The Development of a Mini-research-based Digital Module Using Sigil in Endocrinology Learning

Rahma Widiantie[1*], Ina Setiawati[2], Anna Fitri Hindriana[3], Edi Junaedi[4], Elsa Chintya[5]
[1,2,3,4,5]Biology Education Study Program, Faculty of Teacher Training and Education, Universitas Kuningan
*Corresponding author: rahma.widiantie@uniku.ac.id

Abstract: *Developing technology-based teaching materials that are more innovative, creative, effective, efficient and contextual is a demand in learning. Lecturers are required to be able to develop media and teaching materials by utilizing technological advances. The aim of this research is to develop complete teaching materials or modules consisting of materials, student worksheets, evaluations, assessment techniques and learning videos to improve students' mastery of concepts using the sigil application. The characteristics of the module developed is a digital module based on mini research, where mini research learning can improve students', problem solving abilities and integrated science process skills. The method in this research is the Design and Development Research method with the PPE model which includes 3 stages: Planning, Production, and Evaluation. The results of the research are digital modules based on mini PPE research models, planning by analyzing the need to design flowcharts and story boards from digital modules, production by creating digital modules, namely compiling the module framework and endocrinology material in Microsoft Word software (html format) the file is opened in the software sigil editor is saved in epub format, evaluation by material experts and media experts by assessing the feasibility of the digital sigil module based on mini research in endocrinology learning. The results of the validity test based on the appropriate aspects of content, language and presentation are valid. The results of the practicality test by students on the aspects of content, language and usefulness are valid. Mini-research-based digital modules using sigil software are valid, practical, and suitable for use in Endocrinology courses with the advantage of facilitating thinking skills and increasing student learning independence.*

Keywords: *Sigil, digital module, Mini research*

1. INTRODUCTION

Technological advances are currently bringing various changes to various sectors of life, one of which is the education sector. Likewise, in biology education, lecturers can utilize technology in learning. One of the uses of technology in learning can be Biology teaching materials. The lack of learning innovation, especially teaching materials, will impact students learning outcomes, attitudes, and ways of thinking. Learning that still uses conventional teaching materials will make students bored, less active, and less efficient (Yaniawati et al., 2020). Developing technology-based teaching materials that are more innovative, creative, effective, efficient, and contextual to the conditions, needs, and characteristics of the material and students is a requirement in learning. One element of lecturer competence is developing and utilizing media and learning resources. Lecturers are required to be able to develop teaching media and materials by utilizing technological advances (Malik, 2021).

Following these requirements, it is necessary to research developing teaching materials in the form of teaching materials or digital modules.

E-modules or digital modules are media that are effective, efficient, and prioritize student independence. In the technological era, many new technologies can provide more information. Technology develops with the ever-evolving times (Pratama et al., 2018). In line with increasingly sophisticated and readily available technology at affordable prices, modules are generally presented in printed form, using electronic technology such as a computer can now be presented in digital form or called e-modules (Fausih & Danang, 2014). Digital learning makes learning more engaging, easy to understand, practically used by students without being limited by space and time and can be used by the public (Sari, 2022).

The problem identified is that there are few teaching materials in the form of digital modules developed by lecturers, especially the Biology Education Study Program; the teaching materials provided are only content summaries without evaluation sheets, assessment techniques, and learning videos. So, research is needed to develop comprehensive teaching materials or modules consisting of materials, student worksheets, evaluations, assessment techniques, and learning videos to improve students' mastery of concepts. The characteristics of the module developed are mini-research-based digital modules. Based on previous research, mini-research learning can improve students' problem-solving and integrated science process skills to effectively apply this learning to other biology courses (Widiantie et al., 2021).

