Development Of Mobile Learning Media as Efforts to Support Blended Learning in The Eyes Basic Programming Lessons Engineering Expertise Program Computer and Informatics

Mohammad Nasikhun Amin[a,1,*], **Dwitha Fajri Ramadhani** [a,2], **Heru Wahyu Herwanto**[a,3]

[a]Faculty of Engineering, Universitas Negeri Malang, Malang, Indonesia

[1]nasikhunamin.1605336@students.um.ac.id, [2] dwitha.fajri.1605336@students.um.ac.id, [3]heru_wh@um.ac.id

*Corresponding author

Article Info	ABSTRACT
	The development of science and technology demands a more effective and innovative learning process that gives rise to various types of technology-based educational innovations. The results of observations and informal interviews at SMKN 1 Kepanjen found that basic programming is a subject that is considered difficult, the time allocation given is also lacking, the methods and media used by teachers have not helped students learn the material, and the use of mobile devices in learning is still lacking. This development research followed ADDIE's steps which consisted of five stages, namely analysis, design, development, implementation, and evaluation. The results of this development research are (1) to produce a mobile learning media product called coding; (2) learning media is stated to be very valid to be used as learning media in terms of the media expert's average score of 96.64% in the very valid category, the mean material expert's validity score is 87.94% in the very valid category, the small group's average score is 85.15% in the very decent category, and the mean score of the large group was 81.90% in the very decent category; and (3) the usefulness of the product is proven through learning independence which is obtained from the student's response of 79.28% in the effective category.

I. INTRODUCTION

Technology-based education provides advantages, namely (1) as a driving force for education, including teachers who are expected to be more appreciative and proactive in maximizing educational potential; and (2) provide broad opportunities for students to take advantage of every potential that exists, which is obtained from unlimited sources [1]. Penetration of mobile devices in life certainly has positive and negative impacts. Surahman and Surjono mention the positive impact of having mobile devices is access to information and communication that is more efficient and facilitates various human jobs in various fields [2]. The negative impact that arises is wasted time due to addiction to social media, games, and others.

Basic programming is a subject taught to SMK students in the Computer Engineering and Informatics expertise program. Basic programming is closely related to discussing the concept of algorithms which are the heart of computers. For some students, it takes some concrete examples in real life to be able to communicate algorithm work procedures in programming. Phenomena in the field show that basic programming subjects are difficult for students to understand because the material is abstract and logical. The learning process which is still limited to lectures is not enough to help students learn basic programming.

Based on informal interviews with teachers of basic programming subjects at SMKN 1 Kepanjen during Practical and Field Studies (KPL) it resulted that teachers were required to complete each material thoroughly while teachers had difficulty explaining material due to a lack of innovative learning resources and limited time in teaching. The results of observations on students found the fact that students thought that the time allocation given for learning basic programming was still lacking. The methods and media used by the teacher

also make students feel bored. This causes students to lack understanding of basic programming material. Based on data taken from class X students in the field of Software Engineering expertise at SMK Negeri 1 Kepanjen, it shows that 96.4% have an Android type smartphone. In a day and a night, 50.9% of students use smartphones for 5-7 hours, while 23.6% use smartphones between 3-5 hours, while 14.5% use smartphones for more than 7 hours, and 10.9% use smartphones less from 3 hours. Another fact of using smartphones for social media and games is that 56.4% of students use them within 3-5 hours, 23.6% use them less than 3 hours, 10.9% use them more than 7 hours, and 9% use them between 5-7 hours.

Meanwhile, only 21.8% of students use smartphones to study for more than 3 hours. The data shows that the use of smartphones by students tends to be greater for social media and games than for studying. The data above provides an illustration what is clear is that the use of mobile devices among students requires good control from parents, teachers, and themselves. Moreover, students themselves must be aware that mobile devices can be used for positive things, not just playing social media and games that disturb free time and have a negative impact on their future.

An innovative learning media is needed to support the learning process and help students achieve learning goals. Sumiharsono and Hasanah argue that learning media is anything that can be used to channel messages so that they can stimulate attention, interest, thoughts, and feelings of learners in learning activities to achieve certain learning goals [3].

