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Design for developing an electronic student worksheet based on organic food plant cultivation

Sulis Anjarwati[1*], Alvina Putri Purnama Sari[2]
[1]Vocational Education Automotive Technology, Universitas Nahdlatul Ulama Lampung, Jl. Raya Lintas Pantai Timur Sumatera, Purbolinggu, Lampung Timur, Lampung, Indonesia
[2]Madrasah Ibtidaiyah Teacher Education, Islamic Institute of Agus Salim Metro Lampung, Jl. Bridgen Sutiyoso No. 7 Metro City, Lampung, Indonesia
[*]Corresponding author: sulis.anjarwati.sa@gmail.com

ABSTRACT

The importance of teaching staff in innovating in the era of the Industrial Revolution 4.0 is something that must be considered, one of which is innovating in presenting teaching materials. Electronic-based teaching materials that can be easily used by students are electronic-based student worksheets (E-LKM). E-LKM represents an easily assessable resource for a student. The utilization of E-LKM by students should be in alignment with their specific needs, one of which is the role of universities in promoting the cultivation of organic food crops. Therefore, one of the steps forward involves designing an E-LKM based on the cultivation of organic food plants. This research introduces a novel approach, which will develop an E-LKM based on organic food crop cultivation which is expected to provide insight to students about the importance of cultivating organic food crops as a form of food self-sufficiency. The development of this E-LKM design based on organic food crop cultivation adapts the ADDIE development model. It can be concluded that the ADDIE Model is used in the design of developing E-LKM based on organic food crop cultivation because it has systematic steps, is presented in detail, and produces specific products. From our result, evaluation criteria encompass material validity, practicality, and readability aiming for a minimum score of 85.0-100%.

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INTRODUCTION

The world movement is currently in the era of Industrial Revolution 4.0. namely a form of world development in changing civilization rapidly in a more modern way (digitalization) (Strearns, 2018) which is characterized by the use of all forms of information systems with computational processes and involving big data (Dito & Pujiastuti, 2021). The changes in the civilization that have occurred can be seen in many aspects of life starting from changes in the social sector (Pitoewas, et.al., 2020), and the economy (Sudiantini, et.al., 2023) and which cannot be separated from the disruption of the industrial revolution 4.0 so that has a big impact, namely in the education/learning sector (Afrianto, 2018; Halili, 2019; Ismail, et.al., 2020). The impact of changes in the era of the Industrial Revolution 4.0 in the field of education is felt by educators or lecturers (Putra, et.al., 2022;

Jamuan, 2018) who must be able to innovate in preparing learning tools to adapt to current advances in information technology (Halili, 2019).

Learning tools designed by educators or lecturers play a crucial role, and must make the learning process easier and enhance its effectiveness (Brown, et.al., 2019). From that point, education can achieve learning goals more easily to produce graduates who are in line with the current digitalization era of the Industrial Revolution 4.0. One of the learning tools that must be adapted to suit current developments is teaching materials (Magdalena, et.al., 2020). Lecturers must ensure that teaching materials are developed can be able to cover digital-based learning activities so that learning becomes more effective (Herawati & Muhtadi, 2018). Flexibility is a key in use by the current generation (Syafril & Rahmi, 2023; Cahya, et.al., 2021; Haniah, 2014). Teaching materials that can be used to support learning activities in the current era of digitalization are student worksheets (LKM). Student worksheets (LKM) are one of the teaching materials used by students containing instructions and steps in completing work/assignments following learning objectives. Besides that, the LKM also describes various concepts of lecture material and questions or forms of projects that must be carried out by students. students (Nirwana, et al., 2019).

