



Development of Web-Based Pascal Programming Multimedia at UPT SMK Negeri 2 Sidrap

Ayu Anjeliani¹, Nurmayanti^{2*}, Muhammad Takdir

¹Educational Technology, University of Muhammadiyah Sidenreng Rappang, Indonesia

²Educational Technology, University of Muhammadiyah Sidenreng Rappang, Indonesia

³Educational Technology, University of Muhammadiyah Sidenreng Rappang, Indonesia

*e-mail: antiimaya57@gmail.com

Receive: 12/08/2022

Accepted: 22/09/2022

Published: 21/10/2022

Abstract

This study aims to develop web-based *Multimedia Pascal Programming* in the basic programming subject of TKJ class X UPT SMK Negeri 2 Sidrap. This type of research is research and development (*Research and Development / R&D*) with a 4D development model that has been developed by Thiagarajan, Semmel and Semmel (1974) which includes the stages of *Define, Design, Develop, and Disseminate*. Data collection uses observation instruments, interviews, and questionnaires which are then analyzed descriptively quantitatively. The results showed that Pascal Programming multimedia met the valid criteria based on the assessment of media and material validation with an average value of 85.5%. Thus, it can be concluded that multimedia Pascal Programming is declared very suitable for use in limited face-to-face learning UPT SMK Negeri 2 Sidrap.

Keywords : *Development, Multimedia, Pascal Programming, Web.*

Introduction

Education is the process of forming a human self to run life properly. Education is the main key to creating quality human resources. The implementation of education in Indonesia is in accordance with Law Number 20 of 2003 Article 3 which reads "National education functions to develop abilities and shape the character and civilization of the nation which aims to develop the potential of students to become human beings who have faith and devotion to God Almighty, have a noble character, are healthy, knowledgeable, capable, independent and become democratic and responsible citizens."

Technological advances today have made many changes to the practice of providing education. Based on PP No.19 of 2005, the principle of curriculum implementation is carried out using a multistrategic and multimedia approach, adequate learning resources and technology, and utilizing the surrounding environment as a learning resource. To realize this, it is appropriate for educators to use media that makes learning effective and efficient.

This technological innovation encourages the birth of new concepts and makes learning more meaningful. This can be seen from the use of interactive technology in various forms, such as *computer-based instructions (CBI)*, *intelligent guidance systems (ITS)*, *integrated learning systems (ILS)*, computer assessments and computer communication. For this reason, peran pendidik is expected to be able to take advantage of technological innovations in learning, such as interesting multimedia. Educators must be able to design, develop and utilize multimedia to support the learning process. This is in accordance with Law No.14 of 2005 which states that every teacher must be able to utilize technology for the benefit of organizing educational learning activities.

Multimedia is a combination of text, graphics, animation, audio, still images, and moving video (Priyanto, 2009). Various types of multimedia, namely interactive multimedia, hyperactive multimedia, linear multimedia, multimedia learning presentations, multimedia independent learning, multimedia Kits, hypermedia, interactive media, and virtual reality (Limbong & Simarmata, 2020). One of the real innovations related to the use of multimedia is in the form of web-based learning by utilizing hyperactive multimedia.

Vocational education or SMK is an educational level that prepares students to be ready to work with

the skills provided from school (Nurmayanti et al., 2021). The education program at SMK uses a *link and match* approach (Arfandi & Sampebua, 2016) is realized in the form of learning carried out in schools and supported by fieldwork practice activities (PKL) in industry to provide real experience to learners.

In line with the development of education implementation based on the Minister's Decree 4, learning in schools is carried out with a limited face-to-face learning (PTM) system while still implementing health protocols and / or distance learning (RI, 2003). The provisions for the implementation of face-to-face learning are limited, namely students, teachers, and staff in the school environment have been vaccinated, maintain body immunity and are supported by standardized infrastructure (Suryani et al., 2022). The impact of this policy is that students' theoretical and practical learning time is limited.

Mata lesson at UPT SMK Negeri 2 Sidrap, namely basic programming is a subject that requires practice. With a limited face-to-face learning system, learning practices tend to be difficult to implement. For this reason, the role of multimedia is needed so that learning can be conveyed through efficient use of time. The multimedia in question is web-based multimedia, where theoretical material can be accessed by students through a *web link*.

Web-based multimedia development utilizes Google's features, namely *Google Site*. Web-based *multimedia* using *Google Site* is the right choice for teachers and students to use in learning activities (K.A. Nalasari et al., 2021: 142). The use of web-based multimedia is expected to help teachers in maximizing learning during limited face-to-face learning.

