

## Design an Electrical Power Practical Module in the Introductory Electrical Energy Course

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**Abstract—** The introductory electrical energy course is one of the courses that applies learning using practical methods. In the introductory electrical energy course, there is material about electrical power. Based on observations, it is known that students need more learning media in the form of modules in the electrical power practicum, which causes a lack of interest and low understanding of student learning. Based on these problems, a learning medium in the form of a practicum module was developed to complement practicum learning and is expected to increase students' interest in and understanding of learning. The electrical power practicum module was developed using research and development methods. The researcher's research instrument was a media expert and material expert validation sheet to test the feasibility of the practicum module to be applied in the Electrical Power Practicum. The validation results of media and material experts prove that the electrical power practicum module is very feasible regarding media and material. Based on the percentage of scores obtained from media experts, namely 81.66%, material experts obtained a score of 88.57%, which is included in the very suitable category to be applied in the Basic Electrical Energy course.

**Keywords:** practical module, design, electrical power.

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### I. INTRODUCTION

Learning media is one of the teaching aids that teachers use to deliver teaching materials, improve student creativity, and increase student attention in the learning process. With media, students will be more motivated to learn. Thus, through learning media, the teaching and learning process can be more effective and efficient, and a good relationship can be established between lecturers and students. Learning media is a teaching aid essential to changing the traditional learning paradigm. As a teaching aid, media allows teachers to dynamically, interestingly, and interactively deliver teaching materials. With the diversity of media forms, such as audiovisual, multimedia presentations, or learning software, teachers can adjust teaching methods according to students' learning styles (Dwijayani, 2019; Kusum et al., 2023; Sudarsana et al., 2020; Surani et al., 2024; Wiguna, 2020).

In addition to providing benefits for teachers, the use of learning media also positively impacts student creativity. Media can stimulate students' imagination and creativity through a more visual, audio, or interactive learning approach (Ali Nur Aida et al., 2020; Liu et al., 2021; Mahfida Inayati & Mulyadi, 2023; Nicolaou et al., 2019). This creates a

more dynamic and challenging learning environment, encouraging students to think critically and engage in learning.

In the context of learning motivation, learning media can create a more enjoyable and exciting learning atmosphere for students (Sermatan et al., 2021). With attractive and in-depth presentations of materials, students are more motivated to participate actively in the learning process (Putra et al., 2021). This motivation can positively impact conceptual understanding, information retention, and overall student involvement in learning activities (Meece, 2023; Mohebi et al., 2019).

Furthermore, the effectiveness and efficiency of the teaching and learning process can be improved through the use of learning media (Rahmat et al., 2024). Media allows the presentation of information in a format that is easier to understand, speeds up the process of understanding, and optimizes learning time (Koloway & Kattie, 2023; Saseno et al., 2023). Students can grasp information more quickly and efficiently, while teachers can focus on supporting student understanding and directing deeper discussions (Malado & Habibu, 2023).

From the perspective of the relationship between lecturers and students, the use of learning

media also creates a closer bond. Lecturers can be facilitators who accommodate students' various learning styles, while students feel more involved and have a more satisfying learning experience (Darsih, 2018; Kariippanon et al., 2018; Toyama & Yamazaki, 2020). Thus, learning media is not only a learning tool but also a glue that strengthens positive interactions between educators and students (Suhirman, 2018).

Based on observations conducted at the Electrical Laboratory of Electrical Engineering Education, Ar-Raniry State Islamic University, Banda Aceh, during the learning process of the Basic Electrical Energy course, students are still not fully able to carry out practicums due to the lack of learning media in the form of adequate and relevant practicum modules with the curriculum in explaining essential concepts in electricity, such as reactive power (Q), active power (P), and apparent power (S). Practical modules that cover these concepts can help students understand how to measure and analyze power in electrical circuits.

In connection with the explanation above, students can easily understand the basics of electricity. They can implement the knowledge learned directly in the classroom with the tools provided in the laboratory room. The purpose of this study is to find out how to design an electrical power practical module used in introductory electrical energy courses and to find out the results of the feasibility of the module.

## II. METHOD

The method used in this study is research and development (R&D). The research and development method, or R&D, produces a particular product. By using the R&D method, this study aims to contribute to developing and improving products, especially in designing electrical power practical modules in introductory electrical energy courses. This R&D process is expected to produce products that meet high-quality standards and are relevant and effective in supporting student learning in electrical power. This study seeks to provide sustainable contributions to education and product development by deepening each stage (Gustiani, 2019; Oei et al., 2024).

