

## **The Development of Python's Basic Programming Material for Vocational High School Students**



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**ABSTRACT:** The development of teaching materials is based on students' confusion in essential programming subjects in Vocational High School (SMK) grade X. So far, the learning process has minimal interesting materials to improve student literacy students' programming knowledge is not maximal. This research aims to make teaching material products with an interactive approach to introduce students to primary programming languages that are attractive and easy to understand. The research method uses the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The results of this study were (1) the process of developing basic programming teaching materials was designed through five stages, namely analysis, design, development, application, and evaluation (2) the quality of basic programming teaching materials that were tested through validity and effectiveness criteria. Design experts have validated the media with a score of 94%, content experts with a value of 88%, media experts with a value of 84%, and peer-to-peer teachers with a value of 90%. The data on the effectiveness of student activity observation teaching materials was 86.00. The teacher obtained the results of 85.67 in the feasible category. Based on all the received results, it can show that the product is in a feasible category as a Python's basic programming learning media.

**KEYWORDS:** Python's Basic Programming, teaching materials, ADDIE, Vocational High School.

### **I. INTRODUCTION**

The implementation of the learning curriculum program must be synchronized with the needs of the workforce. The world of work time is experiencing technology following human necessities to accelerate work. Technological changes will provide modification of the learning process in educational institutions. The learning process cannot be separated from the needs of learning resources offered by education instead. Learning sources are essential to meet student needs, especially in increasing student literacy. Besides, textbooks can be used to facilitate the learning process (Habibi et al., 2016). According to Prastowo, teaching materials are a learning material demanded to create an effective learning atmosphere. Teaching materials have a principal role in the teaching and learning process in books as the primary source or book as supporting, examples such as modules, textbooks, handouts, models, interactive teaching materials, audio teaching materials, and so on (Rohmah, 2020).

In a learning process for making innovations is very necessary, especially in technology and media development. Technology is an enabling tool created as a learning media needed for the learning process can be carried out effectively (Kiryakova et al., 2018). One effort to improve learning by applying a flexible teaching approach by making universal designs for learning. Ronald Mace, a study designer, proclaims the term Universal Design (UD). The application of Universal Design for Learning (UDL) in the field of education is still new. Universal learning design can be applied to statistical learning or related to the eye of the exact student (Ruffi & Rochmawati, 2019).

In the current era of technology, the world of education is required to equip students with increasingly sophisticated 21st-century skills. The skills of students must be able to think critically and innovatively to solve problems. Creative and innovative, including skills that must be given since they are still in school. Some of the abilities that must be owned in the 21st century include leadership, technology literacy, social communication, character intelligence, and teamwork. The development of the world of education begins to lead to digital technology learning. The occurrence of technological developments started with changes in the industrial revolution because indirect changes also contributed to the education order in a country (Risdianto, 2019).

#### **A. Programming Technology**

Technology can help the work process easier, fast, and efficient. The development of popular technology is the development of computer programming languages using special commands in computer languages. Computer programming languages are intelligent engineering or artificial intelligence engineering to help to solve problems using algorithm languages. Algorithms are a collection of instructions defined step by step properly to resolve existing problems (Kadir & Abdul, 2019).

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The development of the use of Python Memrogman has been carried out in foreign education, such as research conducted by (Srinath, 2017) who researched the characteristics of Python programming languages , including high-scale language languages used to carry out dynamic type systems and automatic memory management. The use of programming languages can be used for science presented in computer simulations providing an exciting and more interactive display that makes users efficiently provide the input value of the appropriate parameters (Dewantara et al., 2020).

Examples of changes that exist are globalization of communication between humans, and organizations, to fellow countries, occur without limitation of space and time. Experts explain changes as dimensions of time due to a virtual wall. Changes are a reality in human life now or will come. Changes in the phase of human life are marked by many things, one of which is a change in the industrial era. Industrial development must be described to students given knowledge theory and have to study skills and knowledge, mainly leading to the development of the technology experienced by the students (Yahya, 2018).

### B. Interactive Learning

An interactive approach is a learning approach that refers to the conscriptivity or building polypir think in capturing lessons. The interactive learning model focuses on student questions as a central characteristic by digging questions that build polypirer students mentally and physically. Interactive Multimedia Advantages According to (Rizki et al., 2020), interactivity is traceable to force users to interact with material both physically and mentally to encourage users to be active in learning given during learning.