Method

Penelitian is a *Research and development (R&D)* research with a 4D development model (*Define; Design; Develop; and Disseminate*) (Thiagarajana, 1974). This research was conducted at UPT SMK Negeri 2 Sidrap, Kecamatan Pancarijang, Sidenreng Rappang Regency, South Sulawesi Province. The object in this study is multimedia *Pascal Programming* berbasis *Web* Subjek in this study is 2 people validator consisting of media expert validators and material experts. Data collection uses observation techniques, interviews, and questionnaires which are then analyzed using a quantitative descriptive approach. Data analysis in this penelitian uses the percentage formula (Tegeh et al., 2014).

$$P = \frac{\sum x}{SMI} \times 100\%$$

The results of the percentage assessment are then measured using a table of validity criteria according to (Akbar, 2013).

Table 1. Validity Level Categories

Percentage	Categories validity
85,01%-100%	Very Valid, or used without revision
70,01%-85%	Quite valid, or usable but needs minor revisions
50,01%-70%	Less valid, recommended not to use because it needs major revisions
01,00%-50,00%	Invalid, should not be used

Source: (Akbar, 2013)

Results and Discussion

The results of this study are learning products in the form of web-based multimedia *Pascal programming* in accordance with the 4D development model. *Pascal Programming* media development procedures use a 4D development model, namely: (1) *Define* or define, including final initial analysis, student analysis, task analysis, concept analysis and formulation of learning objectives; (2) *Design* or design, including the preparation of tests, selection of media, selection of formats and initial designs; (3) *Develop* or develop, including product development, expert validation, trial development and product revision; (4) *Disseminate*.

The following are the stages of research with a 4D development model.

a. *Define* (Pendekatan)

1) Final preliminary analysis

At this stage, the researcher analyzes the basic problems that occur in the learning process of Basic Programming. The reason found is that (a) the learning process is carried out with a limited face-to-face learning system (PTM), so that learning time and practicum are limited, (b) learning methods using the lecture method with the help of printed books (package books) which are used only during the class hours, (c) the implementation of the practicum is not optimal due to limited time.

2) Student analytics

At this stage the researcher analyzes the characteristics and learning styles of students. In general, class X students of TKJ 1 UPT SMK Negeri 2

Sidrap are more dominant in using an audio-visual learning style.

3) Task analysis

At this stage the researcher analyzes the tasks that students must solve on learning. The basic requirements that will have to be completed are as follows:

Table 2. Basic Programming Task Analysis

No	Competence
1.	Explaining the history of basic programming
2.	Describe the types of programming languages
3.	Explaining the various programming languages
4.	Installing programming language software

4) Analysis concept

At this stage the researcher conducts an analysis on the concept or material to be taught in the learning process. The learning series refers to the teacher's Syllabus and rpp, as well as the student book of SMK / MAK class X Basic Programming Computer Engineering and Informatics expertise program published by Yudhistira in 2017. The material taught based on the syllabus and RPP is the Flow of Computer Programming Logic which consists of sub-materials: History of Basic Programming, Types of Programming Languages, Various Kinds of Programming Languages, and Programming Language Software Installation.

5) Goal formulation

At this stage, the researcher formulates learning objectives based on the results of concept analysis and task analysis (basic competencies and core competencies and learning subject matter). The following learning objectives in the KD to be taught consist of several indicators of cognitive aspects.

Table 3. Indicator Pprogramming learning Dasar

Types of Indicators	Indicator
Knowledge	a. Learners can explain the history of basic

programming

- b. Learners can explain the types of programming languages
- c. Learners can explain various programming languages
- d. Learners can perform the Installation
- e. Programming Language Software

b. Design

1) Test preparation

Test preparation activities are guided by the results of goal formulation and task analysis. The test compiled on the multimedia product Pemrograman The basis of the learning evaluation section is a multiplechoice test of 10 numbers.

2) Media selection

At this stage, the researcher chooses the media used in the presentation of learning materials according to the characteristics and motivations of students. TheM selected and to be used are teks, images, audio, and animations that will be packaged in web-based multimedia *Pascal Programming*. The means of communication used is the *Whatsapp Group* to share *Multimedia Pascal Programming* in the form of *a link* so that students can access *Pascal Programming* on android devices.

3) Format selection

At this stage, the researcher determines the learning strategies, learning resources and learning media formats that will be used in web-based *Multimedia Pascal Programming*. When designing a learning strategy or rpp, the researcher chooses a format that is in accordance with the circular.