The research carried out is in line with the leading research topics developed by the University in the field of Education, namely the development of learning, media, and evaluation of technology-based learning to increase lecturer competence and improve the quality of learning. The purpose of this development research is to make digital modules using Sigil software that can be accessed effectively and efficiently but still prioritizes improving students' thinking skills by applying a mini-research approach in their learning and assignments along with their assessment. Thus, the digital module that will be developed can help improve student competence comprehensively. Sigil software is the EPUB format that has the advantage of providing commands that are used to insert audio and video files in addition to text and images. Moreover, the EPUB format can also be used on all device sizes, making it easy to access many electronic components, both PC and mobile. They are making it easier to package material in an e-module learning media (Aisy et al., 2020)

2. RESEARCH METHOD

The method used in research on making digital modules based on mini research using Sigil in Endocrinology learning is Design and Development Research. The model used in this study is the PPE model, namely Planning, Production, and Evaluation (Richey, 2017). Focus and Design and Development Research is analysis from start to finish, which includes Planning, Production, and Evaluation. It can be described in figure 1 below:
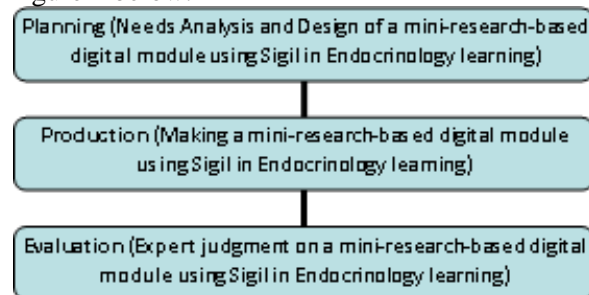

Figure 1. Planning, Production, and Evaluation

a. Planning means making a product plan for a mini-research-based digital module using Sigil in Endocrinology learning that will increase students' conceptual understanding and research skills on endocrinology material. Planning begins with an analysis of the need for electronic teaching materials for students during hybrid learning which is carried out based on previous research on mini-research and literature studies.

b. Production is the activity of making products of digital module based on mini research using Sgil in Endocrinology learning based on the module design/framework and endocrinology material in Microsoft Word software which is stored in the Html file format that has been made. Creating a

module framework in accordance with the objectives of making digital modules with the stages of making flowcharts, story boards, and making mini-research-based digital modules on endocrine material. The creation of digital modules starts with the preface, table of contents, module position map, introduction, learning, evaluation, glossary, and bibliography. These steps were made in Microsoft Word software and saved with the .html extension, then using the Sigil application to add covers, tables of content, insert videos in .mp4 format, and metadata. These steps are saved with the epub extension. They can be read in the Readium application on Google Chrome for computers/laptops, Super Reader, Reader, Ideal Reader, FBReader for Android, IReader for IOS, Blackberry Playbook, and Sony Reader.

c. evaluation is a testing activity, assessing how high the product meets predetermined specifications. The evaluation stage in this study was an activity to evaluate the mini-research-based digital module using Sigil in Endocrinology learning, which was carried out through expert judgment to determine whether digital modules were appropriate for college use. The digital module that has been validated can identify the weaknesses, which will then be corrected according to input from the validator based on validator input. The participants in this study were validators who validated or conducted expert judgment, consisting of two people, namely material experts and one media expert.

The research instruments used in the research "Development of a Mini-research-based Digital Module Using Sigil in Biology Learning" are:
1) Questionnaires in the form of questions that will be asked by researchers to Endocrinology students and lecturers at the University level to obtain information regarding the availability of Endocrine modules and materials to train students' understanding and skills in scientific processing/researching.
2) Researchers carry out documentation studies to strengthen data that has been previously obtained. Researchers document learning tools such as the Semester Learning Plan for endocrine material, endocrine teaching materials, and endocrine material practicum journals.
3) The expert judgment validation sheet is used to determine the feasibility of mini-research-based digital modules using Sigil in Endocrinology learning made by researchers to be shown to media experts in the aspects of the digital module structure and making digital modules, as well as to material experts in the outline aspect of endocrinology theory material as well as mini research. The statement submitted relates to the design of digital endocrinology modules. Using the answer choices, namely scores 1-4 (Strongly Agree, Agree, Disagree, Strongly Disagree), placing a checklist ($\sqrt{}$) on the validation sheet provided.

Data Analysis and Processing in this study were carried out by collecting all the data obtained, processing it, and making reports based on the systematics of conducting research. Data analysis is as follows:
1) Initial data reduction was carried out to summarize the observed data through questionnaires and documentation studies as a needs analysis to provide a clear figure and focus on the needs of the mini-research-based endocrinology digital module using Sigil.
2) Data Display is implemented to describe the overall data obtained from the field. The findings are then described to be systematic and easy to understand.
3) Data Validation is the stage of evaluating the digital endocrinology module which is carried out by media experts and endocrinology material experts using validation sheets. The validator will provide input regarding the weaknesses of the digital module that can then be refined. A product feasibility test was also carried out by 15-small scale respondence and a large-scale trial by 45 respondence.
4) Revision is a stage of improvement that is carried out after obtaining validation values/results from media experts and

endocrinology material experts also the result of the feasibility test. This stage aims to perfect the creation of mini-research-based endocrinology digital modules using Sigil.