Based on the ten stages of research and development, according to Sugiyono, researchers only need a few steps to create a practical module according to the researcher's needs, as seen below (Sugiyono, 2021).

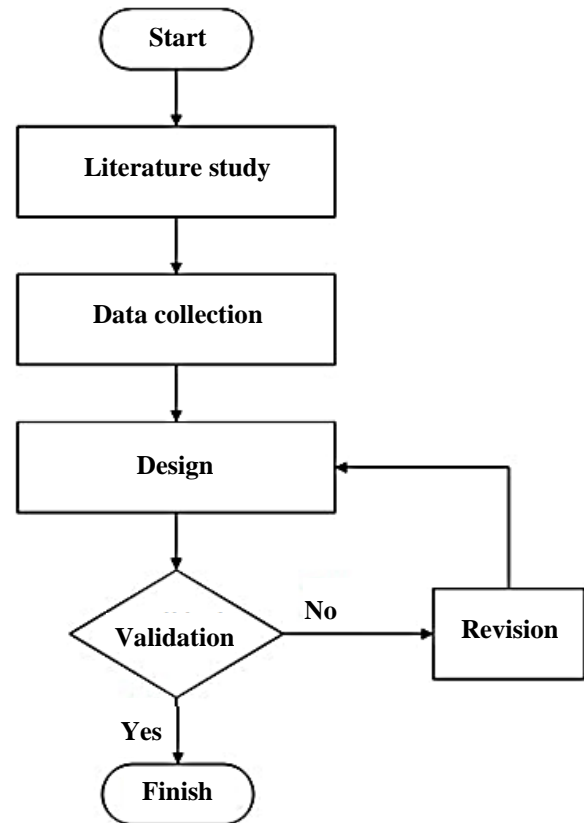


Figure 1. Research flow

The research will be conducted at the State Islamic University (in Indonesian abbreviated as UIN), Ar-Raniry Banda Aceh, in the electrical laboratory located at Jalan Ibnu Sina No. 2, Kopelma Darussalam, Syiah Kuala District, Banda Aceh City, Aceh. The study's population consists of students of the Electrical Engineering Education Study Program, Faculty of Tarbiyah and Teacher Training, State Islamic University of Ar-Raniry Banda Aceh. This electrical power practicum module only focuses on students who take the electrical field.

The instrument used is the validation sheet of material and media experts. A validation questionnaire was used to obtain data on the validation of teaching materials, which has indicators described in several statements. The validators in this study are divided into four, including material experts and media experts. The validation data collection technique in the study was carried out by providing validation sheets to material expert validators and media experts. This activity aims to obtain input, constructive criticism, and valuable suggestions from expert validators regarding the feasibility of the media and materials used in the study.

Researchers validate data by presenting teaching aids to material and media experts and then providing validation sheets to each expert to test the feasibility of materials and modules.

### III. RESULTS AND DISCUSSIONS

#### A. Module Design Results

The Electrical Power Practicum Module uses a web-based design software called Canva (Figure 1). Canva is a popular choice for graphic design for several key reasons. The variety of ready-to-use templates, from posters to social media designs, provides users with an easy starting point to get started and inspire creativity. The drag-and-drop functionality allows users to easily add design elements like text, images, and icons without hassle. In addition, Canva provides an extensive media library and free and paid use flexibility. Integration with various platforms, such as Google Drive and Dropbox, makes sharing and exporting their designs accessible for users. Canva suits beginners and non-designers because of its intuitive and easy-to-learn nature.



Figure 2. Canva logo

#### 1. Electrical Power Practical Module Cover

Figure 3 shows the form of the electrical power practical module cover. The design is attractive and visually reflects the module's identity. With a beautiful and informative appearance, this cover will attract practitioners' attention and motivate them to study the content of the electrical power practical module in more depth.