The learning resource used is the book of class X students of TKJ 1 SMK semester 1 of the 2022/2023 academic year in accordance with the Basic Programming material, while for media format settings, researchers developed it using html format with the *Google Site* application because the multimedia to be produced is web-based multimedia.

4) Initial design

At this stage the researcher designed and made the initial product design of the web-based *Multimedia Pascal Programming*. The initial design of *Pascal Programming* multimedia was outlined in the form of *storyboards* and *flowcharts*. Here's a look at the web-based *Pascal Programming* multimedia *flowchart*.

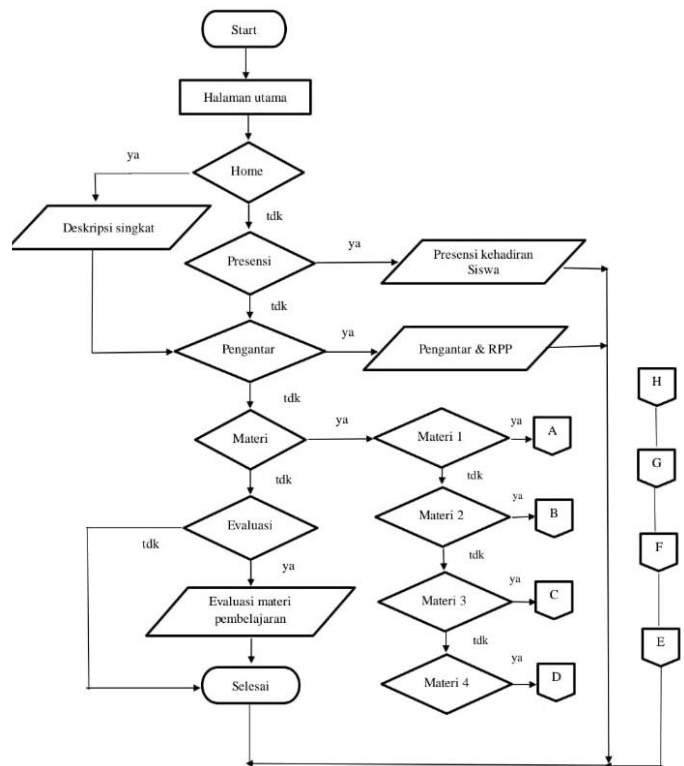


Figure 1. Web-Based Multimedia Pascal Programming Flowchart

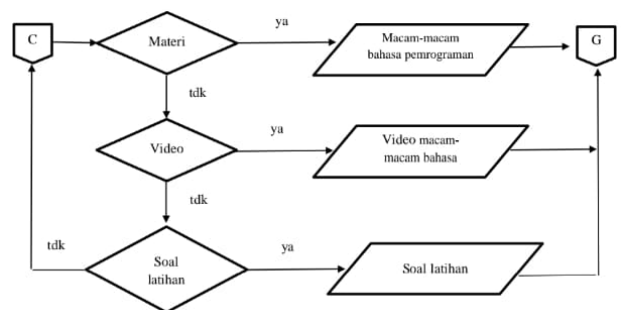


Figure 2. Material Display Flowchart

c. Develop

At this stage, the researcher develops the final product by uniting all aspects of the initial design into a ready-to-use product in the form of Web-based

Multimedia Pascal Programming. The following is a look at the results of the development of multi-media Pascal Programming based on s web.



Perangkat lunak Pemrograman adalah software yang berguna untuk menerjemahkan instruksi-instruksi dari bahasa program ke kode bahasa mesin melalui prosedur tertentu agar dapat diterima dan dibaca oleh komputer. Program tersebut digunakan untuk menerjemahkan perintah-perintah yang ditulis pada bahasa program ke bahasa mesin (*Machine Language*). Bahasa Pemrograman ini wajib dikuasai oleh seorang *Programmer* agar dapat membangun sebuah aplikasi atau *Software* dan untuk membuat aplikasi tertentu maka digunakan juga bahasa Pemrograman yang sesuai dengan kebutuhan.

