in this research is teaching materials with agricultural insight as a medium for introducing and instilling love of agriculture in primary school students in Madura, Indonesia.

2.1. Development procedure

The procedure for developing agricultural-oriented teaching materials in this research used the Borg and Gall model, including: research and informing collecting, planning, preliminary development of the product, and preliminary field testing and main product revision [12]. These steps are intended to produce products that can be tested for suitability and effectiveness. Each of these stages is explained as follows:

2.1.1. Research and information collecting

At this stage, a needs analysis was carried out by collecting various relevant information. Information was obtained through a study of previous research results regarding agricultural development in Indonesia. From this needs analysis, information was obtained that many young people were not interested in working in the agricultural sector. Apart from that, the regeneration of farmers in Indonesia was in a worrying condition. The younger generation's interest in the agricultural sector was decreasing in number. These conditions have encouraged the development of agricultural-oriented teaching materials to introduce and instill a love of agriculture in children from an early age at school.

2.1.2. Planning

This stage was carried out by preparing and carrying out several steps, including conducting studies and identifying agricultural-oriented teaching materials for primary school students by referring to the developmental characteristics and needs. Agricultural material is designed simply for learning in primary schools. In addition, sources and materials were collected to create agrarian-oriented teaching materials for primary school students through journals, books, and the internet according to needs, as well as brainstorming ideas regarding the products produced with colleagues and competent parties. At this planning

stage, various instruments were also prepared to measure the suitability of agricultural-oriented teaching material products for the learning of grade 1 students in primary schools. The instruments created include instruments for material experts, instruments for media experts, and instruments for users.

2.1.3. Teaching materials development

The process of developing teaching materials was carried out after conducting a study and analysis of the agrarian-oriented learning needs of primary school students. The teaching materials developed were in the form of a textbook with the title "I love agriculture". This book is intended for learning by grade 1 primary school students. The title was chosen because it stimulates children to love agriculture. Before being tested, the textbook was validated by experts in the field of primary school education, both material experts and media experts. The validation aimed to obtain input from experts regarding the quality and suitability of teaching material products so that they can be used for learning to introduce agriculture to primary school students.

2.1.4. Preliminary field testing and main product revision

This stage was carried out to test the eligibility of the product and make improvements based on input from the field. The trial of this agricultural-oriented teaching material product includes an alpha test and a beta test. Alpha test is a product trial carried out involving material experts and media experts in the field of basic education. The results of the assessment and various input from the two experts were used as a basis for improving to the product to make it more perfect. The beta test is a trial of agricultural-oriented teaching material products carried out involving grade 1 primary school students. The results of this beta test are useful for getting direct input and assessment from users regarding the quality and suitability of the product. The beta test was carried out by observing students using agricultural-oriented teaching materials in classroom learning.

2.2. Eligibility test design

Trials of products in the form of agricultural-oriented teaching materials were carried out through eligibility testing by basic education experts and student responses. This trial was carried out after the testing instrument was declared valid by the instrument validator and the product was ready to be tested. This trial is very important because it determines the feasibility of the product being developed.

2.2.1. Eligibility test by material experts and media experts

This trial was in the form of an assessment of product suitability by material and media experts in the field of basic education. This eligibility assessment aimed to ensure that teaching materials were suitable for use. Material eligibility testing aimed to see the suitability of agricultural materials in primary school learning. Media suitability testing aimed to see the suitability of the form and appearance of teaching materials to the age level of students in primary schools. It is hoped that the assessment of the eligibility of teaching materials with an agricultural perspective can facilitate students' learning needs in getting to know agriculture.

2.2.2. Student response

Agricultural-oriented teaching material products declared suitable by material experts and media experts were then demonstrated and put into practice in learning. This activity was carried out to determine the readability of the agrarian-oriented teaching materials developed when used by students. This student response is essential so that the teaching material products developed are of higher quality before they are used end masse for grade 1 primary school students

2.3. Eligibility test subject

The eligibility test subject in this research and development (R&D) consisted of material experts, media experts, and students. A media expert is someone with expertise in the field of primary school learning media. The terms and conditions are a minimum of a doctoral degree and an educational background in learning media or educational technology. A material expert is someone who has expertise in the field of primary school curriculum. The terms and conditions are a minimum of a doctoral degree and a basic educational background. Apart from that, 20 students of grade 1 in the primary school were involved as subjects for testing the eligibility of agricultural-oriented teaching material products.

