Circuit: Jurnal Ilmiah Pendidikan Teknik Elektro
Volume 10 No. 2, March - August 2026
ISSN: 2549-3698; E-ISSN: 2549-3701
DOI: 10.22373/crc.v10i2.31627

Design of a Teaching Module for Drawing Electrical Installations in the Technical Drawing Course at SMKN 2 Meulaboh

Ilham Siddiq[a*], Baihaqi[a]

[a] Universitas Islam Negeri Ar-Raniry Banda Aceh, Indonesia

E-mail: 200211034@student.ar-raniry.ac.id

*Corresponding author

Submitted: 16-07-2025 Accepted: 10-02-2026 Published: 31-07-2026

Abstract

In the process of designing electrical installations, installation drawings have a very important role because they are the main reference for implementing installations through the use of standardized electrical symbols. The use of conventional learning methods in the Technical Drawing subject at SMK Negeri 2 Meulaboh is considered less effective in optimizing student learning outcomes. Therefore, it is necessary to develop a learning module that can support the learning process to make it easier, more focused, and more effective. The methodology used is Research and Development which involves a systematic process to develop or optimize the product. By using the validation sheet instrument and questionnaire sheet, the validation results obtained by media experts, material experts, and language experts obtained a percentage of 86%, 87%, and 90%, respectively. The data shows that the designed electrical installation drawing module is very feasible to be applied to the technical drawing subject. Meanwhile, the questionnaire results obtained a percentage of each indicator of 87% proving that the electrical installation drawing module is "Very Feasible" to be applied to the Technical Drawing subject. Thus, the module can be used as a learning medium that can help students understand the material more easily and systematically.

Keywords*: Electrical Installation Drawing, Technical Drawing, Teaching Module.*

Abstrak

Dalam proses perancangan instalasi listrik, gambar instalasi memiliki peranan yang sangat penting karena menjadi acuan utama pelaksanaan pemasangan melalui penggunaan simbol-simbol kelistrikan yang telah distandarisasi. Penggunaan metode pembelajaran konvensional dalam mata pelajaran Menggambar Teknik di SMK Negeri 2 Meulaboh dinilai kurang efektif dalam mengoptimalkan hasil belajar siswa. Oleh sebab itu, diperlukan pengembangan modul pembelajaran yang dapat mendukung proses pembelajaran agar menjadi lebih mudah, terarah, dan efektif. Metodologi yang digunakan yakni *Research and Development* yang melibatkan proses sistematis untuk mengembangkan atau mengoptimalkan produk. Dengan menggunakan instrument lembar validasi dan lembar kuesioner, diperoleh hasil validasi ahli media, ahli materi, ahli bahasa masing-masing mendapatkan persentase sebesar 86%, 87%, 90%. Data menunjukkan bahwa modul menggambar instalasi listrik yang didesain sangat layak diterapakan pada mata pelajaran menggambar teknik. Sedangkan untuk hasil kuesioner mendapatkan hasil persentase dari setiap indikator sebesar 87% membuktikan bahwa modul menggambar instalasi listrik "Sangat Layak" diterapkan pada mata pelajaran Menggambar Teknik. Dengan demikian, modul tersebut dapat digunakan sebagai media pembelajaran yang mampu membantu siswa memahami materi secara lebih mudah dan sistematis.

Kata kunci: Menggambar Instalasi Listrik, Menggambar Teknik, Modul Ajar.

Introduction

Education is a deliberate and structured program designed to create an educational environment and learning methods that help students actualize their potential [1]. The purpose is to help students grow spiritually and morally, have good self-control, build strong character, think clearly, behave well, and gain the skills they need for themselves, their community, the country, and the nation [2]. Vocational High Schools (SMK) are formal educational institutions that provide vocational training at the secondary level, building on the knowledge and skills acquired in junior high school (SMP), Islamic junior high school (MTs), or equivalent programs [3]. To consistently produce competent graduates, SMKs must keep pace with rapid technological advancements and the growing economic globalization [4].

The design of a teaching module is the process of planning and creating structured and systematic learning materials to facilitate the learning process [5]. Design is an activity that encompasses a creative process and planning aimed at developing visual, functional, or systematic solutions to specific problems. Design is not solely concerned with aesthetic aspects but also involves practical problem-solving, where form and function are considered simultaneously [6]. Teaching modules are typically designed to include relevant information, activities, assignments, and evaluations for a specific topic or subject. A well-designed module must consider students' characteristics, provide easy access to information, and enable learning evaluation to measure understanding and the achievement of objectives [7].