LKM are widely used by lecturers as teaching materials because they can maximize student activities in lecture activities both within and beyond the classroom (Patresia, et.al., 2020; Mahtari, 2020). The adaptability of LKM development to student needs is a key factor contributing to their student needs. LKM developed by lecturers plays a crucial role in facilitating students. It can help students easily find concepts in learning/lectures so that students can easily master the competencies as expected (Sari & Wulanda, 2019; Haryonik & Bhakti, 2018). Many MFIs in the current era of digitalization are packaged in electronic form or E-LKM which aims to make it easier to use MFIs, namely easier to access, more practical, and more efficient (Aldresti, et al., 2021). The development of E-LKM by educators or lecturers is currently very diverse. It can start from the appearance, use of development software, and even various lecture materials that can be easily packaged into E-LKM. The use of electronic-based teaching materials can be used as an alternative to providing teaching materials because they can increase the effectiveness of learning activities and make it easier for teaching staff to deliver material during learning activities (Audia, et.al., 2021). One of the materials that can be packaged into E-LKM is material for cultivating organic food crops.

Cultivation of organic food plants is a crucial component of the lecture materials included in the Botany course, at the Faculty of Agriculture, Fisheries and Animal Husbandry, Nahdlatul Ulama University (UNU) Lampung. Material on cultivating organic food crops is given to students to equip students with the concept of the importance of implementing organic food crop cultivation in the current era. There are many negative impacts that we can feel from conventional agricultural activities which use a lot of synthetic pesticides (Singkoh & Katili, 2019; Dhiaswari, et.al., 2019). This encourages universities to provide knowledge intensively to participate in guiding lecture activities. This is done by providing students, namely by promoting the cultivation of organic food plants to maintain the health of all (Wulandari, et.al., 2023). Based on the results of interviews conducted with students and lecturers at Nahdlatul Ulama University (UNU) Lampung, it has been observed that learning activities in Botany courses primarily focused on material mastery within the classroom. However, these activities have not reached their maximum potential engagement in direct practical

activities, particularly in economic botany material which includes Food Botany material. Food botany material includes the importance of carrying out organic food self-sufficiency activities to maintain the stability of food needs in a region (Enriquez, 2020; Brankov, et.al., 2021).

Due to the importance of disseminating information about organic food crop cultivation within the scope of higher education for students, it is necessary to carry out a process for developing electronic student worksheets (LKM) based on organic food crop cultivation. The E-LKM development process is designed using the ADDIE model which involves the schematic of steps: analyze, design, develop, implement, and evaluate). The adoption of the ADDIE model is because the steps are systematic, carried out in detail, and the resulting product applies a specific context (Branch, 2009). The design for developing E-LKM teaching materials is expected to be an effective and efficient step in producing E-LKM based on organic food crop cultivation.

METHOD

The research conducted was a qualitative descriptive study, which involved describing the activity plan for developing electronic-based student worksheets (E-LKM) with material on cultivating organic food crops using the ADDIE development model. Data collection activities were carried out by explaining the development process or steps using the ADDIE model, integrating the findings from the study of the Semester Implementation Plan (RPS) for botany courses as well as material on the cultivation of organic food plants conducted in Taman Fajar village, East Lampung in 2023. This information served as material for designing E-LKM development.

The E-LKM development design steps use the ADDIE model, consisting of the Analyze, Design, Develop, implement, and evaluate steps. The instrument utilized in this research is a questionnaire, which was employed to obtain additional data related to the analysis of E-LKM development. Additionally, a validation questionnaire was used to obtain input regarding the E-LKM development plan based on organic food crop cultivation.

Data analysis and presentation activities in the process of developing an E-LKM design based on organic plant cultivation were conducted descriptively. At the end of the activity, a conclusion will be drawn regarding the design process for developing an E-LKM based on organic plant cultivation.

RESULTS AND DISCUSSION

The E-LKM development design carried out consists of activities from overall planning related to the structure or framework of E-LKM, the systematic content of E-LKM to the evaluation process contained in E-LKM. The design for developing E-LKM based on organic food crop cultivation is guided by the semester learning plan (RPS) for Botany courses developed by lecturers at the Faculty of Agriculture, Fisheries and Animal Husbandry, Nahdlatul Ulama University (UNU) Lampung. One of the materials developed in the RPS is economic botany, with is content description of which consists of economic botany of horticultural plants, woody plants, fibrous plants, medicinal plants, and food plant botany. Learning activities at UNU Lampung have utilized e-learning which has been developed by UNU Lampung, facilitated through the platform smartunulampung.ac.id. The design for the development of E-LKM based on the cultivation of organic food plants is expected to be able

to support the learning process of economic botany material. The E-LKM development plan based on organic food crop cultivation adapts the ADDIE development model.