Figure 3. Web-based multimedia *pascal programming* main page



Komputer membutuhkan sejumlah instruksi untuk melakukan suatu tugas tertentu. Instruksi-instruksi ini dikenal sebagai bahasa pemrograman. Pemrograman komputer awalnya terdiri dari sejumlah langkah-langkah pengkabelan untuk menjalankan suatu tugas. Hal ini dapat dipahamkan sebagai suatu rangkaian pengetikan ke dalam komputer dan kemudian dijalankan. Pada awalnya *diffwaver* engawanya Charles Babbage hanya dibuat untuk menjalankan tugas dengan menggunakan perputaran gigi roda untuk menjalankan fungsi kalkulasi. Jadi, bentuk awal dari bahasa komputer adalah berupa gerakan secara mekanik, selanjutnya gerakan mekanik tersebut digantikan dengan sinyal listrik ketika penemuan AS mengembangkan ENIAC pada tahun 1946 untuk menjadi bentuk modern pada saat ini dan saat ini. Bahkan saat

Figure 4. Web-based Display of *Multimedia Pascal Programming Materials*

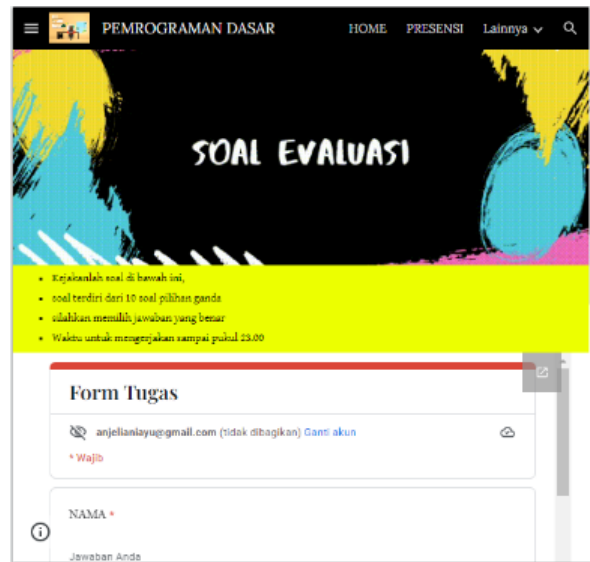


Figure 5. PageViews Evaluasi Materi Basic Programming Learning

1) *Web-based* Multimedia *Pascal Programming* Validation

Validation of the product from the development is carried out by media expert validators and material expert validators. The following is the assessment of each validator on the results of the development of *Web-Based Multimedia Pascal Programming*.

a) Media Expert Validation

The assessment of media aspects in multimedia *Pascal Programming* *Web-Based* consists of two categories, namely display and programming. The ampilan category consists of 9 indicators, namely the clarity of the text or writing, the determination of color selection and composition, the consistency of *button* placement, the quality of the image display, the display quality of animated images, animated presentation, screen display, language accuracy, and *background* color determination. The programming category consists of 10 indicators, namely clarity of navigation, consistency of *button* use, ease of use, text efficiency, image efficiency, program speed, media appeal,

animation settings, ease of selecting serving menus, and ease of use.

The conclusion of the results of the assessment of media expert validators can be seen in table 4.

Table 4. Media Validation Assessment Results

No.	Assessment Aspects	Percentage	Categories validity
1	Display	85%	Quite valid
2	Programming	84%	Quite valid
	Average	84,5%	Quite valid

Based on table 4, the validator assessment results are at a percentage of 84.5% with a fairly valid category, so it can be concluded that Web-based Multimedia *Pascal Programming* can be used but needs minor revisions. The advice given by validators for the perfection of Web-based Multimedia *Pascal Programming* is that it is necessary to add *background* animations.

b) Material Expert Validation

The assessment of material aspects in web-based *multimedia Pascal Programming* consists of two categories, namely material / content and evaluation. The material/content category consists of 6 indicators, namely material in accordance with learning objectives, material in accordance with the measured indicators, accuracy of data and facts, accuracy of use of images, audio and animation, using communicative language, and using clear and easy-to-understand sentences. The evaluation category consists of 6 indicators, namely exercise questions in accordance with learning objectives, the soal delivered / displayed consists of easy level questions, medium and difficult, systematic presentation of training questions, number of weighted questions, suitability of practice questions with indicators, and questions easy to understand / understand.

The conclusion of the results of the assessment of media expert validators can be seen in table 5.

Table 5. Material Validation Assessment Results

No.	Assessment Aspects	Percentage	Categories validity
1	Material/Content	80%	Quite valid
2	Evaluation	93%	Quite valid
	Average	86,5%	Quite valid

Based on the data in table 5, the validator assessment results are at a percentage of 86.5% with the category of very valid, so it can be concluded that Web-based Multimedia *Pascal Programming* can be used without revision. The advice given by validators for the perfection of Web-based Multimedia *Pascal Programming* is that it is necessary to beautify the appearance.

d. Disseminate (Penyebaran)

At this stage, the Web-Based Multimedia *Pascal Programming* learning product is then packaged, taught and distributed to teachers and students of UPT SMK Negeri 2 Sidrap for the next k can be used on the learning process of Basic Programming in schools.

