

# Development of Android-Based Network Service Technology Learning Media for Vocational Middle School Students

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**Abstrak**—Teknologi informasi dan komunikasi telah berkembang seiring dengan globalisasi sehingga interaksi dan penyampaian informasi akan semakin cepat. Salah satu permasalahan dalam pendidikan yang menjadi prioritas untuk segera dicarikan solusinya adalah masalah kualitas pendidikan, khususnya kualitas pembelajaran. Dari berbagai kondisi dan potensi yang ada, upaya yang dapat dilakukan terkait peningkatan mutu di sekolah adalah dengan mengembangkan sistem pembelajaran yang berorientasi pada siswa (children center) dan memfasilitasi kebutuhan siswa akan kebutuhan belajar yang menantang, aktif, kreatif, inovatif, praktis, dan fun dengan mengembangkan dan mengimplementasikan pembelajaran berbasis Teknologi Informasi dan Komunikasi Penelitian ini merupakan penelitian Research and Development dengan model pengembangan media yang digunakan mengacu pada tipe pengembangan Four-D yang terdiri dari 4 tahap yaitu Define (mendefinisikan), Design (desain), Develop (pengembangan) dan Disseminate (penyebarluasan) yang dilaksanakan di SMK kelas XI Teknik Komputer dan Jaringan. Subjek uji dalam penelitian ini adalah siswa kelas XI Teknik Komputer dan Jaringan SMK. Hasil penilaian keseluruhan ketiga validator terhadap penilaian uji validator Media Pembelajaran Berbasis Android adalah 94,28%, sehingga tingkat validitas dapat diartikan Sangat Valid untuk digunakan. Secara keseluruhan penilaian kepraktisan Media Pembelajaran Berbasis Android sebagai sumber belajar adalah 88,46%, sehingga tingkat kepraktisan dapat diartikan Sangat Praktis untuk digunakan. Serta penilaian keefektifan Media Pembelajaran Berbasis Android sebesar 90,86%, sehingga tingkat keefektifan dapat diartikan sangat baik untuk digunakan.

**Kata Kunci:** Android; Learning Media; Methods; Students; Network Service Technologists

**Abstract**—Information and communication technology have developed along with globalization so that interaction and information delivery will quickly. One of the problems in education that is a priority to immediately find a solution is the problem of the quality of education, especially the quality of learning. From various existing conditions and potentials, efforts that can be made regarding quality improvement in schools are to develop a student-oriented learning system (children center) and facilitate students' needs for learning needs that are challenging, active, creative, innovative, practical, and fun with developing and implementing Information and Communication Technology-based learning This research is a Research and Development research with the media development model used referring to the type of Four-D development consisting of 4 stages, namely Define (defining), Design (design), Develop (development) and Disseminate (dissemination) which is carried out in Vocational High School class XI Computer and Network Engineering. The test subjects in this study were students of class XI Computer and Network Engineering SMK. The results of the three validators' overall assessment of the validator test assessment of Android-Based Learning Media is 94.28%, so the level of validity can be interpreted as Very Valid for use. Overall, the practicality assessment of Android-Based Learning Media as a learning resource is 88.46%, so the practicality level can be interpreted as Very Practical to use. As well as the assessment of the effectiveness of the Android-Based Learning Media of 90.86%, so that the level of effectiveness can be interpreted as very good for use.

**Keywords:** Android; Learning Media; Methods; Students; Network Service Technologists

## 1. INTRODUCTION

Education is not just about imparting knowledge or values or training skills. Education functions to develop what students potentially have. Education is not an empty glass that must be filled from the outside. They already have something more or less developed (actualized) or not at all still budding (potential). Law Number 20 of 2003 concerning Education implies that education is an essential and planned effort to realize and give birth to humans as students in a learning atmosphere so that students actively develop their potential so that they have religious-spiritual strength, personality, self-control as a human personality, intelligence, skills, a noble character that is useful for society, nation, and state. So, education can be interpreted as a dynamic influence in developing spiritual, physical, moral skills and a social sense that can create an integral personality [1]. Information and communication technology have developed along with globalization so that interaction and information delivery will quickly. Computer-based learning (CBI) functions as an individual learning system (individual learning). Because it functions as a personal learning system, CBI software can facilitate learning for individuals who use it. Therefore, the development of CBI software must consider the principles of learning, the principles of planning learning systems, and the principles of individual learning. Students interact directly with computer-based interactive media in CBI, while teachers act as designers and learning programs [2].

