Android-Based Network Services Application Learning Media for Vocational High Schools

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Abstract—Digital and communication technology has developed in combination with globalization to ensure quick connectivity and distribution of information. In particular, the quality of education is one of the education challenges that have become a target for urgent solutions. From the various conditions and potentials that exist, efforts that can be made concerning quality improvement in schools are to develop a student-oriented learning system (children center) and facilitate student's needs for learning needs that are challenging, active, creative, innovative, practical, and fun by developing and apply learning based on Information and Communication Technology. This research was generated using the media development method, which refers to Four-D development, which consists of four stages: Define, Design, Develop, and Disseminate, carried out in high school. Vocational class XI Computer and Network Engineering. In this study, the test subjects were students of class XI Computer and Network Engineering at SMK Negeri 8 Padang. The three validator's assessment as a whole, the validator test assessment of Android-Based Learning Media is 94.28%. The validity level can be interpreted as being Very Valid to use. Overall, the practicality assessment of Android-Based Learning Media as a learning resource is 88.46%, so that the level of practicality can be interpreted as Very Practical to use. The evaluation of Android-Based Learning Media's effectiveness of 90.86%, so that the level of significance can be interpreted as Very Good for use.

Keywords—android, learning media, methods, student, network service technology

1   Introduction

Education is not just providing knowledge or values or practicing skills. Education functions to develop what the students have the potential and actual. Empty education glasses must be filled from the outside, but they must have something, more or less has

developed (actualized) or is still a bud (potential). Law Number 20 of 2003 concerning Education implies that education is a fundamental and planned endeavor to build and give birth in a learning environment to humans as learners so that students actively grow their capacity so that they have religious-spiritual force, personality, self-control as human beings with personalities, intellect, abilities, noble character that are useful to society, country, and state. Education can be interpreted as a dynamic influence in developing spiritual, physical, moral, social skills, and feelings to generate an integral person [1][12][18].

Along with globalization, information and communication technology has advanced such that information interaction and distribution can take place quickly [13][14][15]. Computer-based learning is used to function as an individual learning system. Because it works as a particular learning system, the CBI software can facilitate the learning process for individuals who use it. Therefore, CBI software development must consider the principles of learning, learning system planning, and individual learning. Students interact directly with computer-based interactive media in CBI, while teachers act as learning designers and programmers [2][3][16].

In general, the quality of education is one of the education issues that has become a priority for urgent solutions. Efforts that can be made concerning quality improvement in schools are creating a student-oriented learning system (children's center) from the various circumstances, and opportunities and promoting student needs related to learning needs that are demanding, active, imaginative, inventive, efficient, and enjoyable to create and apply knowledge and communication method learning [4][17].

Learning media includes books, tape recorders, cassettes, video cameras, video recorders, films, slides, pictures, drawings, graphics, television, and computers that are physically used to express teaching essential data. Mobile learning promotes learning where its students can access learning materials, instruction, and applications [5].

Android is an operating system designed for cellphones based on Linux, including operating systems, middleware, and open source applications. Firstly, this operating system was developed by Android Inc and was followed by Google Inc [5]. Android-based learning media includes learning materials, video tutorials, practice questions related to digital photo composition subjects. Digital photo composition subjects are subjects in the multimedia department of vocational high schools (SMK) related to how to place various objects captured in the photo frame, whether good or not. The composition of a photo depends on the photo's needs itself. In this learning media, some materials will make it easier for students to use or choose a camera in taking image objects in digital photo composition. This is in line with what stated that multimedia packaged in interactive modules could improve student learning outcomes [6][12].

