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Design and Validation of an E-Learning Module for Organic Fertilizer Training Among Farmers

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Abstract

This study aims to analyze the validity of a training module on organic fertilizer management designed to improve farmers' knowledge. The development of the module was carried out through a systematic process, including literature review, field needs analysis, expert validation, and user readability testing. The training module was designed in a digital format using an e-learning approach to increase accessibility and flexibility in learning. Validation was conducted by subject matter experts and media experts using structured assessment instruments. The results showed that the content validity scores reached 87.62% for content, 86.67% for layout, and 90.77% for language aspects, indicating high validity from a material perspective. Meanwhile, media experts rated the module with scores of 88.19% for display, 86.81% for material, and 89.17% for functional aspects, confirming its feasibility in terms of usability and design. The results of the analysis concluded that the training module is highly valid and suitable for use in agricultural training programs. It has the potential to support the dissemination of knowledge on sustainable organic fertilizer practices and enhance the competency of farmers through digital learning.

Keyword: Module Validity, Organic Fertilizer, Farmer Training, Agricultural Education

INTRODUCTION

Sustainable agriculture is one of the strategic agendas in realizing national food security, especially in the midst of various global challenges such as land degradation, climate change, and dependence on synthetic chemical fertilizers (Qurani & Fawzi, 2022). One of the important efforts in creating an environmentally friendly agricultural system is through the use of organic

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fertilizers as an alternative or complement to inorganic fertilizers. Organic fertilizers have a vital role in improving soil structure, increasing long-term fertility, and maintaining the balance of agricultural ecosystems (Lubis et al., 2021).

However, the use of organic fertilizers among farmers is still relatively low (Mahendra et al., 2020). This is due to various factors, including limited knowledge of farmers about effective organic fertilizer processing techniques, lack of access to credible information, and lack of systematic and applicable training (Daadi & Latacz-Lohmann, 2021). In this context, the development of valid training modules based on the real needs of farmers is very important to support a meaningful learning process. A comprehensive, easy-to-understand training module will help farmers improve their understanding of the benefits of organic fertilizers, proper processing techniques, and how to apply them to different types of crops (Liu et al., 2024).

On the other hand, the importance of training among farmers in sustainable agricultural management is also supported by increasing awareness of the negative impacts of excessive use of chemical fertilizers, such as damage to soil structure, water pollution, and declining crop quality (Baharuddin et al., 2023). In addition, the use of organic fertilizers can reduce farmers' dependence on synthetic chemical fertilizers whose prices tend to fluctuate and often burden smallholders (Sudjono, 2016). Therefore, training in making organic fertilizers is one of the strategic solutions to increase farmers' independence, reduce production costs, and improve the quality of crops (Arumi et al., 2022).

The implementation of farmer training needs to be supported by the availability of training modules as a prayer as a source of information (Ifadah et al., 2021). The training module is one of the learning media that contains material that is systematically and structured, making it easier for trainees to understand and master the material taught (Trinanda et al., 2020). Training modules should be designed in such a way that they are easy to understand, applicable, and appropriate to the needs of farmers in the field. Organic fertilizer training modules must cover various important aspects, ranging from the introduction of raw materials, composting techniques, to the application of organic fertilizers to various types of plants (Dharmawibawa & Karmana, 2022).

Scientifically designed and systematically validated training modules can be an effective means of conveying technical information to farmers in a way that is easy to understand and apply (Atapattu & Nuwarapaksha, 2025). A valid module not only guarantees the feasibility of the material content, but also ensures that the delivery method and form of presentation are in accordance with the characteristics of the training target audience, namely farmers with diverse educational backgrounds and experiences (Khoirunnisa et al., 2020). Thus, effective training can

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change farmers' attitudes and behaviors, so that they are able to recognize and apply the information and suggestions provided (Atthahara et al., 2022).

With the availability of valid training modules and the availability of discussion forums, farmers can exchange knowledge and experiences about agriculture and improving food security (Soedarto & Hendrarini, 2019). Valid training modules contribute to increasing farmers' knowledge, skills, and confidence in implementing organic farming practices in a sustainable manner (Nurlaelah et al., 2023). In addition, training modules can assist training instructors in delivering material in a structured and systematic manner, thereby increasing the efficiency and effectiveness of training.

Therefore, this study aims to analyze the validity of the organic fertilizer management training module as an effort to increase farmer knowledge. Validity analysis was conducted to assess the extent to which this module has met the criteria for content, construct, and display validity based on expert opinions and limited field tests. The results of this analysis are expected to contribute to the development of more quality training tools and support the agenda of empowering farmers in realizing sustainable agriculture.

METHOD

This research is part of a series of research and development activities that focus on analyzing the validity of organic fertilizer management training modules to improve farmers' knowledge. The approach used in this study is a descriptive quantitative approach with the main objective of evaluating the validity aspects of the module in terms of content, construction, and display based on expert assessments and readability tests by limited users.