The rapid development of mobile technology provides opportunities for everyone to develop mobile learning-based learning media. Mobile learning relates to learning using mobile devices such as PDAs, mobile phones, laptops, and other information technology equipment for learning [4]. Mobile learning allows access to learning anywhere and anytime and allows collaboration with others [5]. Several studies state that the use of mobile learning in learning has proven to be effective in helping students achieve learning goals, such as research conducted by Anas and Sumbawati, Alhafidz and Haryono, and Indahini [6]–[8].

The developed mobile learning media aims to support the blended learning process that combines conventional learning models with the use of information and communication technology-based learning media. Rusman, et al argue that blended learning is a combination of blended learning aspects such as web-based instruction and others with traditional or face-to-face learning [9]. Blended learning can be used to overcome problems that arise in the learning process, while Husamah states that blended learning is effective for developing students' skills [10].

Barnard, et al stated that blended learning has the potential to facilitate student learning independence [11]. Blended learning is able to create a learner-centered learning process. This will increase the sense of responsibility of students because of their involvement and participation in learning. The results of research by Zumbrun, et al state that a responsible attitude towards assignments in learning is an indicator of student learning independence. Based on the background and explanation above, the objectives of this development research

are (1) to develop learning media products as an effort to support blended learning in basic programming subjects; (2) produce valid mobile learning media products according to material experts, media experts, and users; and (3) knowing the usefulness of the product which is known through the independent learning of students.

II. METHOD

The research method used is a research and development method. This development research aims to develop Android-based mobile learning media in basic programming subjects.

Figure 1. Model The model used adopts the ADDIE development model. The ADDIE model is an easy- to-implement development research model. Branch describes the ADDIE model consisting of five stages, namely analyse, design, development, implementation, and evaluation [12]. The development research procedures carried out are as follows:

1. Analyze stage:

This stage is carried out as an initial preparation for designing learning media designs which include needs analysis by means of observation and interviews with teachers who teach basic programming subjects and some students who have already taken programming. basic as well as curriculum analysis by reviewing the basic programming material taught at SMKN 1 Kepanjen.

2. Design stage:

This stage is carried out to design learning media which includes making flowcharts, making storyboards, making prototypes, designing product specifications, and designing the implementation of blended learning in learning media.

3. Development stage:

This stage is carried out to carry out the process of developing learning media which includes material development and product development using the Android Studio IDE tools until no bugs or errors are found which indicate the product is ready to be validated to expert judgment.

4. Implementation stage This:

Stage is the stage carried out for testing learning media to users by dividing into small groups of 8 students and large groups of 36 students to find out user responses regarding the learning media that have been developed. Determining the number of students refers to Arikunto [13].
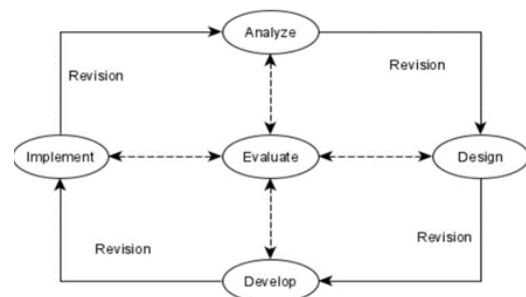

Fig. 1. ADDIE Development

5. Evaluation stage:

This stage is the stage that is carried out at the end of each stage to find out whether the stage is appropriate and declared worthy of going to the next stage.

The data to be collected in this development research consists of qualitative and quantitative data. Qualitative data in the form of suggestions and comments related to the validity of the mobile learning media coding from material experts, media experts and feasibility by learning media users. This data will be used as material for revision of learning media before and after it is implemented. Quantitative data was obtained from assessing the validity of coding mobile learning media by material experts, experts, media, and users through a given questionnaire. These data are also used to measure the usefulness of coding mobile learning media through independent learning.

The data collection instrument used in this development research is a questionnaire. Questionnaires are used to obtain assessments and responses to the media developed by research subjects. The selection of the type of data collection instrument in the form of a questionnaire because of the benefits provided according to the needs in obtaining data. The eligibility criteria for learning media were adapted from Wahono, Mulyanto , and Sungkono [14]–[16] while the usefulness criteria as measured through independent learning were adapted from Sardiman and Fatimah [17], [18].

