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Development of a Practical E-Module for POE-Based Used Cooking Oil Management in West Sumbawa Regency

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Abstract: The research objectives were to determine: 1) the process of developing POE-based E-module practicum management of used cooking oil in West Sumbawa Regency; 2) expert validation test results (construct/design and content/material) E-module practicum management of used cooking oil based on POE in West Sumbawa Regency by the validator; 3) the results of the E-module readability test for the management of POE-based used cooking oil practicum by students. The development of the POE-Based E-Module Practicum Management of Cooking Oil refers to the 4D learning development model. This research only reached stage 3 D (Develop), namely the development stage with detailed activities in the form of expert validation (construct/design and content/material) by the validator and the E readability test of the POE-based waste cooking oil management practicum module. The instruments to be used in this research are: Construct validation sheet and contents of the practicum E-module and the readability test sheet of the practicum E-module. Based on the results of research that has been carried out, the results of validation I from validator I were obtained with a value of 88%. Meanwhile, the results of validation I from validator II were 89.2% with very valid criteria.

Keywords: Development; E-module; Jelantah; POE Based

Introduction

Used cooking oil is used oil that is used once or twice in a frying pan. Used cooking oil comes from various types of frying oil such as palm oil, corn oil, ghee and so on, this used oil is used repeatedly for household industrial needs (Kernani, 2022) (Bachtiar et al., 2022) (Kushadiwijayanto et al., 2021). The quality of cooking oil will of course decrease if it is used repeatedly, which will ultimately affect the quality of the fried food (Erna & Wiwit, 2017) (Herlina et al., 2018) (Nurhasnawati et al., 2017). The use of used cooking oil or used oil in West Sumbawa Regency is generally used up and not managed or used again. This is probably because the people of West Sumbawa Regency have very little understanding of reusing used oil or used cooking oil. Generally, the used oil is used up for frying and is immediately disposed of on the ground (Kusumaningtyas et al., 2019) (Sundoro et al., 2020). Disposal of used cooking oil waste (used cooking oil) is also carried out haphazardly, usually dumped in rivers, ditches or thrown directly onto the ground. This of course results in environmental pollution. For this reason, community involvement in participating in recycling activities needs to be included, both as producers and as members of the waste producing community. So it is necessary to make new breakthroughs, especially for prospective housewives or the public so that they can recycle the remaining used oil into products. Thus the use of these resources will be more efficient. Because leachate that is not properly handled or managed or without processing can certainly have a negative impact on the environment, such as the appearance of odors, thereby reducing aesthetics and the emergence of disease (Ernani, 2015) (Putri et al., 2023) (Chandra et al., 2020).

One way that can be done is to introduce the recycling process in the learning process at school or on

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campus. The learning process will be meaningful if it is adapted to students' learning experiences. Because awareness and understanding of environmental pollution can be instilled effectively through learning activities. Therefore, the supporting factor to support the smooth process of teaching and learning activities is the use of teaching materials. Teaching materials have an influence on the learning process, and can even increase student competence if a teacher can be more creative in its use and not fixated on just one teaching material (Sahratullah et al., 2023) (Raharjo & Lestariningsih, 2018). Technological advances in the current era demand teaching materials that are practical and easy to use anywhere, such as electronic modules. Through this e-module learning, its application will be more efficient because in online learning the material presented will be easy to understand (Syarifah et al., 2022). Electronic modules (e-modules) are a form of presentation of independent learning materials that are systematically arranged into the smallest learning units to achieve certain learning goals (Nissa et al., 2018).

The results of observations in West Sumbawa Regency, that it has never developed a practicum E-Module related to the management of used cooking oil, so it still uses existing textbooks. If you look at the availability of books/practical instruction modules in both the library and in schools, it is still lacking. The available modules or teaching materials are still theoretical/abstract in nature and do not yet show procedural activities that are contextual in nature with everyday life, so students do not gain an in-depth understanding of the management of environmental pollution (used cooking oil).

The learning approach that can be taken is through POE-based learning (predict, observe, explain). This model provides students with the opportunity to produce their own cognitive concepts through reconciliation and negotiation between initial knowledge obtained with new knowledge (Nurfadilah et al., 2020). Apart from that, the POE-based learning model used by teachers can create a fun and quality learning atmosphere (Hidayah & Yuberti, 2018). So that by learning through POE, students can build ideas or his own knowledge. The POE model is a model that is created or oriented towards constructivist learning which emphasizes the way students learn constructing or discovering one's own knowledge (Tyansha et al., 2022).