The subjects in this study consist of two main categories, namely expert validators, which include lecturers or practitioners who have expertise in agronomy, non-formal education, and instructional design. The research procedure includes the development of an initial draft of the training module based on literature studies and field needs. Next is validation by experts, where the module draft is analyzed using a validation sheet that has been developed. After that, the module was revised based on the input of the validators.

The instruments used in this study include module validation sheets compiled based on indicators of content, construct, and display validity. This sheet uses a 4-point Likert scale to measure the feasibility level of each aspect. The validation data was analyzed quantitatively using descriptive statistics, namely by calculating the average score of each aspect of validity. The average score is then converted into a validity level category based on the category.

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Table 1. Validity Category

Category	Validity
> 3,25 s.d 4,00	Highly Valid
> 2,50 s.d 3,25	Valid
> 1,75 s.d 2,40	Invalid
1,00 s.d 1,75	Highly Invalid

(Widoyoko, 2016)

Table 2. Training Module Validity Instruments

No.	Aspects Assessed
1.	Material completeness.
2.	Breadth of material.
3.	Depth of material.
4.	Compatibility with the development of science and technology.
5.	Features, Examples, and References are relevant and up-to-date on the development of science and technology.
6.	Relationship between concepts
7.	The use of language is in accordance with the rules of good and correct Indonesian language.
8.	The language used is clear and does not give rise to double interpretation.
9.	The use of sentences used is able to motivate learners
10.	Design and layout of interesting learning modules.

RESULTS AND DISCUSSION

The organic fertilizer management training module is designed and developed with an e-learning-based digital approach as a form of innovation in delivering training materials to farmers. This approach was chosen to address the challenges of limited time, distance, and access to face-to-face training that farmers often face, especially in rural or remote areas (Mukhlisin et al., 2022). The initial stage in the development of the module is to compile the framework of the content of the module based on the results of literature studies and analysis of farmers' needs. Furthermore, the module content is developed into an interactive digital format that can be accessed through an online learning platform. The results of the design of the training module can be seen in Figure 1.

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Figure 1. Training Module Design Results

Furthermore, this study aims to determine the validity level of the organic fertilizer management training module developed to improve farmers' knowledge. The validation process is carried out by two types of validators, namely material experts and media experts. Each of them provided an assessment of aspects that were in accordance with their expertise using a 4-category likert scale based validation sheet instrument.

Validation Results by Subject Matter Experts

Material validation is an important stage in the training module development process, which aims to ensure that the content and structure of the modules have met academic quality standards and practical relevance. The material expert provides an assessment of the feasibility of the material content, layout qualifications, and language qualifications. The results of the analysis of the validity of the training module material can be seen in Figure 2.

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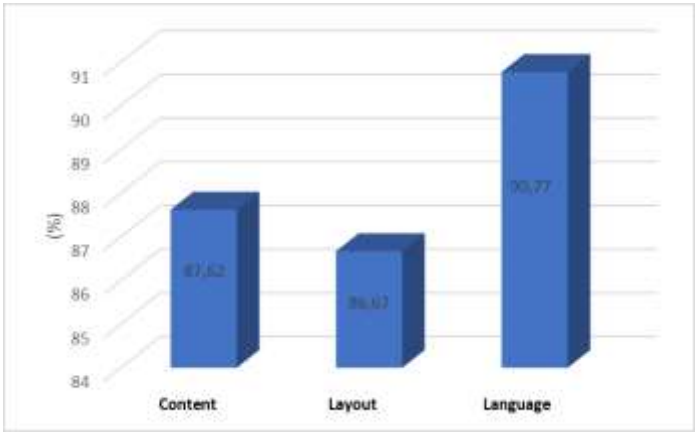


Figure 2. Material Validation Results

The results of the validation of the organic fertilizer management training module were reviewed from three main aspects, namely content, layout, and language. The data is visualized in the form of a bar chart, which shows the average percentage of validators' assessment of each aspect.

The content aspect obtained a validation score of 87.62%, which shows that the material in the module is considered very good and in accordance with scientific standards. The validators assessed that the module contained accurate information, relevant to the needs of farmers, and covered all important topics needed in organic fertilizer management. However, there are some suggestions to add local case examples and more detailed process illustrations to strengthen context and linkage to real practice on the ground.

The layout or visual design of the module received a score of 86.67%, indicating that in general the layout was rated good. The arrangement of visual elements such as images, text, and space has met the principles of readability and comfort in learning. Some feedback from validators suggested that the placement of the image be enlarged and the consistency of the margins considered to improve aesthetics and regularity of the appearance.