The interactive approach has been made by Nur & Ahmad in increasing interest in students to learn English. The study results (Nur & Ahmad, 2017) showed that the implementation of the interactive approach was successful because the success criteria were achieved. The first criterion is 70% of students graduated from the target value of 70 based on KKM. The results showed that 74.57 students did it reach the target score. Besides, the second criterion is students who become more actively involved in the teaching and learning process.

### C. Job Opportunities

Labor needs in the field of programming expertise in the next few years. Data taken from the United States Labor needs for the Big Data field, and the current processing reaches three million people. The data shows work opportunities in processing big data very much. The US Labor Statistics Bureau predicts that the workforce is more than 8 million in the field of IT and computing, including 1 million Siber's security needs, during the next five years (Fagan & Payne, 2018).

Making the syntax code from the popular programming language today can give a feeling of confusion for new students to know to program and provide coding art. The biggest problem for beginner programmers does not seem to understand the basic concepts but more in practice. Learning while doing must be part of the lesson all the time (Micah & Bibu, 2019)

## II. RESEARCH METHODS

The methods for developing teaching materials use Research and Development (R & D) approach. Research and Development (R & D) Research Methods are research methods used to produce a product by testing product effectiveness (Zulfadli, 2017). The Addie model consists of five stages, namely (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) evaluation. (Habibi et al., 2016).

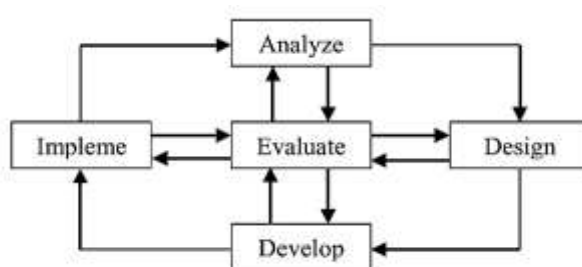


Image 1. ADDIE Research and Development Theory

The analysis phase describes what students learn when submitting material, namely conducting needs analysis, conducting task analysis, and identifying problems. Therefore, what we will produce is a fundamental understanding of the material (Sasongko & Suswanto, 2017). The design stage uses centralized and effectiveness as the formation of a teaching material format. The development stage to identify and reduce errors through expert assessment as a product validator and trial. The implementation phase by conducting direct learning to students to determine the level of effectiveness. The evaluation stage of revising the product when there is a shortage of validator or when the trial.

The proposed learning plan adopts the teaching method "Learning by Example" with an interactive learning approach. Students study the written programs and then try writing other similar programs from the concepts they have learned. Therefore, the proposed system will work with the following features:

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- Coding Environment where students must be able to write the basic code of the Python program.
- The medical tutorial platform students must be able to learn the basics of programming. Students must be able to learn to write their own code or with the help of illustrated explanations.
- (Micah & Bibu, 2019).
- Techniques for data collection development in the following formula:

$$Presentage = \frac{Total\ Score}{Highest\ Score} \times 100\%$$

- Submit a validity sheet of design experts, expert validation of contents, media expert validation, and colleagues (teachers).

**Table 1. Likert Scale used for Validator**

Score Range	Criteria	Conclusion
86% - 100%	Very Good	The media is ready to use
76% - 85%	Good	The media is ready to use
66% - 75%	Sufficient	The media can be used with a revision
56% - 64%	Not Good	The media needs major revision
0% - 55%	Failed	The media is not applicable

Beside the learning media, the validator will also evaluate:

- Syllabus assessment and semester learning plans
- Effectiveness data is obtained from observing the activity of teachers and students in learning.

### III. RESULTS AND DISCUSSION

Product Development of basic programming materials using physics formulas with an interactive approach to class X Vocational students produce learning book products in the form of independent textbooks. Picture learning media help meet student learning resources needs. Interactive teaching materials Basic programming is equipped with steps that are in accordance with the basic learning order of python coding. Python's programing knowledge will help students follow changes to the learning needs of digital technology, especially in coding. Utilization of computer technology in providing an experience for teachers and students can bridge the gap of practical and theoretical learning. It is practically done with real components in the form of computers. Theoretically side by side with the logic developed to process student determinations.