The ADDIE development model is a product-oriented development model that consists of five development steps (Branch, 2009): analyze, design, develop, implement, and evaluate. The resulting product will be used in the learning process for botany courses at the Faculty of Agriculture, Fisheries and Animal Husbandry, UNU Lampung. The ADDIE development mode flow is represented in Figure 1.

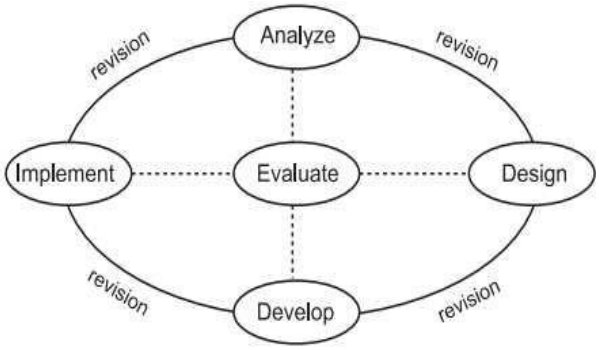

Figure 1. Flow of the ADDIE Development Model (Branch, 2009)

The ADDIE development model flow is widely used in research and development research because it has a flexible or non-rigid flow (Sari, et.al., 2017). Each stage of development can be revised as necessary. The following section describes the E-LKM development design based on organic food crop cultivation.

1. Analysis Stage (Analyze)

The analysis was carried out through an interview process involving students from the faculty of agriculture, fisheries, and animal husbandry who had taken botany courses and general students in the UNU Lampung community. The interview material related to the need to develop digital teaching materials in the current era of the Industrial Revolution 4.0. Additionally, the analysis of development needs is considered from the experience of teaching botany courses by the lecturers related to the need for innovation in developing digital teaching materials for botany courses. The finding revealed a clear demand that students needed electronic teaching materials to support lecture activities in the era of the Industrial Revolution 4.0. Lecturers who teach botany courses also explain the need for innovation in the development of digital-based teaching materials to align with current advancements (Robinson and Kay, 2010). This encourages the students to participate in learning activities more quickly and the competencies they can achieve can be achieved more easily (Amin, 2010).

Analysis was also carried out on teaching materials, namely the importance of universities in promoting the cultivation of organic food crops amidst the large number of farmers who still use chemicals or synthetics in processing crops. The material for cultivating organic food crops which is integrated in the E-LKM development plan is material resulting from research carried out by Sulis et.al., (2023) in Taman Fajar Village, East Lampung. It is hoped that the E-LKM development plan by presenting material on cultivating organic food crops will be one of the right steps in disseminating the need to cultivate food crops organically starting from the educational environment.

2. Design Stage (Design)

The design stage carried out in the E-LKM development process aims to create the product to be developed as well as develop an instrument sheet that will later be used in the E-LKM assessment process.

Electronic Student Worksheet (E-LKM)

The importance of developing E-LKM is because electronic-based teaching materials will make it easier for teaching staff to deliver the material so that learning becomes more effective (Sari, et.al., 2018). Additionally, the development of electronic student activity sheets can help students discover learning concepts independently and be able to solve every problem presented in E-LKM (Hamatum, et.al., 2018; Verdina et.al., 2018). The development of E-LKM is crucial because it is designed according to the specific needs of students (Harwati & Rokhmat, 2021) at UNU Lampung and adapts to the curriculum used by UNU Lampung. Electronic student worksheets (E-LKM) are one of the teaching materials that contain teaching materials and guidance for using LKM (Fajar et.al., 2022). The e-LKM being developed will contain an LKM format that contains the initial components consisting of student identity, lecture/instructional objectives or competencies that must be achieved by students, then the core/content of the LKM which consists of information or material about cultivating organic food crops, stages or process of cultivating organic food crops, organic food crop cultivation projects and feedback, and the last chart is the closing. The closing section contains the completion of the organic food plant cultivation project, evaluation, and final reflection on botany lecture activities on organic food plant cultivation material.