The data analysis technique used in this development research is a percentage descriptive analysis technique used to process the data collected in the form of a questionnaire. Akbar explains the percentage descriptive analysis technique formula is as follows [19]:

6. Validation data analysis by media experts and material experts:

$$Va = \frac{\sum TSh}{\sum TSm} \; x \; 100\%$$

Pers. 1
Information:
Va = Expert Validity
ΣTSh = Total empirical validity score
Σ TSm = Maximum total score

1. Feasibility data analysis by user respondents:

$$Vp = \frac{\sum TSh}{\sum TSm} \; x \; 100\%$$

Pers. 2
Information:
Vp = User Validity
Σ TSh = Total empirical score of validity
Σ TSm = Maximum total score

2. Analysis of independent learning:

$$Kemandirian = \frac{\sum Skor \; yang \; didapatkan}{\sum Skor \; maksimal} \; x \; 100\%$$

Pers. 3

TABLE 1. CRITERIA FOR THE VALIDITY OF LEARNING MEDIA

Presentase (%)	Kriteria
85,01 - 100	Very valid or can be used without revision
70,01 - 85,00	Enough valid or can be used with minor revisions less valid or can be used with major revisions
50,01 - 70,00	Invalid or cannot be used
01,00 - 50,00	Very valid or can be used without revision

TABLE 2. CRITERIA FOR THE FEASIBILITY AND USEFULNESS OF LEARNING MEDIA

Presentase (%)	Kriteria
81,01 - 100	Very valid, very effective, very practical, very thorough
60,01 - 81,00	Valid, effective, practical, complete
41,01 - 61,00	Less valid, less effective, less practical, less complete
21,01 – 41,00	Invalid, ineffective, impractical, incomplete
01,00 - 21,00	So invalid, so ineffective, so impractical, so incomplete

The value of validity, feasibility, and learning independence will indicate whether the mobile learning coding learning media is valid to use or not and whether it has benefits through student learning independence. The validity criteria refer to Akbar's opinion as follows [19]. To measure the feasibility and usefulness of products through independent learning based on student assessments, the following criteria are also adapted like Table 2 [19]

III. RESULT AND DISCUSSION

The results of the development research that has been carried out are in the form of a mobile learning media product called "Kodingan". Coding learning media contains three basic programming materials, namely (a) repetition control structure; (b) arrays; and (c) function. This learning media can already be installed through the Google Play Store. This learning media is a support for blended learning, later this media is used as a learning reference for students on basic programming material so that Self-Paced Learning is expected, namely independent learning that allows students to learn anytime, anywhere online can be achieved. This media supports collaboration between students and teachers as well as collaboration between students through discussion forums. Face-to-face learning is carried out to clarify the material presented in learning media and improve psychomotor abilities Various features include displaying motivational quotes or articles, question banks, coding dictionaries, games using the Quizziz website, discussion forums, study alarms, and learning evaluations in the form of tests using the *Socrative website*. through practicum. This medium has a variety

The product will be validated by material experts and media experts after it has been developed until no bugs or errors are found. The purpose of material expert validation is to measure and assess the validity of the material and the learning aspects presented in the learning media.

There are five aspects assessed by material experts, namely aspects of software engineering, aspects of learning design,

aspects of visual communication, aspects of presentation, and aspects of usability. The purpose of media expert validation is to measure and assess the feasibility of learning media before being used by users. There are three aspects assessed by media experts, namely aspects of software engineering, aspects of visual communication, and aspects of usability. If the learning media is declared valid by material experts and media experts, the product will be tested on users, namely students at SMKN 1 Kepanjen who are taking basic programming subjects. There are two assessments carried out by users, namely the feasibility assessment and the learning independence of students. The feasibility assessment by the user has five assessment aspects namely software engineering aspects, learning design aspects, visual communication aspects, presentation aspects, and usability aspects. While learning independence there are six aspects of assessment namely aspects of independence from others, aspects of having self-confidence, aspects of having a sense of responsibility, aspects of self-initiative behaviour, and aspects of exercising self-control.