The principles of designing learning media based on Android are: (1) learning must be fun (challenging, fantasy, and curious), (2) interactivity (dynamic computer support, dynamic social support, activities, and power), and (3) training opportunities that can motivate, match and provide feedback.
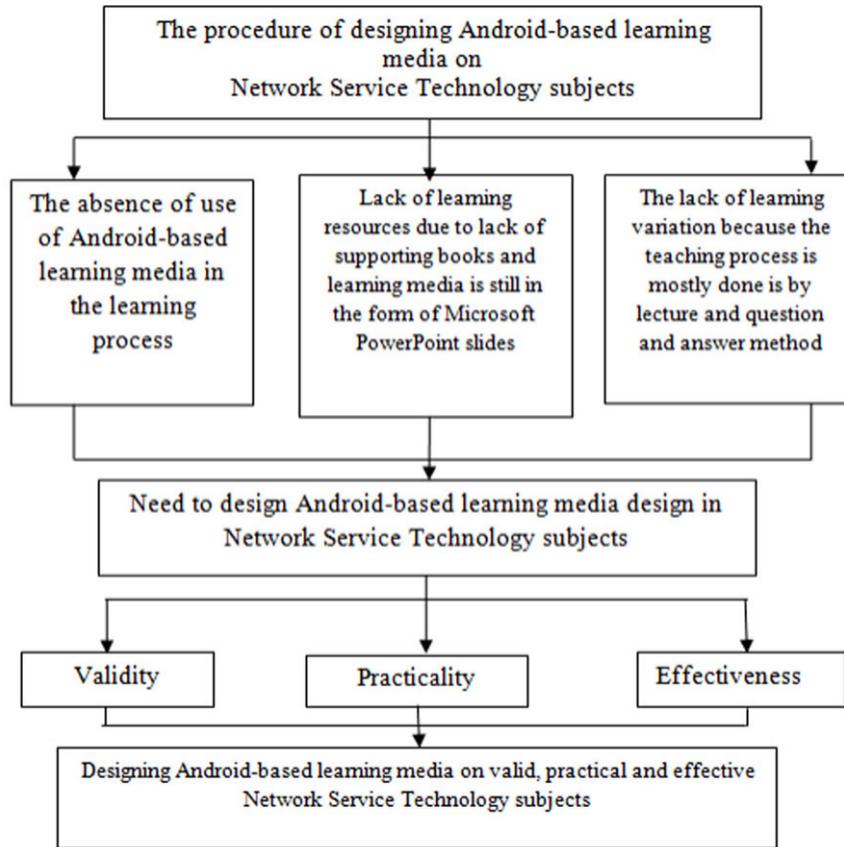
Fig. 1. Framework for research on android-based learning media design

The research objectives of this Android-based learning media are:

a. To make learning media android version as a supplement to computer assembly teaching.
b. To determine the validity, practicality, and effectiveness of Android-based learning media in the XI class network service technology subject majoring in Network Computer Engineering (TKJ) SMK Negeri 8 Padang.

2   Method

Styles This analysis incorporates the research and development approach usually referred to as R&D. (Research and Development). This R&D technique is a testing method used to improve and assess the performance of particular goods. These objects

are not typically in the shape of things or hardware, such as books, stationery, and other learning instruments. In the type of applications, however, [7].