5) Data processing is carried out by calculating the score of the answers from experts in the validation sheet to determine the validation/feasibility of the endocrinology digital module that has been made. The data obtained from the answers of the experts were analyzed using the following formula:

$$Score = \frac{\sum validator\ answer\ score}{\sum item}$$

The expert team validation level is described in Table 1 below:

Table 1. Validation Criteria

Percentage	Criteria
$1 \leq Va \leq 2$	Invalid
$2 \leq Va \leq 3$	Moderate
$3 \leq Va \leq 4$	Valid

Remark : Va = The average validator rating (Setiawati et al., 2022)

3. RESULTS AND DISCUSSION

The results of this study are in the form of a digital module based on mini research using Sigil in endocrinology learning which was developed using the PPE research model, namely Planning, Production, and Evaluation (Richey, 2017).

At the Planning stage, the research team made a product plan for a mini-research-based digital module using Sigil in endocrinology learning based on the results of previous research on mini-research. At this stage, the research team determined the ten endocrinology module components, including course learning outcomes (CPMK), introduction, learning activities (covering; objectives, materials, videos), learning stages, evaluation, mini research assignments, and assessment rubric. In addition, at this planning stage, the team conducted a needs analysis in the field that most students in the Biology Education Study Program used Android smartphones more often than reading books in printed form. It becomes the basis for the researcher team to develop digital modules that can be easily accessed on student smartphones. Students can

use and read digital endocrinology modules anywhere. This digital module is equipped with learning videos that can reduce students' anxiety levels in studying endocrinology material (Aisy et al., 2020)

This digital module is expected to be able to train students to develop their research skills because, in this module, a mini-research assignment is designed along with an assessment rubric. Mini-research-based learning can train students to independently design learning through mini-research projects created to train their cognitive skills, including problem-solving and science process skills (Widiantie et al., 2021).

The second stage of the PPE model is production, at this stage the modules that have been designed are started to be developed. The module is developed with Sigil software application. The preparation of this mini-research-based digital endocrinology module is adapted to the learning outcomes of endocrinology courses. It is expected that Sigil application can be used using an Android smartphone or computer with the aim of taking advantage of students' habits in using their smartphones. The layout example of the module design is shown in the following figure:
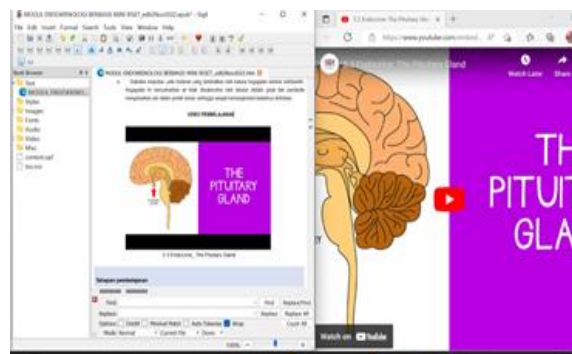

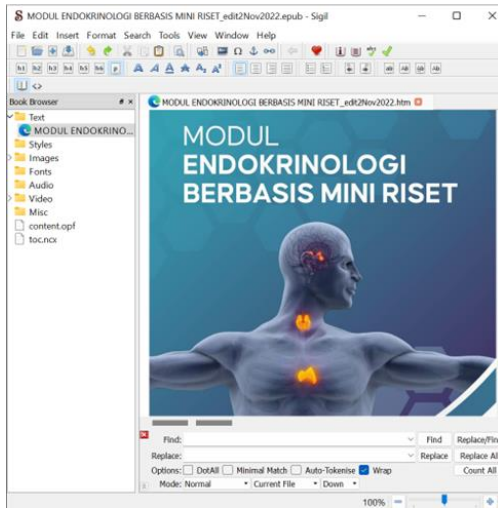**Figure 2.** Video Feature on the module
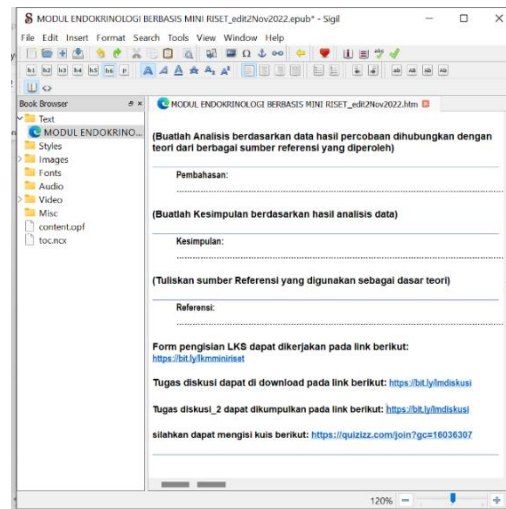
Figure 3. Cover Design