Based on the assessment results of media expert validators and material expert validators, it was obtained that the average assessment was at a percentage score of 85.5%. This shows that Web-Based Multimedia *Pascal Programming* is very feasible to use in the learning process, in this case in face-to-face learning is limited in schools. These results are in line with the results of research (Nalafari et al., 2021) and (Lukitaningrum, 2016) that web-based multimedia products can be integrated in learning to help the learning process in *skeolah*.

Conclusion

This Web-Based Multimedia *Pascal Programming* was developed using a 4D development model consisting of four stages, namely: (1) the *Define* stage; (2) *Design* stage; (3) *The Develop* stage; and (4) *Disseminate* (dissemination) to teachers and students of class X TKJ 1 UPT SMK Negeri 2 Sidrap. Web-Based Multimedia *Pascal Programming* in this study based on the results of the media expert validation assessment got a percentage value of 84.5% and material expert validation got a percentage value of 86.5%. The average assessment of the two validators is in the range of 85.5%. This shows that Web-Based Multimedia *Pascal Programming* is very feasible to be

used in the limited face-to-face learning process in schools, especially Vocational High Schools.

Bibliography

- Akbar, S. (2013). *Learning Device Instruments*. Juvenile Rosdakarya.
- Arfandi, A., & Sampebua, O. (2016). Readiness for the Implementation of Industrial Work Practices for building engineering expertise study program in Makassar City. *Journal of Educational Horizons*, 35(1).
- Limbong, T., & Simarmata, J. (2020). *Media and Multimedia Learning: Theory & Practice*. Our Writing Foundation.
- Lukitaningrum, H. L. (2016). Development of Web-Based Learning Media on Database Materials in Class XI Vocational High Schools. *E-JPTI (Electronic Journal of Informatics Engineering Education)*, 5(5).
- Nalasari, K. A., Suarni, N., & Wibawa, I. (2021). Development of web-based teaching materials on the theme of 9 sub-themes of utilizing natural wealth in Indonesia for grade IV elementary school students. *Indonesian Journal of Learning Technology*, 11(2), 135–146.
- Nurmayanti, N., Ferdiansyah, H., & Zulkifli, N. (2021). Development of a Problem-Based Basic Programming E-Module in Supporting Learning during the Covid-19 Pandemic. *Edumaspul: Journal of Education*, 5(1), 22–30.
- Priyanto, D. (2009). Multimedia development of computer-based learning. *INSANIA: Journal of Educational Alternative Thinking*, 14(1), 92–110.
- Suryani, L., Tute, K. J., Nduru, M. P., & Pendi, A. (2022). Implementation Analysis of the Implementation of Limited Face-to-Face Learning in the New Normal Period. *Journal of Obsession : Journal of Early Childhood Education*, 6(3), 2234–2244. <https://doi.org/10.31004/obsesi.v6i3.1915>
- Tegeh, I. M., Jampel, I., & Pudjawan, K. (2014). *Development Research Model*. Garaha Science.
- Thiagarajana, S. (1974). *Instructional Development For Training Teaches of Exceptional children*.

Author Profile

The first author Ayu Anjeliani was born in Lt. Salo on March 22, 2000. The author studied elementary school at SD Negeri 1 Maccorawalie from 2006 to 2012. Then continued his junior high school education at SMP Negeri 1 Pancarijang in 2012 to 2015. The first author continued his high school education at UPT SMK Negeri 2 Sidrap Majoring in Accounting in 2015 to

2018. Sarjan education was taken by the author at the University of Muhammadiyah Sidenreng Rappang, Faculty of Teacher Training and Education, Educational Technology Study Program (S1).

The second author Nurmayanti, S.Pd., M.Pd., was born in Rappang, December 11, 1994. Bachelor's and master's education is taken by the second author at The State University of Makassar Informatics and Computer Engineering Education Study Program at the undergraduate level and Technology and Vocational Education, The Specificity of Informatics and Computer Engineering Education at the master's level . Currently, the second author is listed as a lecturer at the University of Muhammadiyah Sidenreng Rappang, Educational Technology Study Program.

The third author Muhammad Destiny, S.Pd., M.A.P., was born in Bone, January 1, 1970. Undergraduate education was taken by the third author at STKIP Muhammadiyah Sidenreng Rappang Completed in 1994. At the master's level, the third author continued his education at the University of Muhammadiyah Makassar Completed in 2015. Currently, the third author is listed as a lecturer at the University of Muhammadiyah Sidenreng Rappang oncegus Head of the Educational Technology Study Program in 2019 – Now