

# Development of Physics Learning Module Based on Industrial Vocational Era Era 4.0 to Improve Student Learning Skills in SMK

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**Abstract.** The research conducted to produce a physics-based learning module vocational industry the 4.0 era to improve vocational students learning skills — research techniques implemented by the research development research method and. The results of the study include the development of physics modules based on industry era learning skills 4.0. The feasibility standard for the results of physics learning modules based on industrial vocations in the 4.0 era can be seen from the validators assessment and student response to improving student learning skills. Improvement of students learning skills can be seen based on a questionnaire and observation of learning activities students in physics. Research on the development of physics learning modules based on industrial vocational era 4.0 can be used to improve student learning skills in physics material in Vocational High Schools (SMK). The application modules based on the industrial vocational industry 4.0 era is a media solution and a reference for physics teachers in vocational high schools. The results of the study show that industrial vocational-based physics learning modules in the 4.0 era can improve responses and improve student concentration in learning physics material in vocational high schools.

## 1. Introduction

Physics learning is a process of learning physics that is the emphasis in physics, the process of scientific thinking, producing products to form attitudes on individuals. The process of scientific thinking in the form of concepts, laws and physical theories in studying natural phenomena that produce science that is useful for humans. Students' learning abilities are influenced by learning media and attractive learning modules. Improvement of learning modules following the needs of the times continues to be done to improve learning skills. Learning physics in the classroom today tends to emphasise the mastery of concepts and put aside the students' physics problem-solving abilities [1]. Teachers in the classroom rarely use interesting learning modules that are not relevant to the development of Industrial 4.0. Vocational education is the mastery of knowledge and skills that have economic value, following market



needs with a high education labour coefficient [2]. Industrial Revolution 4.0 is a transformation effort to improve efficiency in each value chain by integrating digital capabilities and production lines in the industry that refers to improving automation, communication machine-to-machine and human to machine, artificial intelligence, and developing sustainable technology in the industry [2].

Program Industrial Vocational Education 4.0 in SMKs where the Industry can foster as many as five SMKs in its area and each SMK can be fostered by more than one industry. As the implementation of the mental revolution program, the Government encourages the improvement of HR, one of which is industrial HR. Learning management aims to control the learning process in the classroom through planning activities, implementation to evaluating learning. The development of learning modules based on industrial vocational industrial era 4.0 aims to change the enormous potential to change the way of learning, ways to get information and ways to entertain such as presentations. Teaching materials can be formulated as anything that can make it easier for students to obtain several information, knowledge, experience, and skills in the teaching and learning process [3]. The development of physics learning modules based on industrial vocations in the 4.0 era was used to improve student learning skills in vocational high schools.

The module is a learning device arranged for learning purposes. The purpose of learning modules is to train students in learning subject matter according to their abilities. Learning modules provide opportunities for students to use different techniques to solve problems learned based on students' knowledge and learning skills. Learning modules are learning devices that contain one sub-learning material, which students can learn independently. The module is a means of students to achieve the learning objectives based on the basic competence or competence achievement indicator, manual self-learning activities (self-instructional), and provide opportunities for students to test themselves through exercises presented in the module. The learning module can be used as an independent study guide both at school and outside school to understand the subject matter provided (Suprawoto, 2009: 2). The developed module consists of several parts, namely: a) cover page, b) preface, c) module usage instructions, d) table of contents, e) introduction, f) concept map, g) let's think together, h) attention please, i) let's try it, j) let's talk, k) let's explore the material, l) problem examples, m) understanding tests, n) summaries, o) evaluations, p) warnings, feedback, enrichment, and r) bibliography [4]. Learning Modules are arranged systematically and are easy to learn and understand well [5]. The learning module is the smallest unit of teaching and learning program, which is studied by students themselves individually or taught by students to themselves (self-instructional) [6]. The advantage of module teaching materials is that modules can be used as independent teaching materials that function to improve the ability of students to learn on their own [7]. Learning modules are instructional materials that are arranged systematically and attractively covering the contents of the material, methods and evaluations that can be used independently to achieve the expected competencies [8]. Learning industry teaching industry is a form of business provides a real experience for learners by involving learners in production lines/services in the industry or at school by involving learners directly.

The process of learning requires skills from each individual so that the learning process becomes maximal and gives satisfying results. Learning skills are not a single unit, but rather a series of a number of groups of activities that are interrelated and supportive. The explanation of the above statement can be interpreted as learning skills is the ability to focus and be directed in carrying out an activity or act [9]. Failures in learning are not solely due to low learning abilities, but because they do not have the skills in effective learning. Learning skills are strategies and techniques that can maximize the use of time, learning resources, and academic potential possessed [8]. Learning skills are a technique and a way to express, acquire, maintain knowledge and solve problems according. Skills are fundamental to academic competence. Effective study skills are associated with positive outcomes across multiple academic content areas and for diverse learners. Another thing that is usually not in the spotlight is the learning style of students [10].