2.4. Types and techniques of data collection

The types of data for this research were qualitative data and quantitative data. Qualitative data was obtained through interviews and observations of the use of agricultural-oriented teaching materials, while

quantitative data were obtained through product eligibility tests on experts and users. After that, the data were processed and analyzed according to research needs. The research instruments used were interview and observation guidelines, and questionnaires for research users.

2.5. Data analysis

Qualitative data analysis techniques in this research applied analysis from Ridder [13], including data reduction, data display, and conclusions. As for quantitative data, descriptive statistics were used shown in percentage form. The results of filling out the questionnaire were tabulated and then presented as a percentage using the following formula:
Per item:

$$P = \frac{X}{X1}\ x\ 100\%$$

overall item:

$$P = \frac{\sum X}{\sum X1}\ x\ 100\%$$

description:
P = Percentage sought
X = Answer score in one item
$X1$ = Highest score in one item
$\sum X$ = Total score obtained
$\sum X1$ = Maximum score
100% = Constant

Percentage calculations using existing formulas were used to determine the appropriateness criteria for learning media obtained from experts and students. The product suitability assessment results were measured using a Likert scale. The main principle of the Likert scale is to determine the location of a person's position in a continuum of attitudes towards attitude objects ranging from very negative to very positive [14]. This study classified the answers to the instrument items into four choices. Each indicator measured was given a score on a scale of 1-4, including 4 (very good/very eligible), 3 (fairly good/quite eligible), 2 (poor/less eligible), and 1 (not good/not eligible). The eligibility criteria based on eligibility percentage can be seen in Table 1.

Table 1. Criteria and percentage of product eligibility

Score	Percentage (%)	Category
4	86-100	Very eligible to be implemented
3	70-85	Quite eligible to be implemented
2	51-69	Less eligible to be implemented
1	<51	Cannot be implemented

3. RESULTS

The development of agrarian-oriented teaching materials to introduce and instill love of agriculture in primary school students was carried out by referring to the problem formulation and research objectives, namely, developing agrarian-oriented teaching materials and testing the eligibility of agrarian-oriented teaching materials. This research produces teaching materials that can be used for teaching agricultural themes to elementary school students. The complete results of this research can be explained as follows.

3.1. Develop teaching materials with agricultural insight for primary school students

The teaching material developed in this research is a textbook for learning about agriculture for grade 1 primary school students. The development of teaching materials was carried out by conducting needs analysis, formulating concepts and forms of teaching materials, and preparing teaching materials. Needs analysis was carried out by reviewing references relevant to the research theme and collecting various materials to be developed into teaching materials, such as types of agriculture, agricultural activities, and processing of agricultural products. The materials that have been obtained were then mapped and determined based on the theme and needs of the teaching materials to be developed.

The concept and form of teaching materials developed are in the form of textbooks for learning for grade 1 primary school students. The reason for choosing this form of teaching material was that it was easier for students to use in the classroom. This teaching material is intended for grade 1 because, at that age, children are still in their golden age and can easily absorb information from the surrounding environment.

This teaching material book was prepared using the Canva application. This application was chosen because it was very easy to use and had complete features for creating teaching materials. Using the Canva application, the resulting teaching materials look excellent and attractive to primary school students. These teaching materials were dominated by interesting agricultural pictures so students would not get bored while learning. The following is a description of teaching materials with an agricultural perspective as a medium for introducing and instilling a love of agriculture in primary school students.

3.1.1. Form and size of teaching materials

The teaching materials developed in this research are in the form of a book with the title "I love agriculture". This teaching material was prepared for grade 1 primary school students. This title was chosen because it stimulates students to have a love for agriculture. By reading the book's title, it is hoped that students will love agriculture. I love agriculture is a simple sentence that students must say to create a feeling of love and interest in the field of agriculture.

The size of the teaching materials developed is A4 or 21 cm in length, 29.7 cm in height and has a thickness of 0.3 cm or the equivalent of 30 pages. This size is ideal for learning for grade 1 primary school students. Apart from being written using large fonts, this teaching material contains more pictures of interesting agricultural activities for students to learn. The shape and size of this teaching material can be seen in Figure 1.

