



## Development of Technical Drawing Learning Modules as Teaching Materials for Technical Drawing Subjects in Class X of the BKP Department at SMK Negeri 1 Botomuzoi for the 2022/2023 Academic Year

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### Abstrak

*Penelitian ini bertujuan untuk menciptakan modul pembelajaran Gambar Teknik yang dapat digunakan dalam pembelajaran mata pelajaran Gambar Teknik di SMK Negeri 1 Botomuzoi sesuai dengan kriteria yang telah ditetapkan. Selain itu, penelitian ini juga bertujuan untuk mengevaluasi kelayakan modul pembelajaran Gambar Teknik yang telah dibuat sebagai bahan ajar dalam mata pelajaran Gambar Teknik di Kelas X Jurusan BKP di SMK Negeri 1 Botomuzoi. Penelitian ini menggunakan model pengembangan Borg & Gall yang telah disederhanakan oleh Anik Ghufon sebagai pendekatan Research and Development (R&D). Prosedur pengembangannya terdiri dari empat tahapan, yaitu studi pendahuluan, pengembangan, uji lapangan, dan diseminasi. Hasil dari penelitian ini adalah Modul Pembelajaran Gambar Teknik layak digunakan sebagai sumber pembelajaran di Kelas X Jurusan BKP di SMK Negeri 1 Botomuzoi. Secara keseluruhan, rata-rata evaluasi oleh ahli materi, ahli media, dan tanggapan peserta didik dari menunjukkan hasil yang positif.*

**Kata Kunci:** Modul Pembelajaran, Gambar Teknik, Research and Development

### Abstract

This study aims to create a Technical Drawing learning module suitable for use in the Technical Drawing subject at SMK Negeri 1 Botomuzoi, adhering to predefined criteria. Additionally, the research aims to evaluate the suitability of the created Technical Drawing learning module as a teaching aid in the Technical Drawing subject for Class X students in the BKP Department at SMK Negeri 1 Botomuzoi. The research employs the Borg & Gall development model, simplified by Anik Ghufon, as a Research and Development (R&D) approach. The development procedure consists of four stages: preliminary study, development, field testing, and dissemination. The outcome of this research is a Technical Drawing Learning Module deemed suitable for use as a learning resource in Class X of the BKP Department at SMK Negeri 1 Botomuzoi. Overall, the average evaluations by subject matter experts, media experts, and student feedback indicate positive outcomes.

**Keywords:** Learning Module, Technical Drawing, Research and Development

## **INTRODUCTION**

Education has an important role as the main foundation in the progress of a country. In Indonesia, regulations regarding education are explained in Law No. 20 of 2003 article 1 paragraph 1 which states that education is an effort made with awareness and planning to create a learning environment and learning process that allows students to actively develop their potential. This aims to obtain spiritual strength, self-control, personality, intelligence, good morals, and skills needed for students, society, nation and state. One of the government's steps in developing this aspect is to encourage formal education at the vocational level. Vocational education aims to prepare students to be able to work in a particular field. The focus of vocational education is to produce graduates who are in accordance with the needs of the business world and industry. For example, Vocational High School (SMK) is one form of formal education institution designed to produce graduates who are in accordance with the demands and demands of the business world and industry.

There are several strategies that can be used to improve the quality of vocational secondary education, one of which is through the application of a competency-based education and training approach. The competency-based approach is used as the basis for curriculum development, preparation of learning materials, implementation of teaching and learning processes, and development of assessment procedures (Depdiknas, 2008). One way to improve the quality of education is through the development of existing teaching materials to make them more practical to use. Teaching materials refer to a set of tools or learning tools that contain learning

materials, methods, and boundaries that are arranged systematically and attractively. The aim is to achieve the expected competencies or sub-competencies. Examples of commonly found printed teaching materials include handouts, books, modules, brochures, and student worksheets.

Module is a form of learning material specifically designed to facilitate student learning (Syarifah et al., 2023). This module is in the form of a book or document containing a series of learning materials that have been arranged in a systematic and structured manner. Modules are designed to provide opportunities for learners to learn independently, without having to depend on direct guidance from the teacher (Telaumbanua, 2022). Learners can use this module as the main guide in learning a subject or topic. In the module, there are learning instructions that have been provided. This study guide serves as a direction for learners in following and understanding the material presented. These learning instructions can be in the form of brief explanations, tasks or exercises, questions to reinforce understanding, or instructions for actions that students must take. With modules, learners have the freedom to learn at their own pace and learning style. Modules also provide flexibility for learners who need additional guidance from the teacher. In this case, the teacher can provide direction and guidance to learners in learning the material contained in the module. Thus, modules are instructional tools that are useful for supporting learner learning independently or with teacher guidance. Modules help learners learn and understand the material more effectively and efficiently.