## 2. Materials and methods

Types of methods used in this research are research and development methods. The design used was an experimental design pre-experimental design with the type of design One Group Pretest-Post-test Design where previously students were given a pre-test (O1) that was treated that is learning without using the development of physics learning modules based on industrial vocational era 4.0 and then students were given a post-test (O2) which is treated by using a physics learning module based on industry vocational era 4.0 whose purpose is to find out the improvement of students' learning skills in physics material. The procedure in this research is Research and Development developed by Borg and Gall [4] without the main field test which includes: (1) research and information collecting, (2) planning, (3) develop preliminary form of product, (4) preliminary field testing, (5) main product revision, (6) operational field testing, (7) final product revision, (8) dissemination and distribution. Broadly speaking, the research procedures to be carried out are as follows..

## 3. Result and discussion

### 3.1 Product of physics learning module based on industrial vocations in 4.0 era on physics material.

The research products developed were in the form of physics modules based on industry 4.0 era in class X (ten) Vocational Schools as follows 1) cover page, 2) foreword, 3) instructions for using the module, 4) table of contents, 5) introduction, 6) concept map, 7) let's think together, 8) attention please, 9) let's try it, 10) let's talk, 11) let's explore the material, 12) sample questions, 13) understanding test, 14) summary, 15) evaluation, 16) warning (feedback), 17) enrichment, and 18) bibliography.

### 3.2 Product Valuation Results of physics module vocational-based industries in 4.0 era

Results of valuation product of physics module-based vocational industries in 4.0 era are in the form of validation of the Learning Implementation Plan (LIP) in Table .1 as follows.

**Table 1.** Results of Module Product Validation Analysis in the form of LIP.

No.	Aspects rated	X per Aspects	Category
1.	Identification of Subjects	3.95	Very Good
2.	Formulation of Indicators	3.75	Very Good
3.	Formulation of Learning Objectives	4	Very Good
4.	Selection of Instructional Materials	3.5	Very Good
5.	Selection of Media Study	3 , 75	Very Good
6.	Learning Model	3.75	Very Good
7.	Learning Scenario	4	Very Good
8.	Language Usage	3.65	Very Good
	<b>Average All Aspects</b>	<b>3.79</b>	<b>Very Good</b>

The results of the validation analysis percentage matching the assessment of physics modules based on industrial vocations era 4.0 obtained an average of all aspects valued at 3.79 with very good criteria.

### 3.3 Learning Module Feasibility Test Results

Results are learning module feasibility LIP using the observation sheet in a limited trial and field trials can be seen in Table 2 and Table 3 as follows.

**Table 2.** Results of Validation Analysis LIP trials are limited

RPP	Observer 1	Observer 2
Meeting 1	95.45%	95.45%
Meeting 2	100%	100%
Meeting 3	95.44%	95.44%

**Table 3.** Results of Validation Analysis LIP field trials

RPP	Observer 1	Observer 2
Meeting 1	100%	100%
Meeting 2	100%	100%
Meeting 3	95.55%	95.55%
Meeting 4	100%	100%

The ability of students' physics learning skills can be seen improvement using the physics learning module based on industrial vocational era 4.0. The results of the analysis of the value of learning skills increase well. The results of the design of the development of physics learning modules based on industrial vocational 4.0 era at the stage design (design) have been revised based on expert and practitioner suggestions to produce learning modules that are ready to be trialled. Assessment of the validator and student responses to the industrial vocational module based on industrial 4.0 era. very good at improving students' learning skills in physics.

The development of physics learning modules based on industrial 4.0 era is very good to be used for physics learning skills of Padangsidimpuan Vocational School students based on the assessment of the results of expert validators and validator practitioners very well in field trials. The development of physics vocational learning modules based on industrial era 4.0 on physics materials can improve student learning skills.

#### 4. Conclusions

Improvement of students learning skills can be seen based on a questionnaire and observation of learning activities students in physics. Research on the development of physics learning modules based on industrial vocational era 4.0 can be used to improve student learning skills in physics material in Vocational High Schools (SMK). The application modules based on the industrial vocational industry 4.0 era is a media solution and a reference for physics teachers in vocational high schools. The results of the study show that industrial vocational-based physics learning modules in the 4.0 era can improve responses and improve student concentration in learning physics material in vocational high schools.

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