CIVED Journal of Civil Engineering and Vocational Education

EISSN: 2622-6774
Vol 10 No.3 September 2023
http://cived.ppj.unp.ac.id/index.php/CIVED

Development of Kodular Application-Based Interactive Learning Media in Engineering Mechanics I Course

Krisdayanti Siska Oktavia Simbolon[1], Juniman Silalahi[2*]
[1,2] Civil Engineering, Universitas Negeri Padang, 25132, Indonesia
[*]Corresponding author, e-mail: juniman@ft.unp.ac.id

Received 9th July 2023; Revision 15th July 2023; Accepted 16th August 2023

ABSTRACT

This study is set by the absence of kodular-based learning media at Padang State University, especially in Engineering Mechanics I course. With the passage of time, the learning media which are utilized on learning must be innovated and provide new experiences to students so that this research problem can be defined. The validity and practicality of kodular application-based interactive learning media in Engineering Mechanics I course. This study goals are to determine the validity and practicality of kodular-based interactive learning media in Engineering Mechanics I course. This research applies Research and Development (R&D) research types and apply the 4D development model. The results of this development state that the rate of validity of interactive learning media based on kodular applications in the Engineering Mechanics I course depends on the assessment of the Expert Appraisal is highly valid. The rate of practicality is depending on the outcome of questionnaires from PTB FT UNP students' class of 2022, eminently practical to be used by students in Engineering Mechanics I learning.

Keywords: *Learning Media; Interactive; Kodular; Engineering Mechanics I; Android.*

INTRODUCTION

A generation that has the desire to become a better person in all aspects is one of the basic foundations in creating an educated nation generation. Education is able to provide support and create a generation of intellect both in terms of cognitive, psychomotor and affective in preparing to face every era that will develop every time. The development of the times will certainly affect all fields, one of which is in the field of education. With the development of this era, education will be required to innovate according to the times. One of the innovations faced by education is learning media that is applied during learning. The important role that learning media has is that it can determine the success of the learning process. This is the reason for the need for learning media that is able to adapt to the times and according to the needs of the learning process. Learning media can be used at every level of education, one of which is higher education.

Padang State University is one of the campuses in West Sumatra, with 9 faculties, one of which is the Faculty of Engineering (FT). FT is one of the faculties whose main mission is to produce graduates to become STM teachers and professionals in the field of engineering. FT has 6 departments, one of that is the Civil Engineering Department. The Civil Engineering Department has 3 study programs (Study Programs), namely: S1 Civil Engineering Education, S1 Civil Engineering, and D3 Civil and Building Engineering. One of the subjects

Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 10 No.3 September 2023
http://cived.ppj.unp.ac.id/index.php/CIVED

that must be mastered by undergraduate students in Civil Engineering Education is Engineering Mechanics I. Engineering Mechanics I is a civil engineering discipline course that studies the actual behavior of building structures against loads acting on structures [1].

Obstacles that occurred to Padang State University students after conducting a series of observations on student conditions and interviews with lecturers who teach Engineering Mechanics I course, it is known that many students find it difficult to solve problems related to numbers and mathematical formulas. In addition, there are lots of learning media provided by lecturers to students, causing students to have to open all learning media with the help of several other applications. This can cause distraction to students when carrying out learning, both face-to-face and independently.

Learning media is a tool that helps in the teaching and learning process by clarifying the meaning of the message conveyed in order to improve and perfect learning objectives [2]. The success of the learning process in schools is influenced by many factors, one of which is the learning media. Learning media are all types of physical equipment that are developed in a structured way to transmit information and build interaction [3]. The selection of learning media that is truly adapted to the general characteristics of students will make it easier for students to understand the subject matter that will be presented by the teacher [4].