Based on the preliminary research findings involving observations and interviews, it appears that the existing

Engineering Drawing learning module does not meet the standards to be used by students independently. The module is still not systematically arranged so that it cannot be an effective learning guide for students. Inadequate systematization is one of the obstacles in this module, so it needs to be improved or rearranged so that the module can function properly as an independent learning tool for students.

Therefore, it is necessary to develop a learning module for Technical Drawing as teaching material for Class X Technical Drawing lessons in the BKP Department at SMK Negeri 1 Botomuzoi so that the module has appropriate quality and is suitable for use. To achieve this, the module needs to be developed by taking into account the criteria for a good module and involving an assessment by experts.

The development of learning modules also requires responses from students. The aim is to identify students' needs and preferences related to Engineering Drawing learning so that the resulting module can be more relevant and effective in supporting their learning process.

In order to produce a module that meets good standards, this development process will involve evaluation from experts in the field of Engineering Drawing. Consideration and input from experts will help to ensure that the content is appropriate, clear, and in line with the curriculum and student needs. With the development of the module involving experts and student responses, it is expected that the resulting Engineering Drawing learning module can be an effective tool and in accordance with the needs of students in learning Engineering Drawing at SMK Negeri 1 Botomuzoi.

In the development process, the module will be made by paying attention to the clarity and systematics of the material, compatibility with the applicable curriculum, and the use of language in

accordance with student understanding. The module will be an effective guide for students in self-learning and improving their understanding of Engineering Drawing. The main purpose of developing this module is to provide optimal support for students in learning Engineering Drawing, so that they can master the material well and independently.

## **METHODS**

The development model applied in this study follows the Research and Development (R&D) approach based on the concept by Borg and Gall, which has been modified by (Ghufron, 2011) into four main stages, namely preliminary studies, development, field testing, and dissemination.

### **1. Preliminary Study**

The preliminary study was carried out through the observation method of the teaching process of Technical Drawing subject in class X of BKP department at SMK N 1 Botomuzoi. The focus of this observation includes elements such as the curriculum used, facilities available, teaching methods, teaching materials and materials used, as well as the competencies that need to be achieved by students. The findings from this observation are the basis used in developing the learning module.

### **2. Development**

The development process refers to the stages described by (Daryanto, 2013) in the process of preparing learning modules, namely: a. Analyzing module needs; b. Designing modules; c. Carrying out implementation; d. Conducting assessments; e. Conducting evaluations and validations; and f. Analyzing the needs of the module. Conducting assessment; e. Conducting evaluation and validation; and f. Ensuring quality assurance. Ensuring quality assurance. The following is a further

description of each stage of the module preparation:

**a. Module Needs Analysis**

The problems detected at SMK Negeri 1 Botomuzoi were found when researchers conducted a preliminary study in class X of the BKP Department of SMK Negeri 1 Botomuzoi. One of them is the lack of teaching materials (modules) in the Technical Drawing subject for students in class X of the BKP Department of SMK Negeri 1 Botomuzoi. This has an impact on student dependence on the role of the teacher. In addition, researchers also found that students' ability to solve problems in the Technical Drawing subject is low, and the level of student involvement in the classroom is still minimal. On the other hand, the potential that exists at SMK Negeri 1 Botomuzoi is the implementation of the 2013 Curriculum. Therefore, it is necessary to support learning facilities, including learning modules, to achieve learning objectives.

**b. Module Design**

At this stage, there is a process of structuring and organizing learning materials in order to achieve a certain competency, so that it becomes a systematic unit. The planned module covers the content taught in semester 2, which is related to Technical Drawing. The module is designed with the aim that learners feel interested and motivated to use it independently, either with or without direction from the teacher, and this is a very considered aspect in its design.

**c. Implementation**

Various elements such as materials, equipment, learning facilities, and learning environment required for learning are tried to be fulfilled so that the predetermined competency targets can be achieved as planned.

**d. Assessment**

The implementation of the evaluation of the learning outcomes of Engineering Drawing also refers to the guidelines described in the module. Thus, the assessment results of this learning can be used to assess the extent to which students have mastered the material taught in the module.

**e. Evaluation and Validation**

Learning modules for Technical Drawing subjects, which have been used or are still being used in the teaching-learning process, require regular evaluation and validation. This validation process involves experts in the field of material who have a deep understanding of the competencies taught, as well as experts in the field of learning media or multimedia. These experts can come from among lecturers or teachers who have expertise in each discipline or have extensive teaching experience. This validation has the aim of determining the extent to which the learning module developed is suitable for use. If the validation results show that the module is not valid, then the necessary step is to revise or improve the module until it meets the validity criteria.