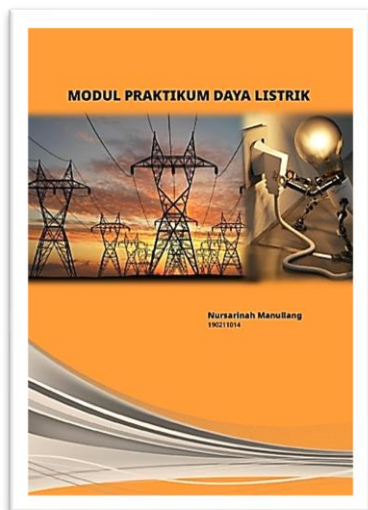


Figure 3. Cover of the electrical power practical module

#### 2. Electrical Power Practical Module Contents

The table of contents plays a significant role as a navigation tool that makes it easier for readers to find the information they are looking for quickly. With the table of contents, readers can quickly identify the sections that are relevant to their needs and jump directly to the desired page or section without having to read the entire module. This table of contents provides a clear structure. It gives a handy navigation guide to help readers access and understand the content of the electrical power practical module more efficiently. The table of contents section can be seen in Figure 4.

A page showing the table of contents for the module. It lists various sections with their corresponding page numbers, such as "DAFTAR ISI" and "DAFTAR GAMBAR".

Figure 4. Table of contents

Furthermore, in the electrical power practicum module, learning objectives explain in detail the goals to be achieved through the practicum. These learning objectives provide clear guidance for practicum participants about what they are expected to understand and master after completing the practicum. With detailed learning objectives, practicum participants can better understand the importance of the practicum and how they can optimize their learning experience.

The introductory theory section of the practicum is the core of the electrical power practicum module. This section offers an in-depth explanation of the theoretical concepts relevant to the practicum. This explanation covers essential aspects that the practicum must understand to understand the basics of electrical power. This introductory theory section of the practicum provides a strong understanding of the concepts underlying the practicum so that the practicum can relate the practicum to the theory that has been studied previously. The introductory theory section can be seen in Figure 5.

Figure 5, which depicts the introductory theory section of the practicum, serves as a visual guide that helps practitioners understand the hierarchy of these concepts. In the figure, each theory element is described in detail, providing a clear direction for

practitioners to thoroughly explore and understand the theoretical content. Therefore, the introductory theory section of the practicum not only presents information but also functions as an interactive and in-depth guide for practitioners.

In addition to providing an in-depth understanding, the introductory theory section of the practicum also serves as a foundation for developing critical and analytical thinking. By understanding the basic concepts, the practicum can explore and relate information to real-world situations. Thus, the introductory theory section of the practicum is not only the initial stage in implementing the practicum but also a forum that stimulates creative thinking and in-depth analysis of the practicum to achieve a more holistic understanding of electrical power.



Figure 5. Learning objectives and theoretical basis section

In addition, the electrical power practicum module also includes practical instructions that provide step-by-step instructions on how to carry out the practicum. These practical instructions include preparation of materials or tools, safety instructions, and protocols that must be followed during the practicum. Through the images contained in the module, such as Figure 6, practicum participants can clearly see examples of the steps that must be followed to carry out the practicum safely and effectively.



Figure 6. Preparation of tools and work steps

There is also an analysis or exercise section given to the practicum participants. This section aims to train the understanding and skills of the practicum participants in applying the concepts learned in the practicum. Through the tasks or exercises given, practicum participants can test their knowledge, identify deficiencies, and hone their skills in applying the concept of electrical power. This section can be seen in Figure 7, which provides examples of tasks or exercises relevant to the electrical power practicum material. With these components, the electrical power practicum module becomes a comprehensive and effective tool in supporting interactive practicum learning oriented towards understanding concepts and actual applications in the context of electrical power.



Figure 6. Task section

## B. Validation Results

In this study, the results of validating the feasibility of the electrical power practicum module were obtained through a validation questionnaire instrument filled out by two experts. The two experts selected to validate the feasibility of the electrical power practicum module were lecturers with knowledge and experience in their fields. In this validation process, the experts were asked to assess specific aspects of the electrical power practicum module, such as learning objectives, clarity of instructions, relevance to theory, flexibility, module size, module cover design, and module content design. After being filled out and collected, this validation questionnaire sheet was analyzed to determine the feasibility of the electrical power practicum module.

### 1. Material Validation Results

To ensure the material feasibility of the electrical power practicum module, Mr Akbarul Kautsar, S.Pd., M.Pd., an education expert and practitioner in the field of electrical power, carried out a validation process. The purpose of this validation is to obtain relevant information, criticism, and



suggestions related to the module so that it can meet the material feasibility standards.