There are many innovations in interactive learning media that have sprung up, one of which is the application of technology that is currently developing, namely collaboration between learning media and smartphone devices with the Android system. Android is a Linux-based mobile device operating system that includes an operating system, middleware, and applications [5]. At this time, the android system is very close among college students [6]. Android-based learning media provides experience for students to learn regardless of time and place with a variety of interesting applications. Kodular is a website, which provides tools to build android applications, and its basic function is block drag-drop programming, so no need to type code programs manually [7]. Therefore, in accordance with the elaboration of the existing problems, the researcher wants to make the latest innovations in learning media at Padang State University, namely developing a *kodular* application-based learning media in Engineering Mechanics I course.

MATERIALS AND METHODS

Types of research

This research implements Research & Development (R&D) research. The research method that creates a particular product based on its effectiveness in meeting community needs is a type of development research. This development will use the Thiagarajan 4-D model as a guide in its development which will be carried out in four stages: Define, Design, Develop, and Disseminate [8].

Place and time of research

This research was carried out at the Department of Civil Engineering FT UNP in September 2022 - June 2023. The validation stage of learning media was carried out by expert appraisals in the field of media and material as well as practicality from the results of the responses from Building Engineering Education students' class of 2022.

Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 10 No.3 September 2023
http://cived.ppj.unp.ac.id/index.php/CIVED

Research procedure

The procedure carried out in the 4D development model can be explained as follows:

1) **Define**
   the stage define is to define instructional needs in developing instructional media. At this stage an initial analysis, student analysis, task and concept analysis are carried out and determining instructional objectives.
2) **Design**
   The researcher creates the product design that will be developed during the design stage. The design stage is carried out by making criterion tests, choosing media and formats, as well as the initial design.
3) **Development (Develop)**
   At this stage, 2 stages will be carried out, namely: (1) Expert appraisal and (2) Developing testing.
4) **Dissemination**
   If the product has received the final results and assessments from experts as well as testing of students have met the eligibility criteria, the next stage is dissemination of the final product. There are 3 stages of product dissemination including: (1) Validation testing, (2) Final packaging, (3) Diffusion & adaptation.

Research Instruments

The instrument used while collecting research data is a questionnaire. Questionnaire is a method data collection that has been done by providing a variety of problem-related questions study [9]. The questionnaire used during this study was a learning media validation questionnaire for expert appraisal and a practicality questionnaire for students regarding the use of kodular application-based interactive learning media in Engineering Mechanics I course. The scale in the questionnaire answers will be used a Likert scale where 4 alternative answers will be given. The four answer scales are used as a Likert scale questionnaire which instructs the respondent to choose one of the preferred poles because a "neutral" option is not available [10].

Data analysis

The process of analyzing the data in this study is by carrying out validity and practicality tests on products for expert appraisal and PTB UNP students' class of 2022. To analyze the results of the validity test obtained from the results of a questionnaire from 3 expert appraisals, while to analyze the results of the practicality test 2 tests will be carried out field trials, namely: (1) Small-scale trials, in this trial practical questionnaires will be distributed to 10 PTB students. (2) Large-scale trials, in small-scale trials practical questionnaires will be distributed to 30 PTB students. The analytical formula applied in analyzing the data is:

Validity test

Formula (1) used in processing data from expert appraisal questionnaire results to obtain validity results can be seen in equation 1 [11]:

$$\bar{x} = \frac{\sum x}{n} \quad (1)$$

note:

$\bar{x}$ = Average score

$\sum x$ = Total score

Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 10 No.3 September 2023
http://cived.ppj.unp.ac.id/index.php/CIVED

n = Total value

After getting the results of the average validity score, it is continued to convert the rating scale to four. The conversion table can be seen in Table 1.

Table 1: Conversion of scores on a scale of four (4)

No.	Score Intervals	Mark	Category
1	$x \geq 3{,}00$	A	Very Valid
2	$3{,}00 > x \geq 2{,}50$	B	Valid
3	$2{,}50 > x \geq 2{,}00$	C	Less Valid
4	$x < 2{,}00$	D	Not Valid

Practicality Test

Formula (1) used in processing data from expert appraisal questionnaire results to obtain validity results can be seen in equation 2 [11]:

$$\bar{x} = \frac{\sum x}{n} \quad (2)$$

note:

$\bar{x}$ = Average score

$\sum x$ = Total score

n = Total value

After obtaining the results of the average validity score, it is continued to convert the rating scale to four. The conversion table can be seen in Table 2.