This Adobe Optimized Runtime-based immersive learning media module was built using four-D models. Four-D development, which consists of 4 stages: identifying, planning, creating, and disseminating, relates to the media development model used [8][19].
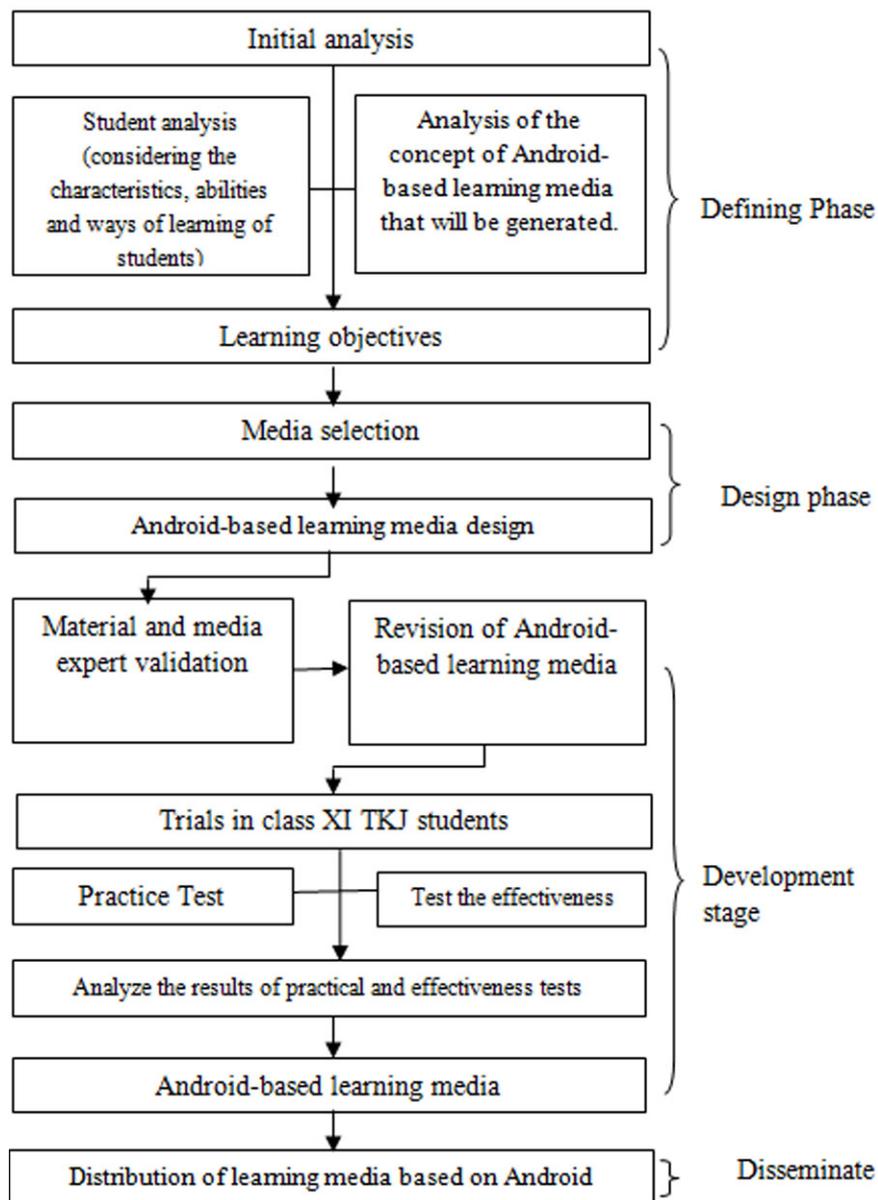

Fig. 2. Research procedure

2.1 Define stage (definition)

The define stage is the stage for determining and defining the terms of learning. This definition includes several steps: preliminary analysis, student analysis, concept analysis, and the formulation/specification of learning objectives.

2.2 Design stage (design)

At this stage, the draft learning device is designed. In this stage, the selection of the media used and the initial product design is carried out.

2.3 Development stage (development)

At this stage, a revised validity, practicality, and effectiveness test were carried out based on the validator's input.

2.4 The Disseminate stage (deployment)

The deployment process is a final design stage. The deployment stage is carried out to promote the design product to be accepted by users, whether individuals, groups, or systems [4].

3 Data analysis

Using descriptive analysis, the data analysis of this research was carried out. The study involves evaluating Android-based learning media's validity, functional analysis of Android-based learning media, and analysis of Android-based learning media's efficacy [9].