After conducting careful checking and analysis with the validator, the researcher obtained an average percentage value of 88.57%. This percentage figure reflects the material's validity level in the electrical power practicum module. With this high score, the electrical power practicum module has passed the feasibility test well and is considered very valid regarding the material. The results of the validation test can be seen in Table 1.

**Table 1.** Results of material validation test

No	Aspects reviewed	Value Criteria
<b>A Learning objectives</b>		
1	The learning objectives in the practicum module are precise and related to the competencies to be achieved.	5
2	The practicum module helps students achieve the learning objectives that have been determined.	4
<b>B Clarity of Instructions</b>		
3	The instructions in the lab module are easy to understand and straightforward.	4
4	The steps or tasks explained in the lab module provide sufficient guidance to carry out the lab properly.	4
<b>C Relation to Theory</b>		
5	The practical module connects the theoretical concepts learned with the valuable work done.	4
6	The practical module helps to understand how theoretical concepts are applied in practical situations and helpful work.	5
<b>D Flexibility</b>		
7	The practical module encourages creativity and problem-solving when carrying out valuable work.	5
<b>Total</b>		<b>31</b>
<b>Percentage</b>		<b>88.57%</b>

### 2. Media Validation Results

Mr. M. Rizal Fachri, M.T., carried out the electrical power practicum module's validation process on June 22, 2023. This validation aims to obtain input, criticism, and suggestions from the validator regarding the feasibility of the electrical power practicum module in terms of media. This validation seeks to ensure that the practicum module meets the feasibility standards regarding media to provide users with an optimal learning experience.

A validation process was carried out to evaluate the feasibility of the media in the practical module by providing an assessment questionnaire to the validator. The questionnaire was well-designed and consisted of 12 questions that assessed various aspects of the feasibility of the media in the module. These questions included assessments of module size, cover design, module content design, and other media aspects. This media validation process was carried out to ensure that the electrical power practical module had good media quality, which could facilitate adequate understanding and learning for users.

The results of the media feasibility validation can be seen in Table 2. Based on the validation results, it is known that the electrical power practicum module obtained an average percentage of 81.66%. This figure shows that the electrical power practicum module has reached a very valid category in terms of media. Thus, the electrical power practicum module is suitable for use as a learning medium in the form of a practicum module in the Basic Electrical Energy course. This media feasibility validation provides confidence that the practicum module has met the media quality standards needed to provide a good learning experience to users.

**Table 2.** Media validation test results

No	Aspects reviewed	Value Criteria
<b>A Module Size</b>		
1	Module size conforms to ISO A4 standard (210 mm x 297 mm)	5
<b>B Cover Design</b>		
2	Showing a good centre point.	3
3	The colour of the layout elements is harmonious and clarifies the function.	3
4	The letters used are attractive and easy to read.	4
5	Use only a few font styles.	4
6	Describe the contents of the material.	5
7	The object's shape, colour, size, and proportionality follow reality.	4
<b>C Module Content Design</b>		
8	Layout consistency.	4
9	Harmonious layout elements.	4
10	Complete layout elements.	4
11	Straightforward module content typography.	5
12	Module content typography makes it easy to understand.	4
<b>Total</b>		<b>49</b>
<b>Percentage</b>		<b>81.66%</b>

### 3. Language Validation Results

Linguist validation is an important stage in compiling texts or written materials. In this process, individuals who have in-depth knowledge of grammar, spelling, punctuation, and word usage work to ensure that the text meets the highest standards in terms of language and written communication. Mr. Muhammad Rozak, S.Pd., M. Ed, carried out linguist validation. The results of the linguist validation can be seen in Table 3.

**Table 3.** Language validation test results

No	Aspects reviewed	Value Criteria
1	Compliance of module size with the ISO A4 standard.	4
2	Displays a good centre point.	5
3	The colour of the layout elements is harmonious and clarifies the function.	5
4	The letters used are attractive and easy to read.	5
5	Use only a few font styles.	4
6	Describes the contents of the material.	5
7	The object's shape, colour, size, and proportionality according to reality.	4
8	Layout consistency.	4
9	Harmonious layout elements.	4
10	Complete layout elements.	5
<b>Total</b>		<b>45</b>
<b>Percentage (%)</b>		<b>90%</b>