The media validation test is carried out by someone who is considered proficient or competent in the field of developing learning media devices, especially in the field of developing mobile learning- based learning media devices. Media validation was carried out by a lecturer majoring in Electrical Engineering, State University of Malang. Data from media expert validation results can be seen in Table 4.

Based on the results of media expert validation, the results of the assessment of all aspects obtained an average of 96.64%. In detail the aspects of software engineering get a validity value of 95.83% with very valid criteria, the visual communication aspect gets a validity value of 92.30% with very valid criteria, and the usability aspect gets a value of 100% with very valid criteria. These results indicate that coding learning media is in accordance with the functionality of learning media and is suitable for use without the need for revision. Learning media that functions well can make students motivated to continue learn and understand the material presented [20]–[22].

The material validation test is carried out by someone who is considered proficient or competent on the material presented in the developed learning media. Material validation was carried out by teachers in charge of basic programming subjects at SMKN 1 Kepanjen. Material expert validation results data can be seen in Table 5.

TABLE 4. MEDIA EXPERT VALIDATION RESULTS

No	Aspek yang dinilai	TSh	TSm	Va (%)	Kriteria
1	Software engineering	46	48	95,83	very valid
2	Visual communication	48	52	92,30	very valid
3	usability	12	12	100	very valid
	Total	106	112		
	Rerata			94,64	very valid

TABLE 5. MATERIAL EXPERT VALIDATION RESULTS

No	Aspek yang dinilai	TSh	TSm	Va (%)	Kriteria
1	Software engineering	36	40	90	Very Valid
2	Learning design	64	72	88,89	Very Valid
3	Visual communication	21	24	87,5	Very Valid
4	Presentation	41	48	85,41	Very Valid
5	Usefulness	35	40	87,5	Very Valid
	Total	197	224		
	Rerata			87,94	Very valid

Table 6. Results of small group trials Aspects

No	Aspek yang dinilai	TSh	TSm	Va (%)	Kriteria
1	Software engineering	110	128	85,93	Very Worth it
2	Learning design	135	160	84,38	Very Worth it
3	Visual communication	80	96	83,33	Very Worth it
4	Presentation	114	128	89,07	Very Worth it
5	Usefulness	106	128	82,81	Very Worth it
	Total	545	640		
	Rerata		85,15		Very Worth it

Based on the results of the material expert validation, the results of the assessment of all aspects obtained an average of 87.94%. In detail the aspects of software engineering get a validity value of 90% with very valid criteria, the learning design aspect gets a score of 88.89% with very valid criteria, the aspect of visual communication gets a validity value of 87.5% with very valid criteria, the usability aspect gets a score of 85 .41% with very valid criteria and the usability aspect scores 87.5% with very valid criteria. This result indicates that the coding learning media has the validity of the material and has a clear learning design. So that it can be said that coding learning media is very valid to use without the need for revision. The above statement is reinforced by the research results of Cholid AA, and Mustaqim & Kurniawan that material that has very good criteria will have an impact on increasing the quality of the media and can be used for a long time [23], [24].

Small group trials were conducted on 8 students in class X RPL 3 SMKN 1 Kepanjen. The time for the trial was carried out on May 6, 2020, at each student's home because the school implemented learning from home. Researchers and teachers monitor student registration logs through the dashboard that has been provided. At the end of learning each student is asked to take a quiz and the teacher can download the results of the quiz work through the Quizziz platform. The following data from small group trials are presented in Table 6.

Feasible Based on the results of small group trials, the assessment of all aspects obtained an average of 85.15%. In detail the aspects of software engineering get a feasibility score of 85.93% with very feasible criteria, the learning design aspect gets a score of 84.38% with very feasible criteria, the aspect of visual communication gets a feasibility score of 83.33% with very feasible criteria, the presentation aspect gets feasibility

value of 89.07% with very feasible criteria and the usability aspect gets a feasibility value of 82.81% with very feasible criteria. These results indicate that learning media is very suitable for use as learning media. The statement above is reinforced by Elmunsyah, et al that the use of mobile learning media can improve the quality of learning [25].