One of the problems in education that is a priority to immediately find a solution is the problem of the quality of education, especially the quality of learning. From various existing conditions and potentials, efforts that can be made regarding quality improvement in schools are to develop a student-oriented learning system

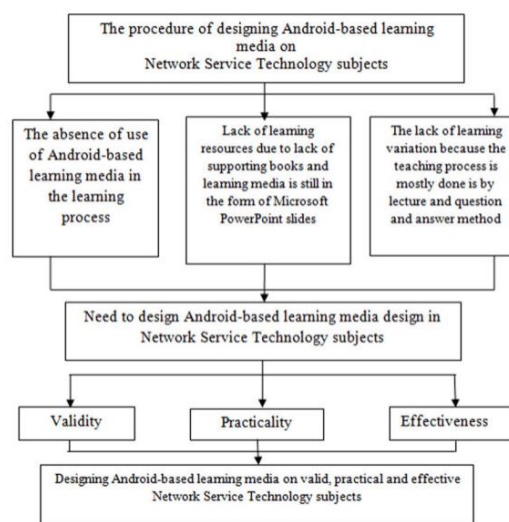
(children center) and facilitate students' needs for learning needs that are challenging, active, creative, innovative, practical, and fun with developing and implementing Information and Communication Technology-based learning [3]. In the teaching and learning process (PBM), the teacher has a role in teaching students to achieve educational goals, namely forming intelligent, skilled, and virtuous human beings. In addition to using appropriate and varied methods in delivering material, a teacher also needs supporting media to increase student motivation in learning. However, the desired learning outcomes have not been obtained with the limited media used.

Therefore the learning media for Android-based Network Service Technology can help the learning process, wherein the Android-based learning media is in the form of theories, pictures, shapes that can be shown, learning videos, and most importantly, there is a competency test in the form of exercises and can see how far the students' abilities are. Which can focus students' attention on learning and not get bored in the learning process because learning is considered more exciting and has variety. Learning media includes tools that are physically used to convey the content of teaching materials, which consist of, among others, books, tape recorders, cassettes, video cameras, video recorders, films, slides (picture frames), photos, pictures, graphics, television, and computers [4].

Learning media based on Android Smartphones include learning materials, video tutorials, practice questions related to digital photo composition subjects. The subject of digital photo composition is a subject in the multimedia department of vocational high schools (SMK) that deals with how to place various objects that are photographed in the photo frame. Whether or not the composition of a photo is suitable depends on the needs of the image itself. Compositions can be made by adjusting the object to be photographed or by changing the angle (angle of capture) and the choice of lenses for shooting things that cannot be altered. To assist students in understanding the material in this digital photo composition subject, it is essential to develop learning media based on Android Smartphones. There are materials in this learning media that will make it easier for students to use or choose a camera to take image objects in digital photo compositions. This is in line with what was conveyed by IndraWijaya (2017) [5] that multimedia packaged in the form of interactive modules can improve student learning outcomes.

Computer-based learning is a learning program used in the learning process by using computer software (learning CD) in the form of a computer program that contains learning content, including title, learning material objectives, and learning evaluation [6]. Information and communication technology, or computers, are adequate in facilitating, equipping, and facilitating students' absorbing knowledge. The use of multimedia aspects makes computer-based learning more exciting and fun. As a learning media created by technology, this Android-based learning media is expected to change the conventional learning climate into an active, exciting, and fun learning environment. Android-based learning media developed in an Android application based on Adobe AIR (Adobe Integrated Runtime) that can be run on Android-based mobile devices. So that the learning media set can be run anytime and anywhere, this learning media is included in the category of mobile learning-based learning media.

The principles of designing this Android-based learning media are: (1) learning should be fun (challenging, fantasy, and curious), (2) interactivity (dynamic computer support, dynamic social support, outside activities, and power), and (3) practice opportunities that can motivate, match, and provide feedback.