A well-designed module must consider the characteristics of the learners, facilitate easy access to information, and enable learning evaluation to measure understanding and achievement of objectives [8]. In its development, instructional module design can integrate digital platforms, multimedia, and interactive features to create a more engaging and technology-oriented learning environment [9]. Among these digital learning tools, interactive e-modules have emerged as an effective medium for delivering complex concepts, including climate change education, by making learning materials more accessible, engaging, and easier for young learners to understand [10]. Therefore, the implementation of digital technology can support the effectiveness of project-based learning and facilitate stronger collaboration between universities and industry [11].

The Technical Drawing course is part of the curriculum at SMK Negeri 2 Meulaboh, West Aceh, particularly for students specializing in Electrical Power Installation Engineering. Initial observations at SMK Negeri 2 Meulaboh revealed that the curriculum for the Technical Drawing course predominantly relies on the lecture method. This method is delivered traditionally and monotonously, without effectively utilizing available learning facilities such as projectors and educational applications. To address this limitation, a multimedia-based instructional module was developed, incorporating learning activities that are systematically aligned with the learning objectives to enhance student engagement and learning outcomes [12]. Initial observations at SMK Negeri 2 Meulaboh, West Aceh, indicate that the curriculum instruction in the technical drawing course predominantly relies on lecture methods.

Teachers are conducted in a traditional and monotonous manner, without effectively utilizing available learning resources such as visual media and educational technology. Therefore, the adoption of more innovative learning approaches, such as Project-Based Learning (PjBL), is necessary, as studies have reported a significant improvement in student understanding compared to conventional teaching methods [13]. Students quickly lose interest and focus during lessons, with many appearing drowsy throughout the class. This condition highlights the need for a more interactive learning environment that can increase student participation and foster critical thinking skills while maintaining balanced screen time [14]. Therefore, the objective of this research is to design a teaching module for drawing electrical installations in the Technical Drawing course at SMK Negeri 2 Meulaboh.

Method

a. Research Design

In this study, the researcher will design a new instructional module to be used as learning material for the Technical Drawing course at SMK N 2 Meulaboh. The chosen methodology is the Research and Development (R&D) method, which involves a systematic process to develop or optimize a product [15]. The R&D method itself includes several development models, and in this study, the researcher employs the ADDIE development model, which consists of the following stages: Analysis, Design, Development, Implementation, and Evaluation [16].

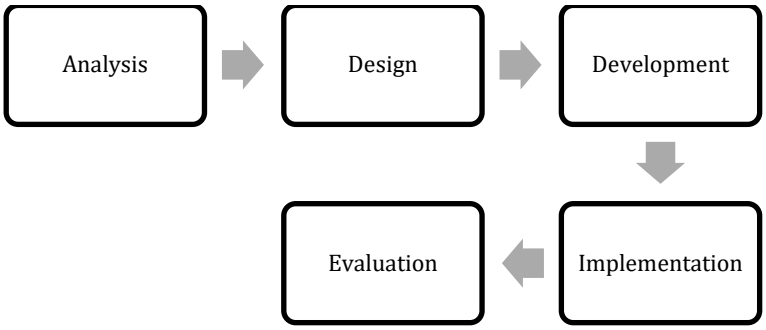


Figure 1. ADDIE Development Model

b. Research Instruments

1. Validation Sheet

Validation is the process of verifying various components such as materials, processes, procedures, operations, systems, and equipment used in research and production, as well as ensuring strict supervision throughout the research process. In this study, the researcher relies on validation from media experts, subject matter experts, and language experts [17]. The validators for this instrument will be selected from faculty members who are experts in their respective fields [18].

2. Questionnaire Sheet

A questionnaire is a method used to gather information from a number of individuals or respondents through a set of questions provided for them to answer [19]. By providing this series of questions, the responses received will be collected as data. This data will then be processed and summarized to produce research conclusions [20]. In this study, the researcher uses a closed validation type, where the validation sheet will

be distributed to students of the Electrical Power Engineering program at SMK N 2 Meulaboh who are currently taking the technical drawing course. This validation sheet will be administered during the teaching and learning process.

c. Data Analysis Techniques

1. Validation

In this study, the researcher uses a method of directly distributing the validation sheets to experts [21]. In this study, the researcher uses a method of directly distributing the validation sheets to experts to ensure that the developed module is valid, appropriate, and effective for using.