**f. Quality Assurance**

To ensure that the learning module for Technical Drawing subject that has been designed meets the standards required in module development, it is important to conduct monitoring during the manufacturing process. This is necessary to ensure that the module is made in accordance with the design plan that has been set. This monitoring process is carried out at each stage in the module development.

**3. Field Test**

The field test was conducted in three phases, namely the initial field test, the main field test, and the operational field test. Each phase of the field test was carried out once. The determination of the number of students involved in the field test was based on the guidelines of the Borg and Gall-style R&D development model which had been simplified by (Ghufron, 2011), as well as previous studies that applied similar development models.

#### a. Initial Field Test

The field trial conducted at this stage involved three students of class X majoring in BKP at SMK Negeri 1 Botomuzoi. These three students had various levels of ability, namely high, medium, and low, which were assessed based on report card records. The purpose of this stage is to obtain feedback from students regarding the learning module in the initial limited trial.

#### b. Main Field Test

The next step was to conduct the main field test, involving six students from class X of the BKP department at SMK Negeri 1 Botomuzoi. These six students had various levels of ability, consisting of two students with high ability, two students with medium ability, and two students with low ability. The subjects involved in the main field test were different from the subjects involved in the initial field test. The criteria for student ability were also determined through the values recorded in the report card.

#### c. Operational Field Test

The operational field test was carried out involving twenty students from class X majoring in BKP at SMK Negeri 1 Botomuzoi. The purpose of this field test is to collect responses from students regarding the learning module. The method is carried out by giving a questionnaire to students, where they provide an assessment of the learning module that

has been developed. The results of this student assessment are used as input for improving the learning module, so that the module can be more suitable for use by students.

#### 4. Dissemination

The final stage of this development research is the dissemination process, where the learning module for Technical Drawing subjects that have been developed will be implemented on a limited basis in class X BKP department at SMK Negeri 1 Botomuzoi. The place of this research was at SMK Negeri 1 Botomuzoi which is located in Hiliwaele I, Botomuzoi District, Nias Regency, North Sumatra Province. The research subjects involved grade X Semester 1 students enrolled in the Construction and Property Business Expertise Program (BKP) at SMK Negeri 1 Botomuzoi. The total number of participants in this study amounted to 20 students.

In accordance with the planned agenda, this research was carried out in the even semester of the 2022/2023 school year, precisely in August 2023. The implementation of this research was adjusted to the schedule set by the school to ensure the smooth running of teaching and learning activities and the achievement of learning materials as expected.

Data collection in research is needed to obtain the desired information or data. In order for the data or information to be obtained, a tool or instrument is needed to collect it. Data collection methods, on the other hand, refer to the steps or procedures used to obtain the desired data or information. In the process of research and development of this module, data collection tools are used in the form of observation sheets and questionnaires.

The data analysis method applied in this research is quantitative descriptive

analysis technique. Descriptive analysis techniques describe or explain systematically, factually, and accurately related to the issues being investigated. The instrument used in this study aims to collect data in the form of numbers. The instrument is designed to measure the value of the variables to be investigated. Each instrument must have an appropriate scale in order to produce precise and accurate data.

In this study, the questionnaire that will be used to assess respondents' responses will be prepared by utilizing the assessment criteria using the Likert scale. The Likert scale was chosen because the method is able to measure individual attitudes, responses, opinions, and perceptions towards a matter. This scale will be applied to evaluate the suitability of the learning module.

In a Likert scale, there are generally five variations of answer choices. However, in this study, the Likert scale will be modified to consist of only four options. This adjustment is made to avoid the possibility of respondents choosing the middle option due to human factors. Thus, this modification aims to obtain more concrete and definite information for researchers. Each response given by the respondents will be converted into numbers according to the conversion shown in Table 1, and the data will be processed for further analysis.

Table 1. Scoring Criteria

No	Category	Score
1	Strongly agree	4
2	Agree	3
3	Disagree	2
4	Strongly disagree	1

The scores recorded from the questionnaires filled out by material experts, media experts, and students as users, were then converted into four score eligibility categories according to the guidelines listed in table 2.

Table 2. Feasibility Score Category

No.	Score Interval	Categories
1	$Mi+1.5S_{bi} < X \leq Mi+3S_{bi}$	Very Feasible
2	$Mi < X \leq Mi+1.5S_{bi}$	Worth
3	$Mi-1.5S_{bi} < X \leq Mi$	Decent Enough
4	$Mi-3S_{bi} < X \leq Mi-1.5S_{bi}$	Not Feasible

## RESULTS AND DISCUSSION

The development of learning modules for Technical Drawing subjects was carried out by applying the Borg and Gall development model (R&D), which has been modified by Anik Ghufuron into four stages, namely preliminary studies, development, field testing, and dissemination.