The distinctive feature of the LKM that will be developed compared to other similar LKM is that the development design of this LKM is electronic-based which will be developed using the *Canva* application which will be presented on Android with material on cultivating organic food crops. The development of E-LKM with the help of the *Canva* application will later provide a material display that is not only filled with theory but will also contain video, audio, as well as several assignment links which will be presented using Google form links and Google spreadsheets.

Material for Cultivation of Organic Food Plants

The material for cultivating organic food plants which will be packaged in E-LKM is material carried out directly by one of the lecturers who teach the botany course at UNU Lampung. Organic food plant cultivation activities will be carried out in 2023 in Taman Fajar Village, East Lampung. The organic food crop cultivation activities that have been conducted will be more meaningful to be conveyed to students through E-LKM. This is because E-LKM has the capability to offer a direct understanding, as well as present and describe data effectively based on direct research results (Harwati & Rokhmat, 2021). The material developed in E-LKM is material that has not been packaged in many existing E-LKM forms, which is one of the important materials in botany courses. The following is some material that will be presented in the development of E-LKM based on the results of research conducted by Anjarwati, et.al (2023) in Taman Fajar Village, East Lampung.

The final assessment of the development of E-LKM is carried out by providing the instrument sheet that has been developed to experts for validation. The validation sheets or questionnaires given to validators to assess products include material validation sheets, practicality

validation, and E-LKM readability level validation sheets. It is crucial to provide the developed instruments to validators for the evaluation of E-LKM products. The Assessment is necessary to be carried out to find out whether the product that has been developed is satisfactory or requires revision for improvement. The E-LKM that has been developed must have a level of material validity in terms of language use, presentation, practicality, and readability. instructor and lecturers related to botany courses will also be used as validators in assessing the content of E-LKM material that has been developed before the product is given or tested to students.

Table 1. Content Design of E-LKM Based on Organic Food Plant Cultivation

No.	Structure E-LKM	Material
1.	Introduction	a. Identity & use of E-LKM b. Introduction to Organic Plant Cultivation c. The importance of cultivating organic food crops
2.	content/core material	a. Socialization and Discussion about Cultivation of Organic Food Crops b. Organic land cultivation c. Tools and materials used in cultivating organic food plants d. Care for cultivating organic food crops e. Processing of organic food crop cultivation results f. Packaging and Branding of organic food crop cultivation
3.	closing	a. Development of organic food crop cultivation projects b. Project evaluation c. Reflections on organic food crop cultivation projects d. Dissemination of organic food crop cultivation projects by students

3. Development Stage (Develop)

At this stage, the product development process will be carried out in the form of E-LKM based on the cultivation of organic food crops. subsequently, an assessment or validation process by validators as well as testing the level of practicality and readability by students. This development process consists of creating E-LKM products to carry out a revision process for the products that have been produced. The E-LKM that was developed contains material for cultivating organic food crops which was carried out in Taman Fajar Village, East Lampung in July-December 2023. The material for cultivating organic food crops was selected because currently, the Indonesian government has promoted the process of planting plants, especially food crops, one of which is organic food, apart from meeting the food needs of the Indonesian population, but also participates in agriculture practice. Numerous benefits can be gained from the process of cultivating food crops organically, such as healthier and better quality produce (Hoesain et al., 2020), and being enhancing the characteristics of the soil including texture and structure (Salamah & Sasongko, 2020).

The organic plant cultivation material will be integrated into E-LKM teaching materials. The organic food plant cultivation activities start from the process of preparation, planting, care, planting, and harvesting, to the management of post-harvest processed products (Sulis et.al., 2023).