3.1 Analysis of validity test

Validity test analysis is based on the validity test sheet, which is carried out in the following steps:

a. Provide score answers with criteria dependent on the Likert scale, namely:

Table 1. Assessment of answers

Selection	Information	Weight	
		Positive	Negative
Strongly agree	SS	5	1
Agree	S	4	2
Doubtful	R	3	3
Disagree	TS	2	4
Strongly Disagree	STS	1	5

b. Determines the highest score
   Highest score = number of validators × number of question items × maximum score.
c. Determine the overall score of each validator by summing up all the results obtained from each predictor.
d. Determine the outcome obtained by the sum of the scores of each validator.
e. The relevance meaning assessment is as follows:

$$NP = \frac{R}{SM} \times 100 \qquad (1)$$

Information:

NP = Percent value sought or which is expected
R = raw score obtained by the validator
SM = Maximum ideal score of the test in question
100 = Fixed Number

f. Provide an assessment of validity with the following criteria:

Table 2. Classification of validity assessment aspects

No	Average value	Rated aspect
1	90%–100%	Very Valid
2	80%–89%	Valid
3	65%–79%	Valid Enough
4	55%–64%	Less Valid
5	<55%	Invalid

g. To find the Frequency Distribution of Validity [10] as follows:

1) Calculating the distance or range (R)
   R = highest data - lowest data
2) Finding the number of classes (K)
   K = 1 + 3.3 log the number of validators
3) Calculating the length of the interval class (P)
   P = R / K

3.2 Practicality test analysis

The measures to analyze the functional value of Android-based learning media are as follows:

a. Determines the highest score
   Highest score = number of students × number of question items × maximum score.
b. Determine each student's total score by adding up
c. From each indicator, all the scores were obtained.
d. Determines the score obtained by adding up the scores of each student.

e. Experimental test data for using Android-based learning media were analyzed using the following formula:

$$NP = \frac{R}{SM} \times 100 \qquad (2)$$

Information:

NP = Value percent sought or expected
R = The raw score obtained by students
SM = Maximum ideal score of the test in question (number of respondents × maximum scale)
100 = Fixed Number

f. After the percentages are obtained, the grouping is carried out according to the following criteria:

Table 3. Practicality assessment

No	Score	Rated aspect
1	86%–100%	Very Practical
2	76%–85%	Practical
3	60%–75%	Quite Practical
4	55%–59%	Less Practical
5	<54%	Impractical

g. To find the Frequency Distribution of Practicality as follows:

1) Calculating the distance or range (R)
   R = highest data - lowest data
2) Finding the number of classes (K)
   K = 1 + 3.3 log number of students
3) Calculating the length of the interval class (P)
   P = R / K

3.3 Effectiveness test analysis

The test questions on Android-based learning media's effectiveness were obtained by calculating the scores of students who answered each item as contained in the test questions.

From this, it is analyzed by the percentage technique, which is stated by the following:

$$S = \frac{R}{N} \times 100\% \qquad (3)$$

Information:

NP = expected value
R = The total score of the item or question that was answered correctly
N = Maximum Score of the test

The results obtained are interpreted using the following criteria:

Table 4. Effectiveness assessment

No	Score	Rated aspect
1	86%–100%	Very good
2	76%–85%	Good
3	60%–75%	Pretty good
4	55%–59%	Less
5	≤54%	Very Less

To find the Frequency Distribution of Effectiveness as follows:

1) Calculating the distance or range (R)
   R = highest data - lowest data
2) Finding the number of classes (K)
   K = 1 + 3.3 log (number of validators)
3) Calculating the length of the interval class (p)

4   Results and discussion

4.1   Intro page

An intro page that describes the initial appearance when opening Android-based learning media.

Fig. 3. Intro page

4.2 Main menu page

On the page after the intro, students will enter the main page. We can see some menus that can be used in the image below:

Fig. 4. Main Menu page

4.3 Material page

The material page will display learning material about Network Service Technology subjects equipped with competency achievement indicators and learning objectives.