2. Questionnaire

The method applied in data analysis in this study is through a data portrait approach. This includes calculating the frequency of specific values on the variables being studied, then presenting these values both absolutely and relatively in relation to the entire population [22].

Result and Discussion

This chapter will discuss the results of the design of the teaching module for drawing electrical installations in the Technical Drawing course at SMK Negeri 2 Meulaboh. The researcher will present the module design, the validation results from the experts, and the questionnaire results from the students.

a. Teaching Module Design

This teaching module is created in the form of an e-module (electronic module) to make it more accessible and flexible for use [23]. The module design was created using Canva, a design platform that offers a wide range of templates and attractive layouts. Since it is in the form of an e-module, this material can be accessed on various digital devices, such as laptops, tablets, or smartphones, thereby supporting a more practical learning process [24]. This e-module is made with several helpful features to make learning easier and more interesting for students. First, it has an interactive table of contents—students can simply click on a title to go straight to that page, so they don't have to scroll through the whole module [19]. Second, there are teaching videos for each topic that give extra explanations to help students understand better. Each page also has an arrow icon next to the page number that takes students back to the table of contents with one click. This makes it easy to move between sections [25]. The module also has smooth page transition animations to make the learning process more fun and less boring.



Figure 2. Module Cover Display

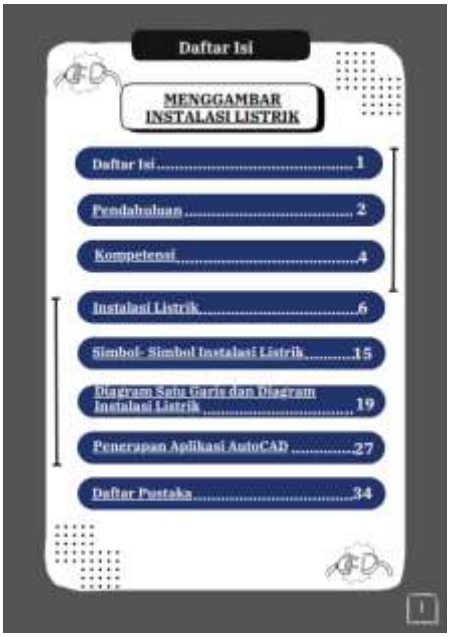


Figure 3. Module Page Access

b. Module Feasibility Results

In this study, the researcher used three types of validation: media expert validation, subject matter expert validation, and language expert validation, aimed at assessing the feasibility of the designed module. The validators for the validation sheet instrument were selected from two lecturers who have expertise in their respective fields to evaluate the feasibility of the teaching module for drawing electrical installations in the Technical Drawing course at SMK Negeri 2 Meulaboh.

1. Results of Media Expert Validation

The main objective of media expert validation is to ensure that the designed or developed learning media meets the standards of quality, effectiveness, and practicality in the learning process. The results of the media expert validation can be seen in the table below:

Table 1. Results of Media Expert Validation

No	Aspects	Statement Criteria	Value Criteria	
			V1	V2
1.	Module Visuals	The module is designed attractively, enhancing its appeal and facilitating students' understanding of the material	4	4
		The alignment of margins and paper size in the module is appropriate	4	5
2.	Cover Design	The cover illustration of the module defines the content/teaching material and highlights the quality of the object	5	4
		The color elements of the layout are harmonious and clarify the function	4	4
		The color of the module title contrasts with the background color	4	5
		The module effectively depicts the content	5	4
		The shape, color, and proportionality of the objects on the cover are appealing	4	4
3.	Module Content Design	The layout of the content is well-organized	4	4
		The layout elements for each point are harmonious	4	4
		The use of font variations is not excessive.	4	5
		It can assist teachers in teaching the Technical Drawing course	5	5
		Quantity	**47**	**48**
		Percentage	**85%**	**87%**
		Average Percentage	**86%**	

2. Expert Content Validation Results

The validation by subject matter experts aims to ensure that the content presented in the learning module meets accurate, relevant, and accountable scientific standards. The results of the subject matter expert validation can be seen in the table below:

Table 2. Expert Content Validation Results

No	Aspects	Statement Criteria	Value Criteria	
			V1	V2
1.	Learning Objectives	The electrical installation drawing module makes it easier for students to understand electrical installation materials	4	5
		The electrical installation drawing module helps students implement the electrical installation drawing material correctly	3	4
		The electrical installation drawing module can enhance students' knowledge	5	5
		The electrical installation drawing module is aligned with the objectives of the material	4	4

2.	Materials	The electrical installation drawing module makes the basic concepts of electrical installation drawing more tangible	4	4
		The electrical installation drawing module contains material that is consistent with the methods of drawing electrical installations	4	5
3.	Time	The electrical installation drawing module helps simplify the explanation of electrical installation drawing materials, making time more efficient	5	3
4.	Benefits	The electrical installation drawing module is beneficial for delivering electrical installation drawing materials	5	5
		The electrical installation drawing module can serve as a medium for teaching electrical installation drawing materials	5	5
		Quantity	**39**	**40**
		Percentage	**87%**	**88%**
		Average Percentage	**87%**	

3. Results of Language Expert Validation

Language expert validation aims to ensure that the language used in the module or learning media adheres to proper linguistic rules, is easy to understand, and effectively conveys the material. The results of the language expert validation can be seen in the table below:

Table 3. Result of Language Expert Validation

No	Statement Criteria	Value Criteria	
		V1	V2
1.	Using correct and proper language rules	5	4
2.	Using terminology that is consistent with the concepts of the subject matter	5	4
3.	The language used is clear and easily understood by students	4	4
4.	The language used is communicative	5	5
5.	Accuracy in language selection to explain the material	4	4
6.	The sentences used represent the content, message, or information intended to be conveyed	5	4
7.	The sentences used are simple and targeted	5	4
8.	The accuracy of spelling in accordance with PUEBI (General Guidelines for Indonesian Spelling)	5	4
9.	Logical structure and sequence of information that follows a good learning flow	4	5
10.	Consistency in the use of symbols or icons	5	5
	Quantity	**47**	**43**
	Percentage	**94%**	**86%**
	Average Percentage	**90%**	

c. Student Response Results

The respondents in the trial of the teaching module for drawing electrical installations were 22 students from class X who were taking the Technical Drawing course at SMK Negeri 2 Meulaboh. The trial of this module was conducted in a face-to-face session on December 4, 2024, in the X class of the Electrical Installation Engineering department at SMK Negeri 2 Meulaboh. The results of the respondents' feedback per indicator can be seen in the table below:

Table 4. Results of Respondent Feedback

Indicator	Item Number	Value Criteria					Quantity	%	Average Percentage
		1	2	3	4	5			
Presentation of	1.	0	0	0	13	9	97	88%	89%
Material	2.	0	0	0	10	12	100	90%	
Time Efficiency	3.	0	0	3	10	9	94	85%	84%
	4.	0	0	3	12	7	92	83%	
Learning Outcomes	5.	0	0	2	11	9	95	86%	88%
	6.	0	0	2	14	6	92	83%	
	7.	0	0	2	4	16	102	92%	
	8.	0	0	2	4	16	102	92%	
Benefits	9.	0	0	0	11	11	99	90%	90%
	10.	0	0	0	10	12	100	90%	
	11.	0	0	0	9	13	101	91%	
	12.	0	0	0	11	11	99	90%	
Total Score and Percentage							**1151**	**87%**	

The evaluation from respondents regarding each indicator on the importance of using the teaching module for drawing electrical installations is shown in Table 4.4 above, with a total score of 1171 from 22 respondents out of a maximum score of 1320. The percentage obtained is 87%, which is categorized as "Strongly Agree" based on the formula used to calculate the respondents' feedback. The results of the individual respondents' feedback can be seen in the table below:

Table 5. Results of Individual Respondents' Feedback

No	Name	Total Criteria Score	Percentage
1.	MM	48	80%
2.	YGM	50	83%
3.	FG	54	90%
4.	MTQH	54	90%
5.	RB	52	86%
6.	S	53	88%
7.	MCS	51	85%
8.	MA	53	88%
9.	FM	53	88%
10.	RA	52	86%
11.	HNU	51	85%
12.	MR	54	90%
13.	MIM	54	90%

14.	LF	56	93%
15.	MAM	54	90%
16.	AN	54	90%
17.	MAF	55	91%
18.	MM	56	93%
19.	TIR	56	93%
20.	MI	55	91%
21.	AZF	55	91%
22.	DAS	53	88%
Total Score and Percentage		**1173**	**87%**

The maximum possible score is 1320, and based on the calculations, a percentage of 87% was obtained. This percentage indicates that the use of the teaching module for drawing electrical installations in the Technical Drawing subject falls under the "Strongly Agree" category. Therefore, this module is considered suitable to be used as teaching material and can be applied during the implementation of this subject's lessons.