Method

The method that will be used in this research is the Research and Development method but this research is only limited to the 3D (Develop) stage. The 3D stages of research can be seen in the following research flow diagram.

The research population included all biology education students at Cordova University, West Sumbawa Regency in the 2022/2023 academic year. The sample in this study was taken using a purposive sampling method in accordance with research needs, namely 2nd semester biology education students taking environmental laboratory management courses.

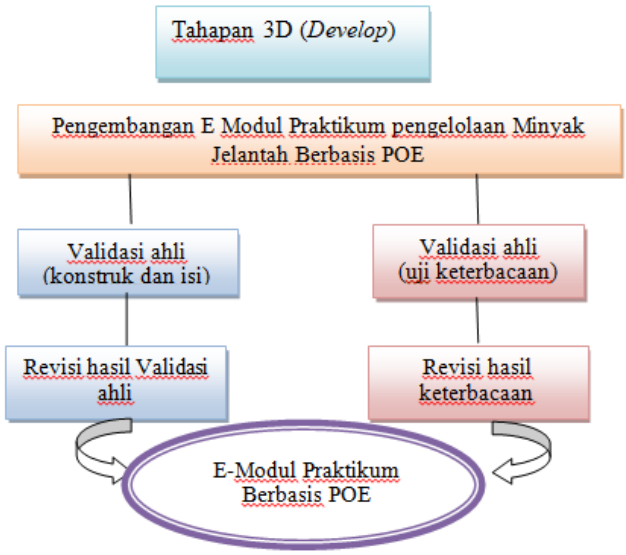


Figure 1. Research flowchart

There are several instruments that will be used in this study, namely: (1) Construct validation sheet and contents of E-module practicum management of used cooking oil based on POE; (2) Readability test sheet E-module practicum management of used cooking oil based on POE.

Research data was collected by collecting the results of assessments by two experts/validators regarding the construct/design and content/material as well as the results of student readability assessments of the POE-based E-module for practicum management of used cooking oil based on POE which is currently being developed (Ernani & Seprianingsih, 2021).

Data obtained from the results of assessments by two experts/validators regarding construct/design and content/material as well as the results of readability assessments by students will be analyzed using the following validation criteria (Afian & Saputra, 2021):

$$\text{Percentage (\%)} = \frac{\text{total (answer x weight of each choice)}}{\text{N x highest weight}} \text{ x } 100\% \quad (1)$$

Analysis of the results of the two experts/validators' assessments regarding construct/design and content/material using the following validation results criteria (Rahman et al., 2023) (Seprianingsih et al., 2017):

Table 1. Criteria for construct validation results and contents of the E-module practicum for POE-based used cooking oil management

Achievement level (%)	Qualification	Information
>80	Very Good	No Need To Revise
70-79	Good	No Need To Revise
60-69	Enough	Revised
50-59	Less Good	Revised
<50	Not Good	Revised

The results of students' readability assessments will then be analyzed using the following validation criteria (Fajarianingtyas & Hidayat, 2019).

Table 2. Criteria for the legibility validation results of the E-module practicum for POE-based used cooking oil management

Achievement level (%)	Qualification
>60	Easy
41-60	Currently
<40	Hard

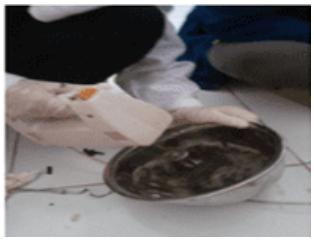
Result and Discussion

Based on the results of research that has been carried out in facing the 21st century era, information was obtained starting from observations that it is important to develop learning E-modules. before composing the E-Module, it begins with the implementation of making soap products from used cooking oil. The implementation of the management of used cooking oil into soap can be seen in Figure 1:

Stage 1. Preparation of materials and tools

Stage 2. Filter the used cooking oil using activated charcoal to make it clearer

Stage 3. Filter 2x to produce clear used cooking oil

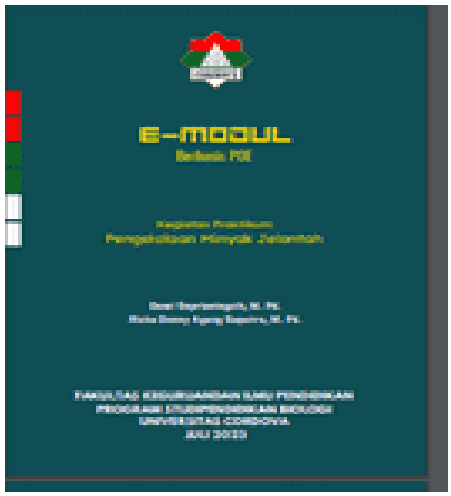


Stage 4. Binahong extract

Figure 1. The implementation of the management of used cooking oil into soap

After the soap-making practicum process is complete, the next process is the development of the POE-Based Cooking Oil Management Practical E-Module which refers to the 4D learning development model (Afian & Sahratullah, 2023). This research only reached the 3D (Develop) stage, namely the development stage with detailed activities in the form of expert validation (construct/design and content/material) by validators as well as a readability test of the POE-based used cooking oil management practicum E-module (Zohri et al., 2022) (Hartanto et al., 2021). The results of the E-Module development are as follows (can be seen in Figure 2).