Fig. 5. Material page

4.4   Video page

On this video page, a learning video of Network Service Technology material will be displayed as shown below:

Fig. 6. Video page

4.5   Evaluation questions page

On the evaluation question page, the question and answer points will be displayed, as shown below:
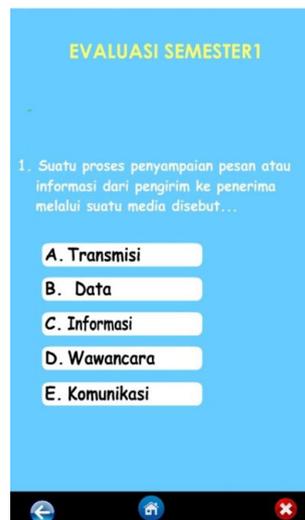

Fig. 7. Evaluation questions page

After students have finished answering all the questions, the evaluation results' scores and scores will be displayed. A display like this is in the evaluation of semester 1 and semester 2. If you press the "repeat" button, it will be redirected back to the starting evaluation page, as shown below:

Fig. 8. Evaluation score page

5 Analysis of validity, practicality, and effectivity

5.1 Analysis of validity test

The task of the validator is to assess Android-based learning media. The validator will offer evaluation, feedback, and analysis on making Android-based learning media. The three experts validated the Android-based learning media expert by filling out the questionnaire by filling out a questionnaire on the learning media. The first and second validators were lecturers at the Faculty of Teacher Training and Education at Putra Indonesia University, "UPI YPTK" Padang. The third validator was a Teacher from Network Service Technology at SMK Negeri 8 Padang.

The evaluation of the validator for Android-based learning media, in terms of (1) Feasibility of content: 92.00%; (2) Language components: 96.67%; (3) parts of the presentation: 91.11%; (4) Graphic Components 97.33%. Overall, the validator test assessment of Android-based learning media is 94.28%, so that the Android-based learning media can be said to be very valid for learning Network Service Technology.

The findings of the validator test in the use of Android-based learning media that we can see in Table 12 above are the data from the average validity score, searching for data with the following formula:

$NP = \times 100$
$NP = \times 100 = 94.33\%$ with very valid criteria

Android-based learning media's validity data through validity trials of 3 validators with 20 questions saw an average value of 92.71%. It can be said that the level of validity of Android-based learning media is stated to be very valid to use for class XI in the subject of Jarnigan Service Technology in the Academic Year 2019/2020. To get a clear picture of the distribution of the validity, questionnaire scores can be seen in Table 5 and Figure 9:

Table 5. Frequency distribution of the validity questionnaire score

No.	Class–Interval	F0	F (%)
1.	93	1	33,33
2.	94	1	33,33
3.	96	1	33,33
	Total	3	100

Based on Table 5, it can be explained that the frequency distribution and level of attainment of the validator in calculating the distance or range (R) are 3 ranges, the number of classes (K) is 3. The class length (P) is 1. In range 93, there is a validator with a percentage of 33, 33%, in field 94, there is one validator with a ratio of 33.33%, and in the range of 96%, there is one validator with a percentage of 33.33%.
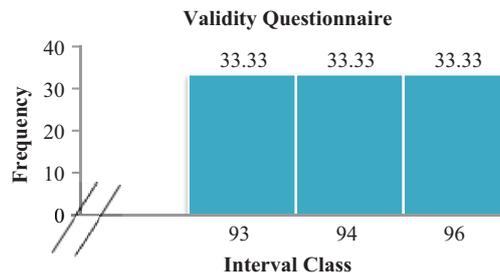

Fig. 9. Histogram of validity questionnaire

Based on Figure 9, it can be explained by the interval class length, namely 4, in range 93, there is 1 validator with a frequency of 33.33, in field 94, there is one validator with a frequency of 33.33, and in range 96 there is one validator with a frequency of 33.33.