Figure 4. Module content

Figure 5. Mini research module

Figure 6. Online Assignment Submission Feature
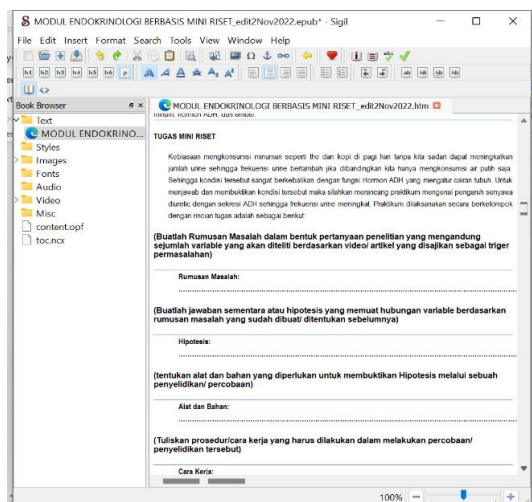
The Validation Purpose of the digital endocrinology module using Sigil was carried out to determine the feasibility of the endocrinology module developed by the research team. Module design validation was carried out with material experts and media experts. The aspects needed to be evaluated from the validation of material experts are related to the appropriateness of the quality of the content, language, presentation, and suitability of the module with the mini research that has been developed previously. The aspects that need to be evaluated from media expert validation are screen design, ease of use, consistency, usability, and graphics. Each validation process was carried out by two media experts and one material expert. The results of the validation of the mini-research-based digital sigil endocrinology module are shown in Table 2.

Table 2. Material Expert Validation Results

No	Aspect	Average Score	Remark
1	Content feasibility	3,9	Valid
2	language	4,0	Valid
3	Presentation	3,1	Valid

Based on the validation results of the endocrinology material expert team from the three aspects of the validation sheet assessment, the conclusion was "valid." The highest score was obtained on the language aspect, with a maximum score of 4. The lowest score was obtained on the presentation feasibility aspect 3.1. Based on the

presentation feasibility score, we improved the presentation of the endocrinology module using Sigil to make it more accessible by making several presentation versions such as pdf or Html. It is necessary to consider that not all smartphones can open the Sigil application but require applications such as radium, etc. While the results of media experts in table 3 are as follows:

Table 3. Media expert validation results

No	Aspect	Average Score	Remark
1.	Screen Design	3,6	Valid
2.	Ease of use	3,4	Valid
3.	Consistency	3,2	Valid
4.	Usability	3,3	Valid
5.	Graphics	3,7	Valid

Table 3 explains the validation results from media experts, the highest score was obtained on the graphics aspect, but the lowest score was obtained from the consistency aspect. Then repairs were made according to the validator's suggestion, namely consistency in terms of the layout of the digital module so that it could be more attractive to use.

The results of the specific validation results can be described in the following figure:

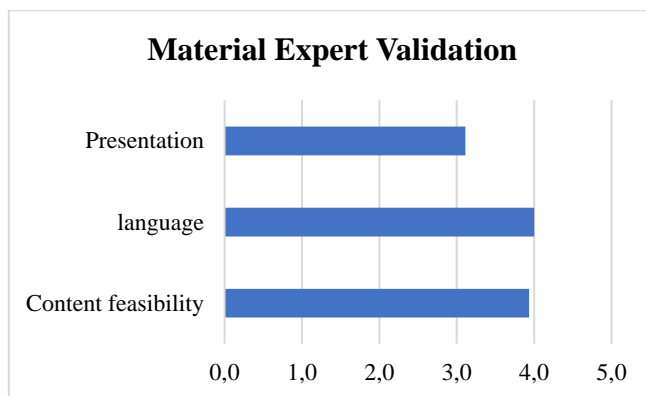

Figure 7. Expert team validation
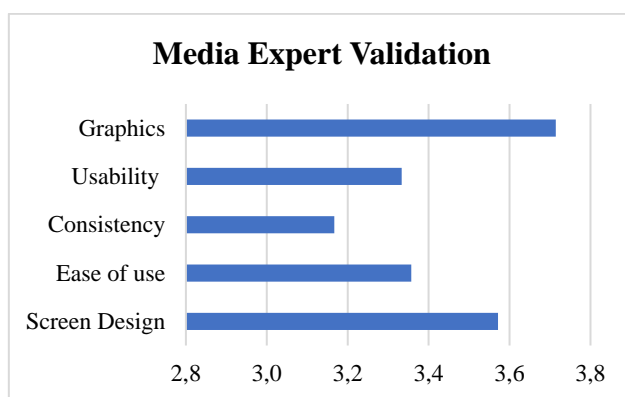

Figure 8. Material Expert Validation

Figure 9. Media expert validation

After the endocrinology digital module using Sigil has been tested for validation/feasibility by experts, then the endocrinology module is subjected to field trials. This module product trial was carried out to see the product's practicality. The practicality test was carried out in 2 stages with a different number of respondents, namely tests on a small scale and tests on a large scale. Trials on a small scale were carried out using 15 respondents, and large-scale trials were carried out using 45 respondents. The test results are as follows:
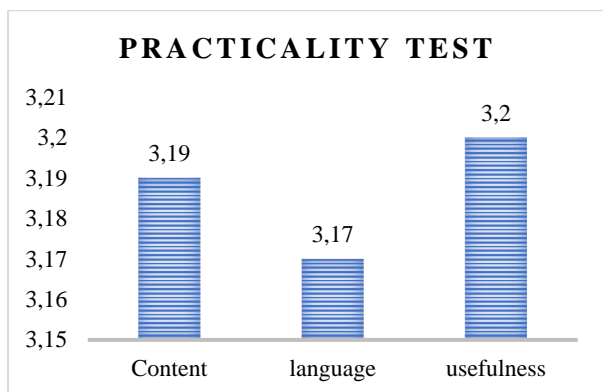
Figure 10. Practicality Test Results

Students' product practicality test results in terms of content, language, and usefulness are valid with relatively the same range of scores. Overall the test results for the product of the endocrinology digital module using Sigil have a good level of validity and practicality because using the Sigil application is beneficial in the product development process.

Digital module products developed based on the results of validity tests show that they meet the criteria for digital modules: being self-instructional, self-contained, adaptive, user-friendly, and consistent in writing letters, spacing, and layout (Fausih & Danang, 2014).

It is in line with the research results of (Gufran & Mataya, 2020) explained that the Sigil application has many advantages, including being easy and practical to develop as learning media. Sigil applications can make developing or creating digital modules more accessible and improve students' critical thinking skills. Thus, it can remove boredom and passivity of students in learning the subject materials.

The expected teaching materials are teaching materials that contain complete materials with the device, from instructions to evaluation. Suitable teaching materials/modules are teaching materials that integrate learning manuals, multimedia, and even instructions online sites that students can access (Alperi, 2020)

Digital module using Sigil software is more dynamic than other formats because the size of the text, images, and paragraphs constantly adjusts to the screen of the device used by the reader. So that students can more easily access it to support

learning and increase learning independence (Hidayat et al., 2017).

The product developed in this research, namely a mini-research-based digital module using Sigil has many advantages, including being easy to use; can be accessed anytime and anywhere; comprehensive because it contains materials, videos, mini research assignments, evaluations and assessment rubrics; and it can facilitate students' thinking skills in learning Endocrinology.

4. CONCLUSION

The research produces a product in the form of a digital module based on mini research using Sigil which is valid based on the validity of material and media experts and practical based on practicality tests by users. The advantages of the developed module are that it is complete according to the module criteria, easy to access anytime and anywhere, can facilitate thinking skills and increase student learning independence. So, this product is suitable for use in Endocrinology learning.

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