Table 2: Conversion of scores on a scale of four (4)

No.	Score Intervals	Mark	Category
1	$x \geq 3{,}00$	A	Very Practical
2	$3{,}00 > x \geq 2{,}50$	B	Practical
3	$2{,}50 > x \geq 2{,}00$	C	Less Practical
4	$x < 2{,}00$	D	Impractical

RESULTS AND DISCUSSION

The results of this development are in the form of Kodular-based learning media products in the *apk.* format that using kodular through the 4D development stage model. Each stage was carried out during development with the following description:

Define

In the definition stage, the researcher carried out 4 stages, namely: (1) front-end analysis, this stage was to identify the problems that occured during the learning process. The problems found is that many applications are needed to open learning media provided by lecturers and there is still no kodular interactive learning media in Engineering Mechanics I course. (2) Learner analysis, the problem encountered in students is that students need learning media which can contain various forms of learning media so as to reduce distraction during learning. (3) Concept Analysis, at this stage conducting an analysis of the course concept. (4) Specifying Instructional Objectives, at this stage formulating objectives.

EISSN: 2622-6774
Vol 10 No.3 September 2023
http://cived.ppj.unp.ac.id/index.php/CIVED

Design

At this stage the researcher carried out in 4 stages, namely: (1) Constituting criterion-referenced tests, namely conducting validity and practicality questionnaires of learning media. (2) Media Selection, this stage selects the media to be developed based on the results of the define stage. The selected media is interactive learning media (3) Format Selection, at this stage selecting the application format. In developing this learning media, the APK format was chosen. (4) Initial Design, this stage is the design process of learning media, starting with making flowcharts, story-boards, to making learning media with codular.