5.2 Practicality test analysis

Practicality testing is used to determine the level of practicality of Android-based learning media, trials conducted by 35 students. The assessed aspects consist of conditions of use, the effectiveness of learning time, and benefits comprised of 18 questions. The factors assessed in the practicality test comprised 18 statement items, namely 8 statement items for the state of use, 5 items for the statement for the effectiveness of learning time, and 5 items for benefits.

Assessment of 35 students for Android-based learning media in terms of (1) State of Use: 88.57%; (2) Learning Time Effectiveness: 88.23%; (3) Benefit: 88.57%. Overall, the practicality test assessment for Android-based learning media was 88.46%.

The Android-based learning media could be efficient for students to use for learning Network Service Technology for class XI TKJ at SMK Negeri 8 Padang.

The results of the student practicality test using Android-based learning media search for data using the formula below:

$NP = \times 100$

$NP = \times 100 = 88.46\%$ with very practical criteria

Experimental data of Android-based learning media through validity trials of 35 students with 18 questions saw an average value of 88.46%. It can be said that the level of validity of Android-based learning media is stated to be very practical to use for class XI in Network Service Technology subjects in the Academic Year 2019/2020) [11].

Questionnaire scores can be used in Table 6 and Figure 10 to get a better view of the distribution of validity:

Table 6. Frequency distribution of questionnaire practicality scores

No.	Class–Interval	F0	F(%)
1.	64–68	4	11,43
2.	69–73	3	8,57
3.	74–78	7	20,00
4.	79–83	6	17,14
5.	84–88	12	34,29
6.	89–90	3	8,57
	Total	35	100

Based on Table 6, it can be explained that the frequency distribution and level of practicality achievement in calculating the distance or range (R) are 26 ranges, the number of classes (K) is 6. The length of the interval class (P) is 4. In the field 64–68, there are 4 respondents with a percentage of 11.43%, in the range 69–73, there were 3 respondents with a ratio of 8.57%, in the field of 74–78 there were 7 respondents with a percentage of 20.00%, in the range 79–83 there were 6 respondents with a ratio of 17, 14%, in the range 84–88 there are 12 with a percentage of 34.29% and in the field 89–90 there are 3 respondents with a ratio of 8.57%.
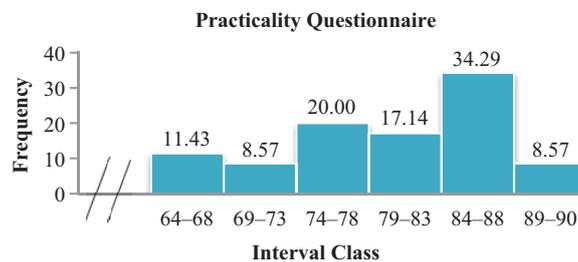

Fig. 10. Histogram for practicality questionnaire

Based on Figure 10, it can be explained by the length of the interval class, namely 6, in the range 64–68 there are 4 respondents with a frequency of 11.43, in the range

69–73, there are 3 respondents with a percentage of 8.57, in the range 74–78 there are 7 respondents with frequency 20.00, in the range 79–83 there are 6 respondents with a frequency of 17.14, in the range 84–88 there are 12 respondents with a frequency of 34.29 and in the field 89–90 there are 3 respondents with a percentage of 8.57.

5.3 Effectiveness test analysis

At this stage, the activity is focused on evaluating whether the Android-based learning media used is useful for increasing learning activities. The aspects that are assessed on the effectiveness test consist of 40 items.

Students very well use the assessment of 35 students for Android-based learning media for learning Network Service Technology.

The results of the student effectiveness test using Android-based learning media where the data are seen from the effectiveness value shown in the table above looking for data using the following formula:

$$S = \times 100$$
$$NP = \times 100 = 90.86\% \text{ with very good criteria}$$

Data on Android-based learning media's effectiveness by testing the efficacy of 35 students with 40 items seen the effectiveness value of 90.86%. It can be said that the level of effectiveness of Android-based learning media is stated to be very well used in the subject of Network Service Technology class XI TKJ at SMK Negeri 8 Padang in the 2019/2020 Academic Year [11].