Based on the result, the expert validation process was conducted for the instructional module on electrical installation drawing. This validation is a crucial step to ensure the quality and effectiveness of the module. The score obtained from the media expert validation reached 86%, which falls into the valid category. Meanwhile, the validation carried out by the language expert received a score of 90%, categorized as highly valid. In addition, the evaluation by the subject matter expert resulted in a score of 87%, indicating a very high level of validity. These validation results provide confidence that the module meets the required standards in terms of both media and content.

The evaluation results regarding the media feasibility of the instructional module on electrical installation drawing showed a score of 86%. This score, obtained from media expert validation, reflects a high level of validity in the module’s media-related aspects. The content validation yielded a score of 87%, indicating the quality and accuracy of the instructional material. Furthermore, the language evaluation of the module demonstrated excellent performance with a score of 90%, which falls into the highly valid category. This 90% score reflects efforts to present information clearly, free from grammatical errors, and in adherence to high standards of written communication.

The expert validation process was conducted for the teaching module on drawing electrical installations. This validation step is crucial to ensure the quality and effectiveness of the module. The score obtained from the media expert validation reached 86%, which falls into the valid category. Meanwhile, the validation conducted by the language expert achieved a score of 90%, which is classified as highly valid. Additionally, the evaluation from the subject matter expert showed a score of 87%, reflecting a very high level of validity. These validation results provide assurance that the module meets the required standards in terms of both media and content. Student engagement during the learning process, particularly in the context of electrical installation drawing, demonstrates the relevance and appeal of the module. Furthermore, this module offers an alternative learning material that is more engaging compared to previous conventional methods, such as textbook-based learning and PowerPoint presentations.

Conclusion

This study aimed to develop an electrical installation drawing module for use in the Technical Drawing subject at SMK Negeri 2 Meulaboh. The module was designed as a learning resource to support teachers and students in the learning process. To evaluate its feasibility, expert validation was conducted. This study successfully developed an e-module for the Technical Drawing subject using Canva. The module was designed based on relevant learning objectives and competencies and features interactive navigation through hyperlinks, making it easier for students to access learning materials efficiently. The validation results indicated that the module achieved an average score of 87%, with material, media, and language experts providing ratings of 87%, 86%, and 90%, respectively. Therefore, the electrical installation drawing module was categorized as "Very Feasible" for implementation in the Technical Drawing subject. Feedback from 22 students showed an overall score of 87%, with all assessment indicators categorized as very good. These results indicate that the electrical installation drawing module is "Very Feasible" and suitable for use in the Technical Drawing subject.