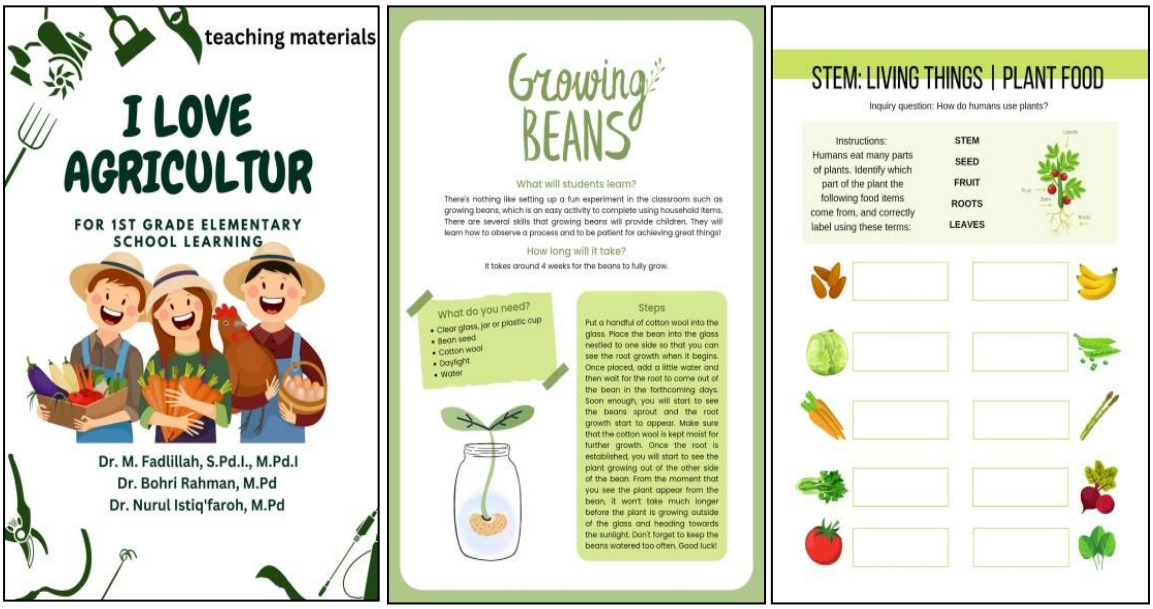

Figure 1. Form and example of the content of agricultural-oriented teaching materials

In Figure 1 there are 3 parts of the teaching materials developed. On the cover (first image) it says teaching materials I Love Agriculture: for 1st grade elementary school learning. In the middle picture is one of the contents of teaching materials about "planting beans". In this section students are asked to create fun experiments in class such as planting beans like no other, which is an easy activity to complete using household items. There are several skills that growing beans will impart to children. They will learn how to observe a process and be patient to achieve great things. The materials used are clear glass, jars or plastic cups, green bean seeds, cotton, sunlight, and water. The procedure for planting is to put cotton in a glass, put the beans in the glass, and add a little water. It takes about 4 weeks for the beans to fully grow.

The last image in Figure 1 is part of teaching materials with a STEM theme: food from plants. In this chapter, students are asked to name and write the names of fruits, vegetables, and grains according to the pictures. These are some descriptions of the contents of agricultural-oriented teaching materials.

3.1.2. Themes and learning activities in teaching materials

The agricultural-oriented teaching materials developed in this research are divided into several themes and learning activities. Apart from that, the teaching materials presented in this book contain more agricultural pictures, such as types of agriculture, agricultural tools, and agricultural activities. The agricultural themes and activities in this agricultural-oriented teaching material are generally as follows:

- Uncle's farm story: In this section, a story about agriculture is presented, and students are asked to answer questions according to the content of the story they have listened to or read in the teaching material. This research produces teaching materials that can be used for teaching agricultural themes to elementary school students. This material aims to introduce several agricultural plants and train children to listen to and understand simple stories.
- Farm equipment: This section presents material about various equipment commonly used by farmers for gardening or farming. Some agricultural equipment introduced included tractors, hoes, rakes, shovels and funnels. The learning activity carried out by students is to connect pictures of agricultural equipment according to their names.
- Getting to know objects in the garden: In this section, material is presented about objects in the garden that are used for farming. The aim is to introduce students to some of the equipment used in gardening or farming. The student's activity is that they are asked to write the names of agricultural equipment according to the pictures provided.
- Plant parts: This material presents pictures of plant parts, from seeds to plant roots. Next, students are asked to connect the pictures of the parts of the plant according to their names. The aim of this activity is to introduce students to the parts of plants so as to foster a sense of love for the plants around them.
- Plant needs: In this section, material is presented about the needs of plants so they can thrive. In this material, students are asked to cut out the available pictures and paste them in the appropriate column. The purpose of this material is to teach children to care for plants well and train children to grow crops according to what the plants need.
- Beans planting: In this section, students are asked to carry out practical activities in planting beans by inviting them to carry out simple experiments. The aim is to teach children how to plant beans and introduce students to various materials and procedures for planting plants, especially beans. Through this activity, students are expected to gain meaningful experience in the planting process, thereby generating children's interest in agriculture.
- Various agricultural crops: This section presents material about various agricultural crops. The aim is to introduce students to various types of agricultural plants. The activity carried out by students in this material is to connect pictures of agricultural plants with the names provided. It is hoped that this activity can help and stimulate students towards various types of agricultural plants.
- Fruits and vegetables: In this section, material is presented regarding activities to classify types of fruit and vegetables. The aim is to introduce students to the differences between fruits and vegetables. The activity carried out by students is to group pictures of fruits and vegetables according to their type by cutting and sticking.
- Food from plants: In this section, STEM activities are presented, mentioning the parts of plants that are used as human food. Students are asked to write down the types and parts of plants that can be used for food. Apart from teaching students to think critically, this activity also aims to introduce various types and parts of plants that can be useful for humans.
- Getting to know agricultural products: This section presents the material about agricultural products processed into food. Students are asked to name agricultural foods and cross out foods that are not agricultural products. Apart from introducing several types of processed food from agriculture, it also trains students' astuteness and critical thinking.

The agrarian-oriented teaching materials developed have advantages compared to teaching materials in general. This teaching material is specially prepared for learning agricultural themes. The presentation of the material in this teaching material is very interesting because 80% of it is in the form of pictures and arranged simply so that it is easy for students to use. With this agricultural-oriented teaching material, it is hoped that students will be able to know and love agriculture.

3.2. Testing the eligibility of teaching materials with agricultural insight for primary school students

Based on product eligibility trials involving material experts and media experts, it shows that agricultural-oriented teaching materials are very suitable to be used to introduce and instil a love of agriculture in grade 1 primary school students. The assessment score obtained from material experts was 87.5% from 10 statements, while the assessment score from media experts was 85% from 10 statements. Thus, the average eligibility score for agricultural-oriented teaching material products reached 86.25%. This means that, from the assessment of material experts and media experts, the product developed is very suitable

for implementation in learning in lower-grade elementary schools. The results of the eligibility assessment from material and media experts can be seen in Table 2.

Apart from that, material experts commented that the content of this agricultural-oriented teaching material was very good and interesting for the characteristics of lower-class primary school students. The teaching materials developed were very useful for teachers and students who want to study agricultural themes. With agricultural-oriented teaching materials, it is hoped that children will love the agricultural world, which has so far been underestimated.

A positive response to this agrarian-oriented teaching material was also shown by grade 1 primary school students. Based on the eligibility test involving 20 grade 1 primary school students, it showed that the product developed was very suitable for use in learning. The assessment score obtained from students regarding the suitability of teaching materials with an agricultural perspective was 85.25% from 10 statements. Eligibility assessment data from grade 1 primary school students can be seen in Table 3.

Table 2. Material and media expert assessment scores

No.	Assessor	Number of statements	Number of assessment scores	Assessment percentage (%)	Assessment category
1	Material expert	10	35	87.5	Very eligible
2	Media expert	10	34	85	Quite eligible
Average percentage assessment score				86.25	Very eligible

Table 3. Student assessment scores

No.	Assessor	Number of statements	Number of assessments	Assessment percentage (%)	Assessment category
1	Student 1	10	33	82.5	Quite eligible
2	Student 2	10	35	87.5	Very eligible
3	Student 3	10	30	75	Quite eligible
4	Student 4	10	29	72.5	Quite eligible
5	Student 5	10	31	77.5	Quite eligible
6	Student 6	10	30	75	Quite eligible
7	Student 7	10	35	87.5	Very eligible
8	Student 8	10	37	92.5	Very eligible
9	Student 9	10	37	92.5	Very eligible
10	Student 10	10	37	92.5	Very eligible
11	Student 11	10	37	92.5	Very eligible
12	Student 12	10	37	92.5	Very eligible
13	Student 13	10	32	80	Very eligible
14	Student 14	10	31	77.5	Quite eligible
15	Student 15	10	35	87.5	Very eligible
16	Student 16	10	35	87.5	Very eligible
17	Student 17	10	36	90	Very eligible
18	Student 18	10	35	87.5	Very eligible
19	Student 19	10	35	87.5	Very eligible
20	Student 20	10	35	87.5	Very eligible
Average percentage of assessment scores				85.25	Very eligible