To get a clear picture of the frequency distribution of the effectiveness test scores as in Table 7 and Figure 11:

Table 7. Frequency distribution of the effectiveness of test question scores

No.	Class–Interval	F0	(F%)
1.	60–66	2	5,71
2.	67–73	3	8,57
3.	74–80	4	11,43
4.	81–86	2	5,71
5.	87–93	2	5,71
6.	94–100	22	62,86
	Total	35	100

Based on Table 10, it can be explained that the frequency distribution and level of achievement of the validator in calculating the distance or range (R) are 40 ranges, the number of classes (K) is 6. The length of the interval class (P) is 7. In the 60–66 field, there are 2 respondents with a percentage of 5.71%, in the range 67–73, there were 3 respondents with a ratio of 8.57%, in the range of 74–80 there were 4 respondents with a percentage of 11.43%, in the field 81–86 there were 2 respondents with a ratio of 5, 71%, in the range 87–93 there were 2 respondents with a percentage of 5.71% and in the field 94–100 there were 3 respondents with a ratio of 62.86%.
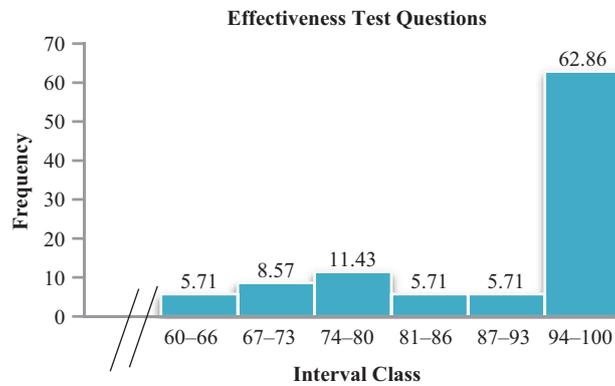
Effectiveness Test Questions

Fig. 11. Histograms for the effectiveness test

In Figure 11, it can be explained by the length of the interval class, namely 6, in the range 60–66, there are 2 respondents with a frequency of 5.71, in the range 67–73 there are 3 respondents with a percentage of 8.57, in the range 74–80 there are 4 respondents with frequency 11.43, in the range 81–86 there are 2 respondents with a frequency of 5.71, in the range 87–93 there are 2 with a frequency of 5.71 and in the field 94–100 there are 22 respondents with a frequency of 62.86.

6   Conclusion

It can be inferred as follows, based on the definition, data analysis, and creation of Android-based learning media :

6.1 Validity through the validator test assessment of Android-based learning media is 94.28%. The validity level can be interpreted as very valid for use in the Network Service Technology subject for class XI TKJ at SMK Negeri 8 Padang.

6.2 The practicality of Android-based learning media is 88.46%. The usefulness level can be interpreted to be very practical to use in Network Service Technology class XI TKJ at SMK Negeri 8 Padang.

6.3 The effectiveness of Android-based learning media is 90.86%. The significance level can be interpreted to be very well used in Network Service Technology class XI TKJ at SMK Negeri 8 Padang.

In the use of learning media to support better learning, the following are suggested: 1) It is better if teachers are required to be able to create learning media that can generate learning interest, which can affect satisfactory student learning outcomes and by learning objectives, because From the research obtained by the author, currently, middle-level students do not like learning more, students feel bored, bored and not interested in learning. This is caused by several factors such as the absence of attractive learning media, lack of interest and motivation to learn, and inadequate facilities and infrastructure. 2) For policymakers in education, it is recommended that they provide a source of funds, facilities and infrastructure, and other facilities so that educational goals can be adequately conveyed, learning activities in class are maximized, and the

holding of training to improve teacher professionals so that they can be more creative in delivering learning.

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