The shape of the outer cover of POE-Based Used Cooking Oil Management Practical Module E



Form of the inner cover of POE-Based Used Cooking Oil Management Practical Module E

Foreword

Introduction

Core activities

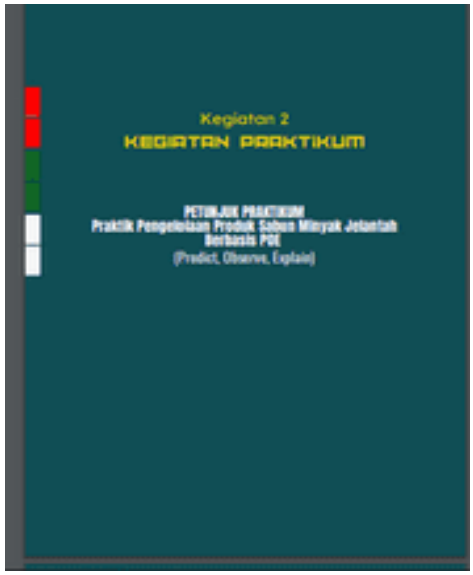
Learning Activities

Learning Activities

Core activities

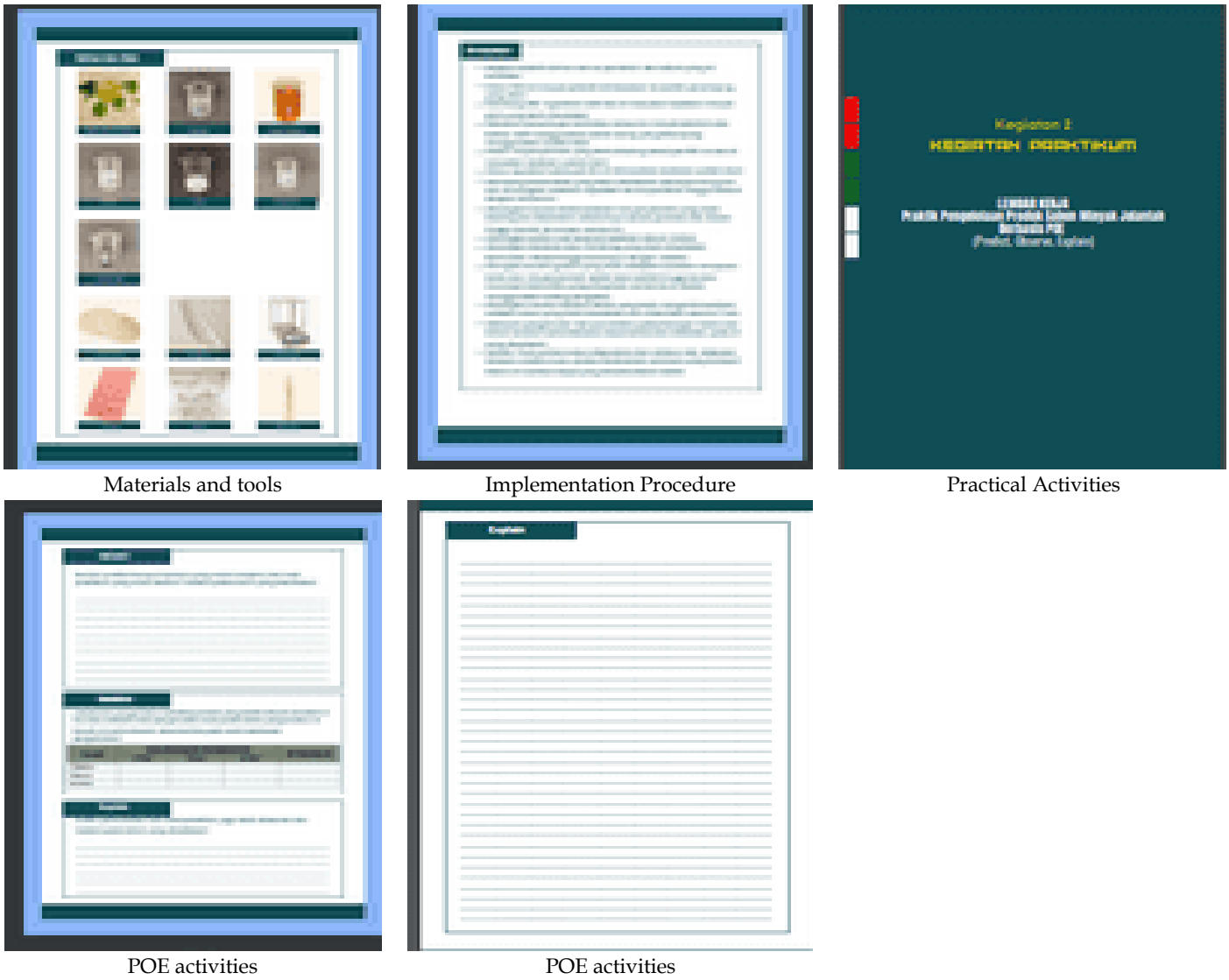
Core activities

Cooking Oil Damage



Learning Activity 2

Preliminary Activities



Materials and tools | Implementation Procedure | Practical Activities

POE activities | POE activities

Figure 2. The results of the E-Module development

The development of the POE-Based Cooking Oil Management Practical E-Module is necessary because: 1) it aims to enhance the quality of learning, 2) it can be utilized to keep up with technological advancements, 3) POE-based learning (Predict, Observe, Explain) provides an instructional approach focused on practical experiences, 4) the E-Module offers flexibility in learning anytime, anywhere, allowing students to access learning materials without being restricted by specific locations or times. 5) The E-Module can be easily updated to encompass new developments in science and technology, thereby enhancing the efficiency of time and resource management in delivering learning materials, 6) The E-Module can assist students in developing practical skills relevant to the industrial sector.

Research data is presented by collecting the results of assessments by two experts/validators regarding the construct/design and content/material as well as the results of readability assessments by students regarding the POE-based used cooking oil management practicum that is being developed. Data obtained from the results of assessments by two experts/validators regarding the construct/design and content/material as well as the results of readability assessments by students will be analyzed using construct and content validation criteria as well as readability validation criteria for the POE-based used cooking oil management practicum E-module (Oktarina et al., 2023) (Nisrina et al., 2020). The results of research implementation to date, the research data obtained are the results of validation I from validator I with a value of 88%.

Meanwhile, the results of validation I from validator II were with a value of 89.2%% (Seprianingsih et al., 2023) (Hayati & Fauziah, 2023). The description of the results of the first stage of validation from the two validators is shown in Table 1.