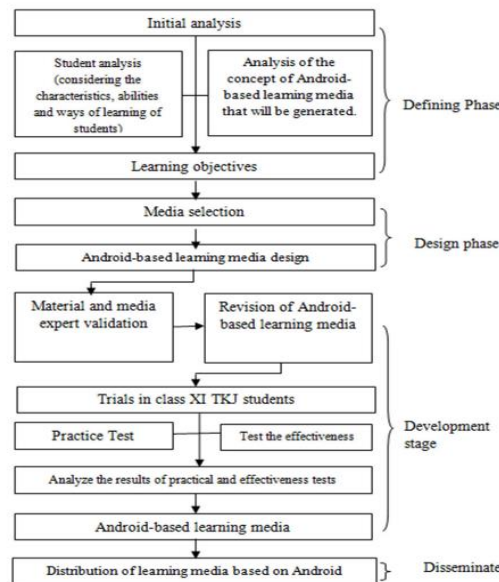
**Figure 1.** Thinking Framework for Design Research Android Based Learning Media

In detail, the research objectives of this android-based learning media are: 1) To make android-based learning media as a supplement to computer assembly learning, 2) To find out the validity, practicality, and effectiveness of android-based learning media on the subject of Network Service technology class XI of the Computer Network Engineering Department of SMK.

## 2. RESEARCH METHODOLOGY

This type of research uses research and development, commonly referred to as R&D (Research and Development). This research and development method is a research method used to produce specific products and test the effectiveness of these products. These products are not always in the form of objects or hardware, such as books, stationery, and other learning tools. However, it can also be in the form of software [7].

This interactive learning media based on Adobe Director was developed using four-D models. The media development model used refers to the type of Four-D development, consisting of 4 stages, namely Define, Design, Develop and Disseminate [8].



**Figure 2.** Research Procedure

### 2.1 Define Stage

The define stage is the stage to define and define the learning requirements. This defined stage includes several final steps, student analysis (learner analysis), principal, the initial analysis of concept analysis, and the formulation of learning objectives (specifying instructional purposes).

- a. Early Analysis Late  
Recent analysis activities were carried out to determine the fundamental problems needed in the design and manufacture of Android-based learning media.
- b. Student Analysis  
Student analysis is a student characteristic by the design and manufacture of Android-based learning media.
- c. Concept Analysis  
Concept analysis aims to identify, detail, and systematically compile relevant concepts to be taught based on the initial to final analysis.
- d. Formulation / Specification of Learning Objectives  
This stage is carried out to formulate the results of student analysis and concept analysis to become indicators of achievement of learning outcomes which then become learning objectives.

### 2.2 Design Phase (Design)

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

- a. Media Selection  
Media selection is done to determine the appropriate media to deliver the subject matter. The media selection process is adjusted to the previous concept analysis and student characteristics.
- b. Initial Design  
Thiagarajan divides the design phase into four activities: constructing criterion-referenced test, media selection, format selection, and initial design. Activities carried out at this stage include:

**Tabel 1.** Activities carried out

Option	Quality	
	Positive	Negative
Strongly agree	5	1

Option	Quality	
	Positive	Negative
Agree	4	2
Uncertain	3	3
Disagree	2	4
Strongly Disagree	1	5

- Develop criteria tests as the first action to determine the initial abilities of students and as an evaluation tool after the implementation of activities.
- Choose learning media according to the material and characteristics of students.
- The selection of the form of presentation of learning is adjusted to the learning media used.
- It was simulating the presentation of material with the media and learning steps that have been designed.

### 2.3 Development Stage (Development)

At this stage, the validity, practicality, and effectiveness tests were revised based on the input given by the validator.

#### a. Validity test

This test aims to determine the feasibility of using Android-based learning media in the subject of Network Service Technology. The steps for validating Android-based learning media to the validator are as follows:

- Requesting the validator's willingness to see the use of Android-based learning media in the subject of Network Service Technology.
- Asking validators to conduct an assessment of Android-based learning media in the subject of Network Service Technology.
- After the assessment, the researcher revised the Android-based learning media in Network Service Technology.

After the validity test, the authors revised the Android-based learning media based on suggestions from the validator.