Language is the aspect that received the highest score, which is 90.77%. This shows that the use of language in the module is very effective, communicative, and easy to understand by the target user, namely farmers. The language used is judged according to the characteristics of the target reader, not too technical but still maintaining the accuracy of the terms. In addition, sentence structure and language style are also adjusted so as not to confuse and provide a logical flow of understanding.

The three aspects that were validated obtained a score above 85%, so that in general it

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can be concluded that the organic fertilizer management training module is included in the category of being very valid and feasible to be used as a learning medium in farmer training. However, some minor improvements such as adding local context, improving image visualization, and adjusting the layout are still recommended to improve the quality of the module before it is widely implemented.

Validation Results by Subject Matter Experts

The purpose of media validation is to ensure that the technical and visual aspects of the media used in the training module have met the criteria of feasibility, effectiveness, and user convenience. Media experts assessed the appearance and presentation aspects of the module, which included layout design, readability, format consistency, color and font selection, and illustration feasibility. The results of the assessment can be seen in Figure 3.

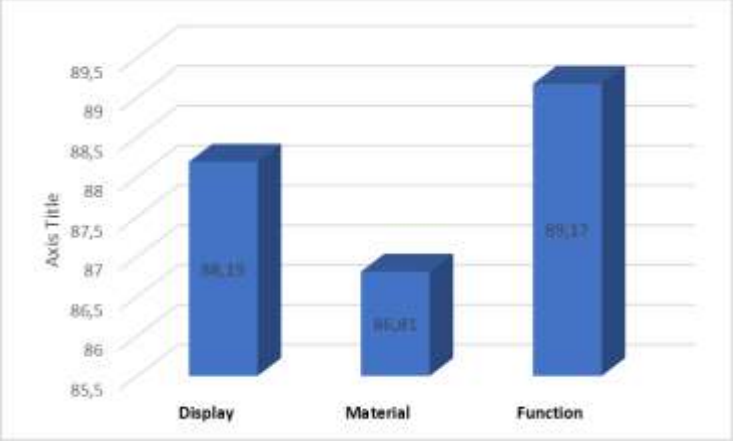


Figure 3. Material Validation Results

The results of media validation in the organic fertilizer management training module were reviewed from three main aspects, namely display, material (completeness of materials), and function. These three aspects were validated by media experts to assess the extent to which the modules have met the eligibility criteria in terms of design, completeness, and effectiveness of their use in the digital learning process.

The display aspect obtained a validation score of 88.19%, which indicates that the visual display of the module is rated very good. The validators gave positive ratings of consistent graphic design, attractive color selection, and the use of images and illustrations that support content understanding. The module is considered quite user-friendly and aesthetically appealing

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to trainees. However, there are minor suggestions to further adjust the color contrast in some parts to improve reading comfort.

The aspect of material completeness obtained a score of 86.81%, indicating that the material presented in digital media was quite complete and relevant to the learning objectives. Validators assessed that all important content was readily available, although there were suggestions to add interactive features or links to additional resources to enhance participants' learning exploration. The packaging of materials in the form of digital modules is also considered to be quite concise and systematic.

The functional aspect received the highest score, which was 89.17%, which means that the media is considered very functional and easy to use. The modules are well accessible on a wide range of digital devices, especially smartphones and computers, without any significant technical barriers. Navigation between pages, clear instructions for use, and content integration go well. This shows that the media is ready to be used in e-learning training for farmers.

Overall, the results of the media validation show that this digital training module has met the eligibility criteria in terms of appearance, completeness, and function of use. With the average score in all three aspects being above 85%, the media is stated to be very feasible to be used in supporting the e-learning-based organic fertilizer management training process. A few minor improvements such as improved display contrast and the addition of interactive elements will further enhance the quality and appeal of the module.

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that several things can be concluded, namely that the organic fertilizer management training module developed through a systematic approach and based on field needs is proven to have a high level of validity. This is shown by the validation results from material experts and media experts who provide excellent assessments of the content, appearance, and function of the module.

The validation results from the subject matter experts show that the content, layout, and language aspects in the modules have met the quality standards. The average percentage of validity was above 86%, with the highest assessment in the language aspect at 90.77%. This shows that the content of the material has been relevant, easy to understand, and in accordance with the needs of farmers.

The validation results from media experts also showed that the module was rated very good in terms of visual appearance (88.19%), material completeness (86.81%), and use function

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(89.17%). The module has met the criteria as an attractive, accessible, and functional digital learning medium for e-learning-based training.

Readability tests by users showed that the module was well received by farmers as the main target. This confirms that the module design is not only academically feasible, but also applicable in the field. Overall, this digital-based organic fertilizer management training module is stated to be very feasible and ready to be used as teaching materials in farmer training programs. The use of this module is expected to support the improvement of farmers' knowledge of sustainable agricultural practices, especially in terms of the use of organic fertilizers.

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