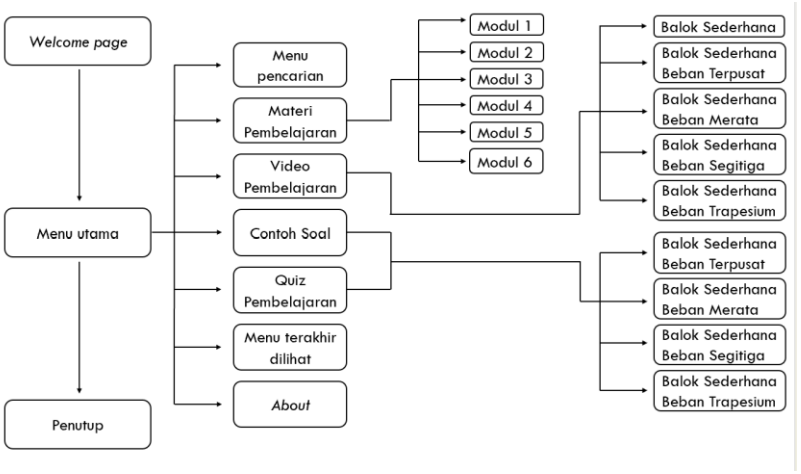

Figure 1. Making a flowchart of learning media

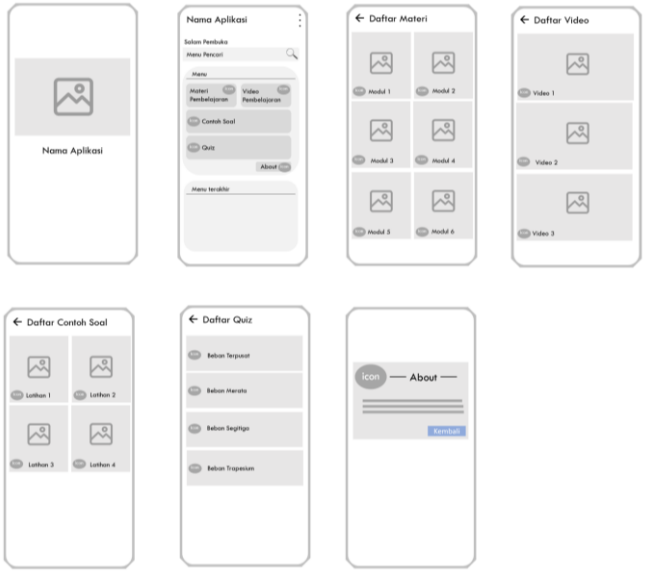

Figure 2. Making story-boards for learning media

EISSN: 2622-6774
Vol 10 No.3 September 2023
http://cived.ppj.unp.ac.id/index.php/CIVED

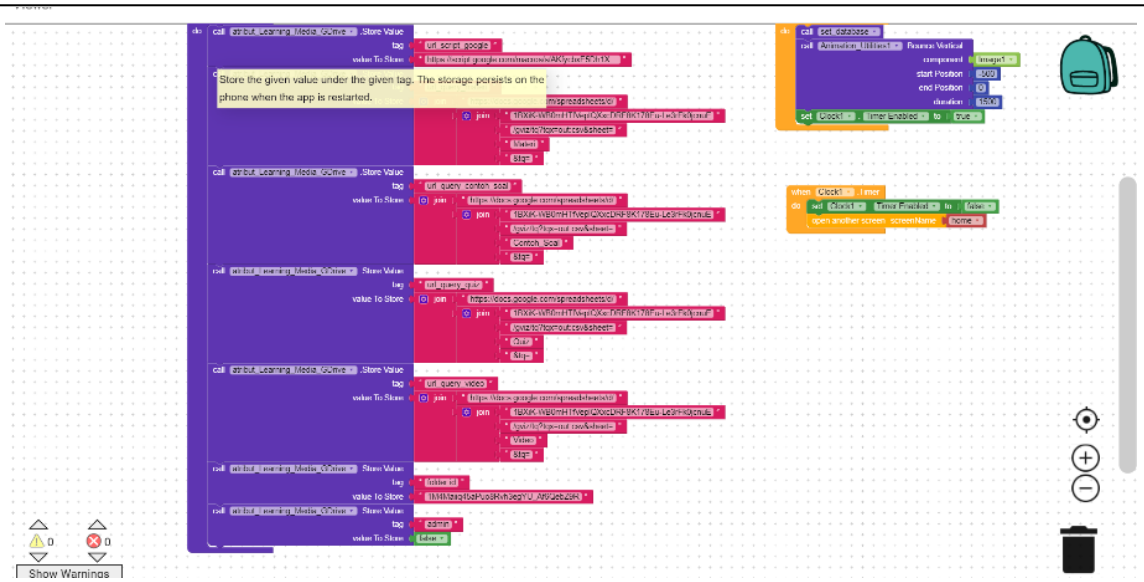

Figure 3. Making learning media using kodular

Development

In this development stage, the researcher carried out 2 stages, namely (1) Expert Appraisal, at this stage validating the Expert Appraisal and (2) Develop Testing, at this stage testing was carried out on students. There are 2 trials for students: (1) small-scale trials and (2) large-scale trials. The results of the validity test by the Expert Appraisal can be seen in Table 3 and Table 4.

Table 3: Results of the validity of learning media by material experts

No.	Aspect	Score average	Category
1.	Completeness	3.90	Very Valid
2.	suitability	3.90	Very Valid
3.	Regularity	3.70	Very Valid
4.	Instructional Redaction	3.80	Very Valid
Final score		3.80	Very Valid

Table 4: Results of the validity of learning media by media experts

No.	Aspect	Score average	Category
1.	Legibility	3.50	Very Valid
2.	Convenience	3.67	Very Valid
3.	Appearance	3,40	Very Valid
4.	Navigation	3.38	Very Valid
5.	Management	3.50	Very Valid
Final score		3.49	Very Valid

The results of the development trials for PTB FT UNP students class of 2022 on small-scale trials can be seen in Table 5. and large-scale trials in Table 6.

Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 10 No.3 September 2023
http://cived.ppj.unp.ac.id/index.php/CIVED

Table 5: Results of small-scale practicality tests

No.	Name	Score average	Category
1.	DIPA	3.00	Very Practical
2.	HS	3.35	Very Practical
3.	LSA	3.61	Very Practical
4.	NL	3.64	Very Practical
5.	RMS	3.03	Very Practical
6.	SY	3.00	Very Practical
7.	SMP	2.50	Practical
8.	MA	3.35	Very Practical
9.	MAA	3.38	Very Practical
10.	FR	3.00	Very Practical
Final Average		3,20	Very Practical

Table 6: Results of practical large-scale tests

No.	Name	Score average	Category
1.	IN	2.94	Practical
2.	Ms	2.94	Practical
3.	FAO	2.94	Practical
4.	Ma	2.94	Practical
5.	MCP	3.35	Very Practical
6.	NAN	3,13	Very Practical
7.	RF	3.45	Very Practical
8.	RFS	2.97	Practical
9.	TDS	3,13	Very Practical
10.	TIM	3,16	Very Practical
11.	AJA	3,10	Very Practical
12.	AR	3.45	Very Practical
13.	RNP	3.45	Very Practical
14.	BC	3.45	Very Practical
15.	KDA	3.03	Very Practical
16.	KK	3.61	Very Practical
17.	LA	3.00	Very Practical
18.	Mau	3.39	Very Practical
19.	MAI	2.81	Practical
20.	MN	2.94	Practical
21.	RI	3.00	Very Practical
22.	RSR	3.35	Very Practical
23.	RKS	3,16	Very Practical
24.	RSS	3,10	Very Practical
25.	MRA	3.03	Very Practical
26.	NSL	2.94	Practical
27.	RS	3.35	Very Practical
28.	AM	3.03	Very Practical
29.	PND	3.06	Very Practical

30.	SD	3,16	Very Practical
Final score		3,15	Very Practical

Dissemination

The final stage in this development is product dissemination. The dissemination stage is carried out by entering the final product developed into the Playstore.

The results produced by this development research are in the form of interactive learning media in the *apk.* format. The results of this study stated that the products that had been developed by applying the 4D development model were declared valid based on the results of the validity of expert appraisal (media and material experts) and practically based on field trials on students (large and small scale trials). The feasibility of interactive learning media based on codular applications shows that this learning media is very suitable to be used as a supporting medium by students in the learning activities of Engineering Mechanics I course which provides new experiences in learning to use gadgets and minimizes distractions that might occur when carrying out learning. The material provided in this learning media varies greatly from the form of e-modules, learning videos, to practice questions and evaluations in the form of quizzes that can be done in the answer box provided. In addition, Android-based learning media provides good things in the cognitive, meta-cognitive, affective and socio-cultural dimensions [12].

According to the conformity of opinion [13] the role of a learning media is as a tool in increasing student motivation to learn so that students more easily understand the material and are able to expand beyond the classroom boundaries. This can be proven through the results of student response questionnaires in the practicality test which can be concluded, "This codular-based interactive learning media makes it easier and motivates me to understand simple block material".

The results of this study are also in line with the results of the study [14]. This study uses codular media on the sine and cosine rules material. This study obtained very feasible results, with the conclusion that the media was considered worthy of being used as a learning medium in supporting students to understand learning material. In line with [15]. The results of this study indicate that the feasibility of Engineering Mechanics I learning media with Adobe Flash is 3.47, included in the very feasible category to use.

CONCLUSION

The conclusions obtained are in accordance with the results of the research and discussion, namely that this research develops interactive learning media with the help of codular applications in Engineering Mechanics I course.This development applies the Research & Development (R&D) type of research and applies the 4D development model. The results of this development research found that the criteria were very suitable as learning media and practical for students to use in Engineering Mechanics I learning. This conclusion was obtained after validating 3 expert appraisals. Expert appraisal in the media sector obtained a final result of 3.80 with very feasible criteria and an Expert Appraisal in the material sector obtained a final result of 3.49 with very feasible criteria. The results of the 2022 UNP PTB student questionnaire on testing the practicality of codular application-based interactive learning media in the Engineering Mechanics course I obtained 2 results, namely on a small scale with a final score of 3.20 get the very practical category.