#### A. Python Basic Programming Development Module

Basic programming is one of the materials studied by SMK students as fields of specialization expert majors. In this study develop the basic Python programming language because it includes programming which is in great demand for technology developers, especially science data. The results of teaching materials that have been made in the form of student learning material modules that can be studied both at school and home. The link of the book can be accessed by visiting this link:

<https://drive.google.com/file/d/1tDPnOnzXMvL2sg-8XfrHqgxDP6mUT7G9/view?usp=sharing>



**Image 2.** Student's Module Footage

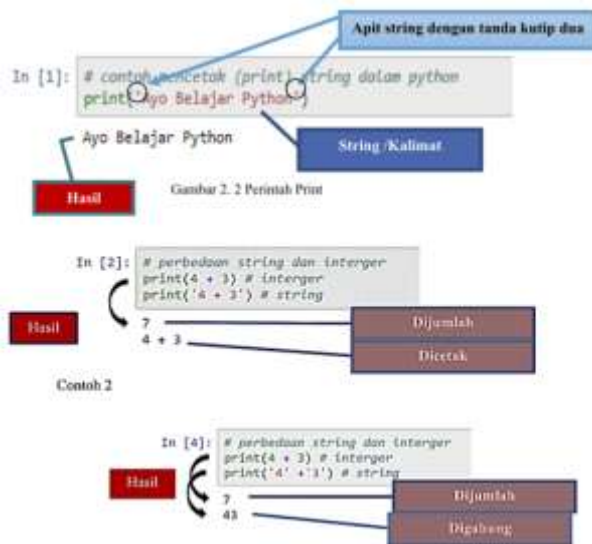


Image 3. A simple program made in the form of a picture dialog



Image 4. Example of Python's modest program

The results of the study were presented in the form of the presentation of validation data obtained from three experts, namely (1) design experts, (2) experts of content / material, and (3) media experts.

### B. Validation Score

Below, you can find the validation score after the validation process by qualified Subject Matter Experts:

Table 2. Validation Results

Validator	Score	Criteria	Conclusion
Instructional Design Expert	94 %	Very Good	The media is ready to use
Content Expert	88 %	Very Good	The media is ready to use
Media Expert	84 %	Good	The media is ready to use

Table 3. Recapitulation of Assessment Results

Assessment Type	Average Score	Criteria
Syllabus	91.00 %	Very Good
Lesson Plan	86.00 %	Very Good
Validator	88.67 %	Very Good

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Table 4.

Questions	Score	Criteria
Do instructions for using teaching materials clearly delivered?	86 %	Very Good
Does the picture of the practice instructions in attractive and applicative teaching materials in understanding the material?	84 %	Good
Is the language used in easy to understand readings?	82 %	Good
Is the material been displayed in order?	83 %	Good
Is the exercise sheet that is clear enough to do?	84 %	Good
Do using this teaching material, you understand the material?	84 %	Good
Do these teaching materials make you more enthusiastic in exploring programming?	84 %	Good
Do these teaching materials make you more curiosity about programming material?	84 %	Good
Do you feel the benefits of learning programming material with this book?	86 %	Very Good
Does this book greatly provide additional insight into programming?	84 %	Good

### IV. CONCLUSIONS

The product developed in this research is a module that shows Basic Programming Materials for grade X Vocational High School Nahdhotul Ulama 1 Kedungpring in textbooks. The criteria obtained are very good and ready to use learning. The agency is seen from the results of expert validation, so it is suitable for use in classroom learning. The assessment results that have been validated by design experts with a value of 94%, for experts fill with a value of 88%, a media expert with a value of 84%, and the opinion of colleagues with fellow teachers with a value of 90%. Data on the development of fundamental programming materials based on the average validator of design experts, material experts, and media experts obtained the percentage results (89%) with very good criteria. The syllabus assessment and lesson plan results got an average score of 91.00 and 86.00 with very good criteria.

Data on the effectiveness of teaching materials based on observations of student activities obtained 86.00 and the teacher obtained by the result of 85.67 with effective categories so that students are able to learn independently now to get good feedback. Of all the results that have been obtained can show that the product is included in the category very well, thus having a positive impact on students.

### V. ACKNOWLEDGEMENT

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