The large group trial was conducted on 36 students in class X RPL 3 SMKN 1 Kepanjen. The trial period was carried out from 11 May to 15 May 2020 at each student's home because the school implemented learning from home. Researchers and teachers monitor student registration logs through the dashboard that has been provided. At the end of learning each student is asked to take a quiz and the teacher can download the results of the quiz work through the Quizziz platform. The following data from small group trials are presented in Table 7.

Feasible. Based on the results of the large group trial, the results of the assessment of all aspects obtained an average of 81.90%. In detail the aspects of software engineering get a feasibility score of 83.69% with very feasible criteria, the learning design aspect gets a score of 82.09% with very feasible criteria, the aspect of visual communication gets a feasibility score of 82.63% with very feasible criteria, the presentation aspect gets feasibility value of 81.78% with very feasible criteria and the usability aspect gets a feasibility value of 79.51% with feasible criteria. These results indicate that learning media is very suitable for use as learning media. The statement above is reinforced by Elmunsyah, et al that the use of mobile learning media can improve the quality of learning [25]. In addition, the research results of Anas and Sumbawati, Rahmat et al, Alhafidz and Haryono , Indahini also show that the use of mobile devices in learning facilitates the learning process of students [6]–[8], [26].

Learning independence trials were obtained from the results of students' assessments in questionnaires that had been distributed after users used mobile learning media coding. The questionnaire was filled in by class X RPL 1 and X RPL 3 students totalling 36 students. The following data on the results of the student learning independence test are presented in Table 8.

TABLE 7. RESULTS OF LARGE GROUP TRIALS **ASPECTS ASSESSED.**

No	Rated aspect	*TSh*	*TSm*	*Va (%)*	Criteria
1	Software engineering	482	576	83,69	Very Worth it
2	Learning design	591	720	82,09	Very Worth it
3	Visual communication	357	432	82,63	Very Worth it
4	Presentation	471	576	81,78	Very Worth it
5	Usefulness	458	576	79,51	Worth it
	Total	2359	2880		
	Rerata			81,90	Very Worth it

TABLE 8. THE RESULTS OF STUDENT LEARNING INDEPENDENCE THE SCORE

No	Aspek yang dinilai	Skor yang didapat	Skor maksimal	Kemandirian (%)	Kriteria
1	Independence from others	451	576	78,3	effective
2	Confidence	350	432	81,01	very effective
3	Behave discipline	348	432	80,55	effective
4	Have a sense of responsibility	344	432	79,62	effective
5	Behave on own initiative	444	576	77,09	effective
6	Exercise self-control	346	432	80,1	effective
	Total	2283	2880		
	Rerata			79,28	effective

Based on the results of the learning independence trial, the results of the assessment of all aspects obtained an average of 79.28%. In detail, the aspect of independence from others gets a score of 78.3% with the criteria of being effective, the aspect of self-confidence gets a score of 81.01% with the criteria of very effective, the aspect.

of disciplined behaviour gets a score of 80.55% with the criteria of being effective, the aspect of having a sense of responsibility gets a score 79.62% with the criteria of being effective, the aspect of behaving based on one's own initiative gets a score of 77.09% with the criteria of being effective, and the aspect of exercising self-control gets a score of 80.01% with the criteria of being effective. These results indicate that learning media is effective in fostering student learning independence. The above statement is reinforced by Cholid. AA, et al, Kuswanto & Radiansah, Astuti, IAD, et al that the use of mobile learning in learning provides broad learning opportunities for students independently [23], [27], [28].

IV. CONCLUSIONS

Based on the development research that has been done, it can be concluded that (1) produce a mobile learning media called Android-based coding that is used to support blended learning in basic programming subjects. Media can be installed through the Google Play Store with a size of 5 MB; (2) mobile learning coding learning media is considered very valid to be used as a learning medium for basic programming subjects in terms of the percentage of validity from media experts of 96.64% with very valid criteria and the percentage of validity from material experts is 87.94% with very valid criteria. The results of the trial in the small group obtained a percentage of 85.15% with very feasible criteria and a large group of 81.90% with very feasible criteria; and (3) coding mobile learning media is considered useful as evidenced by the assessment of learning independence by students with a percentage of

79.28%. Based on this assessment, the mobile learning coding learning media is effective in fostering student learning independence.

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