From the product eligibility test involving material experts, media experts, and students, it can be concluded that agricultural-oriented teaching materials are very suitable to be used as a medium to introduce and instil a love of agriculture in primary school students. Teachers and students can use these teaching materials in learning activities, especially agricultural themes. It is hoped that the use of agricultural-oriented teaching materials in learning will foster students' interest in agriculture.

4. DISCUSSION

Teaching materials are very necessary for teachers and students in implementing agriculture-based learning. Teaching materials are needed in the learning process to encourage students' understanding of the material taught by the teacher [11]. Teaching materials can provide direction and goals regarding everything the teacher wants to achieve in learning [15]. Teaching materials are learning plans that contain content and various learning instructions as well as expected results [11]. Agricultural-based teaching materials are learning guidelines that contain agricultural material or themes. With these teaching materials, teachers can introduce and instil love of agriculture in students at school. Agricultural programs in schools can provide agricultural insight to students [16], [17].

Introducing and instilling love of agriculture in students at school can be done through agrarian-oriented learning. Learning activities using agricultural-oriented teaching materials can significantly increase children's knowledge and love of agricultural activities [3]. Agriculture-based learning given to children can become a habit for them regarding matters related to agricultural activities [18]. Agricultural activities that need to be included in agricultural-oriented teaching materials include gardening and getting to know various agricultural equipment [19]. Learning material can be structured simply, such as getting to know plants, fruits, and vegetables [20]. Agricultural activities, especially those carried out outdoors, can provide children with the experience of getting to know the surrounding environment and becoming more environmentally friendly [21]. A gardening-based curriculum provides an opportunity to develop a scientific attitude, namely curiosity, and can increase children's friendly attitude towards nature [22]. Gardening activities at school apparently influence children's naturalistic intelligence [23]. This explanation illustrates that agricultural-based learning is very beneficial for students. Apart from introducing children to agricultural activities, this learning can also influence children's cognitive and naturalistic abilities. Implementing learning with gardening activities can improve children's science process skills well [24]–[26].

Agricultural insight teaching materials can be used as a medium for getting to know agricultural activities, such as gardening and farming. Learning by using agricultural-oriented teaching materials makes children more environmentally friendly. According to Kim *et al*. [22], agricultural activities such as gardening can make children more enthusiastic about caring for and watering plants. These activities can also foster a sense of concern for the environment [21]. Apart from that, agricultural learning can also promote healthy food to children. Research by Taniguchi *et al.* [20] explains that agricultural activities can significantly increase the intake of vegetables such as chayote, chickpeas, and tomatoes. Other research explains that the impact of gardening has an influence on vegetable consumption [27] and can increase children's desire to try new foods [28].

To increase the effectiveness of food learning, agricultural-oriented teaching materials must be prepared and developed optimally. Good teaching materials should be prepared by teachers according to students' needs and characteristics [29], [30], and adapted to students' cognitive development [31], [32]. Agricultural-oriented teaching materials must also be prepared simply and systematically so that they can be used effectively. As explained, teaching materials are a set of materials that is arranged systematically, whether written or not, so as to create an environment or atmosphere that allows students to learn [15]. Some of the material that needs to be included in agricultural-oriented teaching materials is an introduction to agricultural plants, farming activities, and processing of agricultural products [33]. Through agricultural activities presented in agricultural-oriented teaching materials, it is hoped that teachers can help introduce and instill a love of agriculture in elementary school students.

5. CONCLUSION

Schools must continue to introduce agriculture to children in various ways. Learning with an agricultural theme can equip children with knowledge about agriculture and basic gardening skills. The development of teaching materials with an agricultural perspective is really needed by educators and students in schools. The results of trials with experts and students show that agricultural-oriented teaching materials are very suitable for use by teachers in introducing and instilling a love of agriculture in students at school. Agricultural activities arranged in agricultural-oriented teaching materials must be interesting and can arouse students' motivation to study agriculture. To determine the success of agricultural-oriented teaching materials in learning, a broader effectiveness test is needed. By developing teaching materials with an agricultural perspective, it is hoped that it can foster children's interest in agriculture.

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