### Data Analysis

The data analysis process is carried out to identify the feasibility level of the Technical Drawing Learning Module, through the evaluation results provided by two material experts and two media experts, as well as to assess the extent of input provided by students from Class X of the BKP Department at SMK Negeri 1 Botomuzoi.

#### a. Data Analysis of Evaluation Results and Material Expert Validation

Evaluation and validation were carried out by two validators, both of whom were teachers at SMK Negeri 1 Botomuzoi and Lecturers of the Building Engineering Education Study Program at Nias University. Item analysis of research instruments for material experts refers to the characteristics of modules that are considered good by Depdiknas (2008), namely self-instructional, self-contained, stand-alone, adaptive, and user-friendly aspects.

Table 3. Results of Evaluation and Validation of Material Experts

Assessed Aspect	Score	Category
<i>Self Instructional</i>	3,55	Very Feasible
<i>Self Contained</i>	3,25	Very Feasible
<i>Stand Alone</i>	3,25	Very Feasible
<i>Adaptive</i>	3,50	Very Feasible
<i>User Friendly</i>	3,00	Worth
<b>Average Score</b>	<b>3,31</b>	<b>Very Feasible</b>

Based on the evaluation by material experts from all aspects, namely self instructional, self contained, stand alone, adaptive, and user friendly aspects, the average total score for each aspect is 3.31 out of a maximum score of 4.00. With this value, the learning module is also included in the "very feasible" category.

b. Media Expert Evaluation and Validation Data Analysis

Evaluation and validation by media experts were carried out by two validators, namely one lecturer from the Building Engineering Education Study Program at Nias University and one teacher from the BKP Technical Drawing Department at SMK Negeri 1 Botomuzoi. Item analysis of research instruments for evaluation by media experts adopts the quality elements of the model proposed by Daryanto (2013), which includes aspects of format, organizational aspects, aspects of attractiveness, aspects of font shape and size, aspects of free space (space), and aspects of consistency.

Table 4. Media Expert Evaluation and Validation Results

Aspects Rated	Score	Category
Format	3,25	Very Feasible
Organization	3,21	Worth
Attractiveness	3,33	Very Feasible
Font Shape and Size	3,25	Very Feasible
Space (Blank Space)	3,00	Worth
Consistency	3,13	Worth
<b>Average Score</b>	<b>3,20</b>	<b>Worth</b>

Based on the evaluation by media experts from all aspects, namely format aspect, organization aspect, attractiveness aspect, font shape and size aspect, blank space aspect, and consistency aspect, the average total score for each aspect is 3.20 from the maximum score of 4.00. With this value, the learning module is also included in the "feasible" category.

c. Operational Field Test

Operational field trials produce information to understand input and responses related to the Technical Drawing Learning Module in three aspects, namely material aspects, media aspects, and module learning aspects. This operational field trial was conducted on 20 students who were in Class X of the BKP Department at SMK Negeri 1 Botomuzoi.

Table 5. Operational Field Test Result

Assessed Aspect	Score	Category
Material	3,38	Very Feasible
Media	3,39	Very Feasible
Module Learning	3,45	Very Feasible
<b>Average Score</b>	<b>3,41</b>	<b>Very Feasible</b>

Based on the results of the operational field test related to the material, media and learning aspects of the module, the average total score of each aspect is 3.41 out of a maximum score of 4.00, indicating that this instrument is included in the "very feasible" category.

d. Instrument Reliability for Field Test The reliability of the instrument used to obtain responses from learners was also evaluated.

The results of the calculation of the reliability of the instrument given to students can be explained in the following table:

Table 6. Reliability Results

Reliability Statistics	
Cronbach's Alpha	N of Items
.778	35

With a reliability value of 0.778, the input instrument used for students can be classified as "reliable". This indicates that the instrument given to learners has measured an object with consistent results when tested on the same group at different times. This is the hallmark of a reliable instrument.

## CONCLUSION

In this case, the conclusion that can be drawn is that the results show that the feasibility assessment of learning modules based on material experts and media experts is on average in the "very feasible" category. In addition, positive responses from students are also included in the "very feasible" category. Therefore, based on the assessment of the three parties, it can be concluded that the Technical Drawing Learning Module is suitable for use as a learning resource in Class X of the BKP Department at SMK Negeri 1 Botomuzoi. This module is considered to have good quality and is able to support the teacher's performance in delivering material and assisting students in learning independently and actively.

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