References

[1] A. Ardhiya et al., "The Role of Counselors in Realizing Quality Towards SDGs 2030," Proc. IOIGC, vol. 2, no. 1, pp. 176–187, 2022.
[2] M. Y. A. Bakar, "Problems of Islamic Education in Indonesia," Journal Name, vol. 1, no. 1, pp. 99–123, 2015.
[3] H. Susanto, "Factors Influencing Teacher Performance in Vocational High Schools," J. Vocat. Educ., vol. 2, no. 2, pp. 197–212, 2012.
[4] M. Musfiqon dan Nurdyansyah. N. (2015). Scientific Learning Approach. Sidoarjo: Nizamia learning center., 41," no. 20, 2015.
[5] A. N. Ndruru, "Development of Discovery Learning-Based Learning Modules in Engineering Drawing Subjects," J. Suluh Pendidik., vol. 11, no. 2, 2023.
[6] B. R. Noviadji and A. Hendrawan, "Designing an Illustration Book as a Media for Introducing the Field of Design Science," J. Desain, vol. 8, no. 2, p. 103, 2021, doi: 10.30998/jd.v8i2.7930.
[7] E. I. Sidiq and C. Rif, "Learning Resources and Teaching Aids as Learning Media," J. Edukasi Nonform., vol. 2, no. 2, p. 596, 2022.
[8] R. Mohan, *Measurement, Evaluation and Assessment in Education*, 2nd ed. New Delhi, India: PHI Learning Pvt. Ltd., 2023
[9] U. Khasanah, Development of Information and Communication Technology-Based Learning Media (ICT). Sukoharjo, Indonesia: Tahta Media Group, 2024.
[10] N. M. A. Nordiana Md Khamis and K. Osman, "Expert Validation of e-Module Content on Plant Importance in Mitigating Climate Change for Primary School Students," Geogr. J. Soc. Sp., vol. 21, no. 3, pp. 172–189, 2025.
[11] Y. A. Sadrina, S. I. Permatasari, A. Wijaya, and Subekti, "The Effectiveness of the Smart Campus Platform in Supporting Project-Based Learning," Edu Cendikia J. Ilm. Kependidikan, vol. 6, no. 1, pp. 75–87, 2026, doi: 10.47709/educendikia.v6i01.7452.
[12] C. R. Basilio and E. M. S. Sigua, "Development and Validation of Multimedia-Based Instructional Module in Science 7," Sci. Technol. Educ. Manag., vol. 2, no. 1, pp. 152–162, 2022, doi: 10.5281/zenodo.6496847.
[13] K. S. Faraby, "The Influence of the Project-Based Learning Model on Students' Understanding of the Electrical Protection System Course," JPTE, vol. 12, no. 2, pp. 408–409, 2026.

[14] H. Song and L. Cai, "Interactive Learning Environment as a Source of Critical Thinking Skills for College Students," BMC Med. Educ., vol. 24, p. 270, 2024, doi: 10.1186/s12909-024-05247-y.
[15] E. Mulyatiningsih, Development of Learning Models. Yogyakarta, Indonesia: Universitas Negeri Yogyakarta, 2012.
[16] S. Haryati, "Research and Development (R&D) as a Research Model in the Field of Education," Maj. Ilm. Din., vol. 37, no. 1, pp. 11–26, 2012.
[17] N. Dermawati, Suprapta, and Muzakkir, "Development of Learning Models," J. Pendidik. Fis., vol. 7, no. 1, pp. 74–78, 2019.
[18] A. Putra, H. Syarifuddin, and Z. Zulfah, "Validity of Guided Discovery-Based Student Worksheets in an Effort to Improve Conceptual Understanding and Mathematical Reasoning Skills," Edumatika J. Ris. Pendidik. Mat., vol. 1, no. 2, p. 56, 2018, doi: 10.32939/ejrpm.v1i2.302.
[19] S. Samsiyah, N. Latif, C. D. Aprilia, A. R. Auliansyah, G. Raditya, M. Zukar, and N. T. Adella, *Consumer Behavior*. Sumedang, Indonesia: CV. Mega Press Nusantara, 2023
[20] B. A. M. Fernandez, "Study of Non-Prescription Antibiotic Use in Manggarai and West Manggarai Regencies–NTT," Calyptra J. Ilm. Mhs. Univ. Surabaya, vol. 2, no. 2, pp. 1–17, 2013.
[21] I. Prasetyo, "Data Analysis Techniques in Research and Development, UNY 2014.," *UNY Fak. Ilmu Pendidik.*, vol. 6, p. 11, 2014.
[22] M. S. Farza, *Design of a PLC-Based Electric Motor Control Trainer for the Electrical Machine Control Practicum Course*. Bachelor's Thesis, Department of Electrical Engineering Education, Universitas Negeri Padang, Padang, Indonesia, 2022
[23] E. Noverisa, N. Setiawati, and V. Prasetio, "Development of Android-Based Interactive E-Modules in Bunpou Courses," J. Pendidik. dan Bhs. Jepang, vol. 13, no. 1, pp. 64–78, 2022.
[24] D. Mayasari, *Development of a Learning Module on the Competence of Identifying Main Fabrics and Lining Materials for Grade XI Fashion Design Students at SMK Negeri 3 Magelang*. Yogyakarta, Indonesia: Fakultas Teknik, Universitas Negeri Yogyakarta, Skripsi S1, 2014
[25] A. Atabik, "Product Design Marketing from the Perspective of Islamic Economic Law," Tawazun J. Sharia Econ. Law, vol. 1, no. 1, p. 87, 2018, doi: 10.21043/tawazun.v1i1.4911.