#### b. Practical Test

Students carry out the practicality test with the following steps:

- Provide direction to students on how to fill out the assessment questionnaire.
- Students are directed to observe the use of Android-based learning media in Network Service Technology by the teacher.
- Students are required to assess the use of Android-based learning media in the subject of Network Service Technology.
- Students are asked to fill out the questionnaire that has been provided.

#### c. Effectiveness Test

After the practicality test, an effectiveness test is carried out, namely a trial of learning media conducted on students, namely by evaluating the learning outcomes test obtained from the teaching-learning process itself. It is helpful to see or examine which students master materials from the learning materials. Using Android-based learning media [8]. Learning test questions are given after students participate in the learning process with Android-based learning media.

### 2.4 Disseminate Stage (Spreading)

The deployment process is the final stage of design. The deployment stage is carried out to promote the design product to be accepted by users, either individuals, groups, or systems.

### 2.5 Data Analysis

The data analysis of this research was conducted using descriptive analysis. The study includes an analysis of the validity of Android-based learning media, an analysis of the practicality of Android-based learning media, and an analysis of the effectiveness of Android-based learning media [9].

#### 2.5.1 Validity Test Analysis

Analysis of the validity test based on the validity test sheet carried out with the following steps:

- Giving a score of answers with criteria based on the Likert scale, namely:  
Table 1. Assessment of Answers
- Determine the highest score  
Highest score = number of validators x number of question items x maximum score.
- Determine the total score from each validator by adding up all the scores obtained from each indicator.
- Determine the score obtained by adding up the scores from each validator.
- Determination of the validity value is as follows:

$$NP = \frac{R}{SM} \times 100 \tag{1}$$

Description :

NP = Percent value sought or expected

R = raw score obtained by the validator

SM = Ideal Maximum Score of the test in question

100 = Fixed Number

- f. Provide a validity assessment with the following criteria:

**Table 2.** Classification of Aspects of Validity Assessment

No	Average value	Category
1	90%-100%	Very Valid
2	80%-89%	Valid
3	65%-79%	Quite Valid
4	55%-64%	Less Valid
5	<55%	Invalid

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

- a) Calculating distance or range (R)

R= highest data – lowest data

- b) Finding the number of Classes (K)

K= 1+3.3 log number of validators

- c) Calculating the length of the class interval (P)

P= R/K

### 2.5.2 Practical Test Analysis

To find out the practical value of Android-based learning media, the following steps are taken:

- a. Determine the highest score

Highest score = number of students x number of question items x maximum score.

- b. Determine the total score of each student by adding up all the scores obtained from each indicator.

- c. Determine the score obtained by adding up the scores of each student. Practical test data on the use of Android-based learning media were analyzed using the following formula:

$$NP = \frac{R}{SM} \times 100 \tag{2}$$

Description :

NP = percent value sought or expected

R = Raw score obtained by students

SM = Ideal maximum score of the test in question (number of respondents x maximum scale)

100 = Fixed Number

- d. After the percentage is obtained, grouping is carried out according to the following criteria:

**Table 3.** Practical Assessment

No	Average Value	Category
1	86%-100%	Very Practical
2	76%-85%	Practical
3	60%-75%	Practical enough
4	55%-59%	Less Practical
5	<54%	Not Practical

- e. To find the Frequency Distribution of Practicality as follows:

- a) Calculating distance or range (R)

R=highest data – lowest data

- b) Find the number of classes (K)

K=1+3.3 log number of students

- c) Calculating the length of the class interval (P)

P= R/K

### 2.6 Analisis Uji Efektifitas

The test questions on the effectiveness of the Android-based learning media it was obtained by calculating the scores of students who answered each item as contained in the test questions. From there, it is analyzed by the percentage technique, which is stated by the following:

$$S = \frac{R}{N} \times 100\% \tag{3}$$

Description:

NP = Expected value

R = Total score of items or questions that are answered correctly

N = Maximum Score of the test

The results obtained are interpreted using the following criteria:

**Table 4.** Effectiveness Assessment

No	Value	Category
1	86%-100%	Very good
2	76%-85%	Good
3	60%-75%	Pretty good
4	55%-59%	Not good
5	≤54%	Not very good

To find the Frequency Distribution of Effectiveness as follows:

- Calculating distance or range (R)  
R= highest data – lowest data
- Finding the number of Classes (K)  
 $K=1+3.3 \log$  (sum of the number of validators)
- Calculating class interval length (P)

### 3. RESULTS AND DISCUSSION

#### 3.1 Intro Page

An intro page describes the initial view when opening an Android-based learning media.