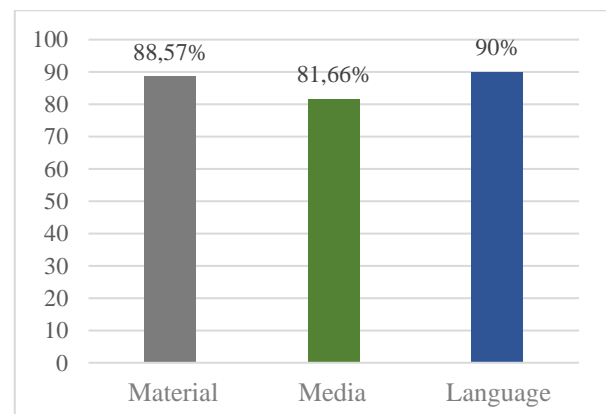
The power electronics practicum module has passed the language validation test with a score of 90%, placing it in the very valid category. A score that reaches this level indicates that the practicum module has undergone a thorough evaluation and has met high language validity standards. This high validity means the module can present information clearly and accurately communicate power electronics concepts. Thus, the validation test results reaching 90% provide confidence that the practicum module is reliable and effective in supporting the understanding of power electronics material for practicum participants.

### C. Discussions

This research was conducted to design a learning media, a practicum module, using the Research and Development (R&D) research model. The main objective of this research is to develop valid and practical learning media for use in the practicum of the Introductory Electrical Energy course. This practicum module will help students carry out electrical power practicums more efficiently and effectively. In addition, by developing a valid and

practical electrical power practicum module, this module can improve the quality of learning and provide a better learning experience for students. Thus, this research significantly improves the quality of education in Introductory Electrical Energy (Haristah et al., 2019).

Media and material experts have validated the electrical power practicum module. In the media validation test, the media expert gave a percentage value of 88.57%, the material validation test obtained a percentage value of 81.66%, and the language validation test was 90%. Therefore, overall, the electrical power practicum module is considered "very feasible" to be applied to practicums in the Introductory Electrical Energy course, both in terms of media and material. These good validation results confirm that this electrical power practicum module can be relied on as a practical learning tool in teaching students the concept of electrical power. This module teaches students more structured, easy, and efficient ways to conduct electrical power practicums. The validation data from media and material experts that researchers have collected can be seen as a graph in Figure 8. The graph shows the validation results of media and material experts on the media and materials used in the study.



**Figure 8.** Graph of validation results from material, media and language experts

Based on Figure 8, the results of validating the feasibility of the material from the research on the electrical power practicum module obtained a score of 88.57%. This result indicates that the material presented in the practicum module has been declared valid and follows the study's objectives. Validation of the feasibility of the material is carried out by considering aspects of information accuracy, completeness of the material, and the ability of the material to facilitate practitioners' understanding of the concept of electrical power. With a high score, it can be concluded that the material in the practicum module has passed a strict feasibility test, is

considered relevant and can provide significant benefits in learning electrical power.

Meanwhile, the media feasibility validation results from the electrical power practicum module research showed a score of 81.66%. This score reflects the suitability of the media used in the practicum module with the learning needs and research objectives. Visual suitability, presentation clarity, and information readability are the primary considerations in the media feasibility validation process. Although the media validation score did not reach a very high level of suitability, the results can still be considered adequate and meet the feasibility standards in the context of the electrical power practicum module. To improve the media validation score, it is necessary to evaluate and adjust the media elements used to better support the understanding and experience of practitioners in studying electrical power material.

In the context of language validation testing, the electrical power practicum module has also undergone a careful evaluation process. The results of the language validation test show that this module has successfully achieved a score of 90%. This score reflects a high level of language validity, indicating that the instruments and texts used in the practicum module have been well-designed and structured so that they can clearly and accurately communicate electrical power concepts to the practicum participants. The success of achieving a score of 90% on the language validation test provides additional confidence in the quality of the material presented in this practicum module. With high language validity, this module is expected to provide a more effective learning experience and can be accessed well by the practicum participants.

#### IV. CONCLUSION

The electrical power practicum module is designed with specifications of learning objectives, material content, practicum processes and analysis tasks that make students help students understand the electrical power practicum. The results of expert validation showed that material experts obtained a percentage of 88.57%, and media experts obtained a percentage of 81.66%. Based on the results of the validation of media experts and material experts on the electrical power practicum module, the results show that the electrical power practicum module gets the category "Very Eligible" to be applied to the Introductory Electrical Energy course.

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