The assessment of the E-LKM product involves material expert validators specializing in the field of botany and organic plant cultivation as well as experts in teaching material development in the fields of education and ICT. Each validator possesses a minimum educational qualification of Strata-II (S2). Field practitioners involve lecturers teaching botany courses with a minimum of 3

years of learning experience. Field practitioners also involve students to participate in assessing the E-LKM that has been developed, namely students from the UNU Lampung Faculty of Agriculture, Fisheries and Animal Husbandry, totaling 5 students into small groups. Testing the level of practicality and readability carried out by students aims to obtain input, criticism, suggestions, or responses to the E-LKM products that have been developed.

4. Implementation Stage (Implementation)

This implementation stage is a stage carried out to prepare a learning environment utilizing the E-LKM product that has been developed. Before integration into lecture activities, products that have been validated will be tested again to test their level of practicality and readability using a medium group consisting of 15 students who have been selected randomly. This medium-group testing is a continuation of the previous small-group testing, at this stage, it is hoped that E-LKM will be understood by students. Following the completion of the group testing, the lecturer will conduct direct learning activities using E-LKM based on organic food crop cultivation which has gone through a validation process and been declared valid, a practical product, and the product has a good readability level.

5. Evaluation Stages (Evaluate)

The final stage of the ADDIE development model is the evaluation stage, the evaluation process is carried out to assess the final results of the product that has been developed. Evaluation is carried out using assessment instruments or questionnaires by validators and field practitioners (lecturers and students). The obtained evaluation results will be analyzed and then a conclusion will be drawn regarding the product being developed. This analysis will determine whether the developed product is feasible, practical, and has a high level of readability or does it even needs to be revised again.

Data analysis was conducted utilizing the score assessments provided on the validation sheet and questionnaire sheet. The assessment uses a score on a Likert scale adopted from Akbar (2013). The Likert scale used starts from a score range of 1-4 which means the criteria range from very poor/ inappropriate/ feasible/ interesting/ easy/ suitable/ accurate to very good/ precise/ feasible/ interesting/ easy/ suitable. The use of the Likert scale range in assessing product development is because this assessment scale is easy to use to measure the characteristics of a person/individual in an assessment using scores. The Data obtained from the results of analysis using validation sheets/questionnaires will then be analyzed and presented in the form of percentages using the following formula.

$$PV = \frac{\text{Tsp}}{\text{Tsh}} x\ 100\% \qquad (1)$$

Information:

PV: Percentage of validation

Tsp: Total assessment score

Tsh: Total expected score (Adapting Akbar, 2023)

The validity percentage criteria are explained in Table 2 below. The validity percentage of E-LKM must reach a minimum value of 85.1-100% so that the product can be said to be valid/fit to be used.

Table 2. Validity Criteria for Validator Scores

Value Scale (%)	Information
100	Very Valid (can be used without revision)
99,99	Very Valid (usable with minor revisions)
70,1-85,00	Sufficiently Valid (can be used with revisions)
50,01-70,00	Less valid (recommended not to be used, needs major revision)
01,00-50,00	Invalid (unusable)

(Source: Adapted from Akbar, 2013)

CONCLUSION

The activity of developing an Electronic Student Worksheet (E-LKM) based on organic plant cultivation was carried out using the ADDIE model. Development design is carried out from the initial stage, namely analysis, to the final stage, namely evaluation. The evaluation design for the development of E-LKM based on organic plant cultivation includes the validity of the E-LKM material, the practicality of the E-LKM, and the readability level of the E-LKM with a minimum score of 85.0-100%. The material presented in E-LKM is material on cultivating organic food crops from the beginning to the end of the implementation of organic food crop cultivation which has been carried out in Taman Fajar Village, East Lampung. E-LKM development by educators can be carried out by integrating other subject matter according to needs so that all lecture material can be studied and understood easily by students in the current era of digitalization.

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