REFERENCE

[1] Silalahi, Juniman. (2017). Analisis Statis Struktur Tertentu: Statika. Padang: UNP Press Padang.

[2] Kustandi, Cecep dan Darmawan, D. (2020). Pengembangan Media Pembelajaran Konsep dan Aplikasi Pengembangan Media Pembelajaran bagi Pendidik di Sekolah dan Masyarakat. Jakarta: Kencana.

[3] Yaumi, Muhammad. (2018). Media dan Teknologi Pembelajaran. Jakarta: Kencana.

[4] Kisworo, Marsudi Wahyu. 2016. Revolusi Belajar. Jakarta: Asik Generation.

[5] Supardi, Y. 2014. Semua Bisa Menjadi Programer Android. Jakarta:Elex Media Komputindo.

[6] R. Muhammad, "Penggunaan Media Pembelajaran Berbasis Aplikasi Android Pada Pembelajaran Teks Eksposisi," *diksi.* , vol. 29, no. 2, hlm. 205-215, 2021. https://doi.org/10.21831/diksi.v29i2.36614

[7] Setiawan, R, "Rancang bangun media pembelajaran berbasis android tanpa coding semudah menyusun puzzle". Jurnal Sistem Informasi dan Sains Teknologi, vol . 2 No. 2, hlm. 1–7, 2020. https://doi.org/10.31326/sistek.v2i2.729

[8] Thiagarajan, S., Semmel, D. & Semmel, M. I. (1974). Instructional Development for Training Teachers of Expectional Children. Minnesota: Leadership Training Institute, University of Minnesota.

[9] Prawiyogi, Anggy Giri , T. L. Sadiah, A. Purwanugraha, P. N. Elisa. "Penggunaan Media Big Book untuk Menumbuhkan Minat Membaca di Sekolah Dasar".Jurnal Basicedu, vol. 5 No. 1, hlm. 446-452. https://doi.org/10.31004/basicedu.v5i1.787

[10] Hadi, Sutrisno. (1991). Analisis Butir untuk Instrumen. Yogyakarta: Andi Offset.

[11] M. Djemari. (2008). Teknik Penyusunan Instrumen Tes dan NonTes. Jogjakarta: Mitra Cendikia Jogjakarta.

[12] G. S. Thaha, S. Wakhinuddin, Ambiyar, M. Mukhlidi, dan I. Dedy, " Pengembangan Media Pembelajaran Berbasis Android- Pembelajaran Inovatif Untuk Meningkatkan Kompetensi Siswa SMK," *ZONAsi:Jurnal Sistem Informasi.* , vol. 4, Edisi khusus 2022. https://doi.org/10.31849/zn.v4i.12450

[13] Noor, Muhammad. (2010). Media Pembelajaran Berbasis Teknologi. Jakarta: PT. MULTI KREASI SATU DELAPAN.

[14] S. A. R. Achmad, "Pengembangan Media Mobile Learning Menggunakan Kodular Pada Materi Aturan Sinus Cosinus", *Skripsi. UIN Syarif Hidayatullah Jakarta*, 2022. https://repository.uinjkt.ac.id/dspace/handle/123456789/61697

[15] M. Fauzi, P.Zola, "Pengembangan Media Pembelajaran Berbasis Adobe Flash Pada Mata Kuliah Mekanika Rekayasa 1 Program Studi Pendidikan Teknik Bangunan FT UNP" asce, vol. 3, No. 2, 2022. https://doi.org/10.24036/asce.v3i2.392566

Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 10 No.3 September 2023
http://cived.ppj.unp.ac.id/index.php/CIVED