Table 3. Expert Validation Results

Validation	Indicator 1	Indicator 2	Indicator 3	Indicator 4	Indicator 5
Validators 1	100	100	60	80	100
Validators 2	100	66	80	100	100
Average	100%	83%	70%	90%	100%
Criteria	Very Valid	Very Valid	Valid	Valid	Very Valid

Validation of the POE-Based Cooking Oil Management Practical E-Module is crucial for several reasons. First, validation ensures that the structure and design of the E-Module align with the learning objectives and curriculum standards, allowing the material to be effectively and accurately delivered to users. Second, validation ensures that the content and module materials adhere to scientific principles and accurate information. Third, through readability and comprehension tests, validation ensures that the material can be well understood by students, supporting the effectiveness of learning. Fourth, validation helps align the E-Module with the established learning objectives, ensuring the module can assist in achieving the desired competencies for users. Fifth, validation aids in identifying the potential impact of the E-Module on the learning process, including the module's effectiveness in enhancing the skills, understanding, and motivation of students. Finally, by ensuring compatibility with the latest technology, validation helps maintain the sustainability and relevance of the module over an extended period. Thus, validation becomes a critical step in ensuring that the E-Module can provide maximum benefits in the learning process

Conclusion

The conclusion of this research is that the validation results for the use of POE-based used cooking oil management practicum E-Modules from both validators were 89.2% with very valid criteria.

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Author Contributions

DS: responsible for supervising the development process of the POE-based used cooking oil management practical e-module in West Sumbawa Regency. His duties include monitoring the data processing process from the validation of instruments and readability tests, drafting the e-module, and conducting feasibility studies. Meanwhile, RDAS: has responsibilities such as survey and observation, instrument development, data processing, article writing, and mandatory publication as part of his duties.

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Conflicts of Interest

The author declares no conflicts of interest related to the publication of this scientific article

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