**Figure 3.** Intro page

#### 3.2 Main Menu Page

On the page after the intro, students will enter the main page. Some of the menus that can be used can be seen in the image below:



**Figure 4.** Main Menu Page

#### 3.3 Material Page

On the material page, learning materials will be displayed on Network Service Technology equipped with indicators of competency achievement and learning objectives.



**Figure 5.** Material Page

### 3.4 Video page

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



**Figure 6.** Video page

### 3.5 Evaluation Questions page

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



**Figure 7.** Evaluation Questions page

After students finish answering all the questions, the scores and scores from the evaluation results will be displayed. A display like this is in the 1st semester and 2nd-semester evaluations. If you press the "repeat" button, you will be redirected back to the evaluation start page, as shown in the image below :



**Figure 8.** Intro page

Analysis of Validity, Practicality, and effectiveness.

### 3.6 Validity Test Analysis

The validation of android-based learning media from the validator was carried out to assess the design of android-based learning media. The validator provides assessments, suggestions, and comments on the design of android-based learning media. By filling out the questionnaire provided. Expert validation in Android-based learning media.

Assessment of the validator for Android-based learning media, in terms of aspects (1) Feasibility of content: 92.00%; (2) linguistic component: 96.67%; (3) Presentation component: 91.11%; (4) Graphical Component 97.33%. Overall, the assessment of the validator test on Android-based learning media is 94.28%, so the Android-based learning media can be said to be very valid for learning Network Service Technology.

The results of the validator test in the use of Android-based learning media that we can see from the data from the average validity values are in table 12 above, looking for data using the following formula:

$$NP = \frac{R}{SM} \times 100$$

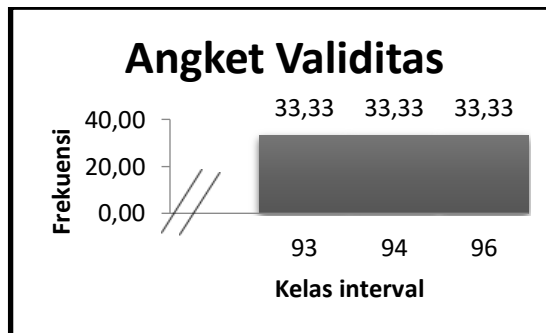
$$NP = \frac{1886}{20} \times 100 = 94,33\% \text{ with very good criteria}$$

Data on the validity of the Android-based learning media through a trial of the validity of 3 validators with a total of 20 questions.2019/2020. To obtain a clear picture of the distribution of the validity questionnaire scores, it can be seen in Table 5 and Figure 9:

**Table 5.** Distribution of Score Frequency Validity Questionnaire

No.	Class – Interval	F0	%F)
1.	93	1	33,33
2.	94	1	33,33
4.	96	1	33,33
Amount		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, and the length of the course (P) is 1. In the 93 range, there are validators with a percentage of 33.33%. In the range of 94, there is one validator with a rate of 33.33%, and in the field of 96%, there is one validator with a percentage of 33.33%.



**Figure 9.** Histogram of Validity Questionnaire

Based on Figure 9, it can be explained that the interval class length is 4, in range 93, there is 1 validator with a frequency of 33.33, in range 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.

### 3.7 Practical Test Analysis

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

Assessment of 35 students for Android-based learning media in terms of (1) Condition of Use: 88.57%; (2) Effectiveness of Learning Time: 88.23%; (3) Benefit: 88.57%. Overall, the practicality test assessment of Android-based learning media is 88.46%, so the Android-based learning media can be efficient for students to use for learning Network Service Technology for class XI TKJ at SMK Negeri 1 Painan.

The results of the practicality test of students using Android-based learning media look for data using the following formula:

$$NP = \frac{R}{SM} \times 100$$

$$NP = \frac{1592,57}{18} \times 100 = 88,46\% \text{ with very good criteria}$$

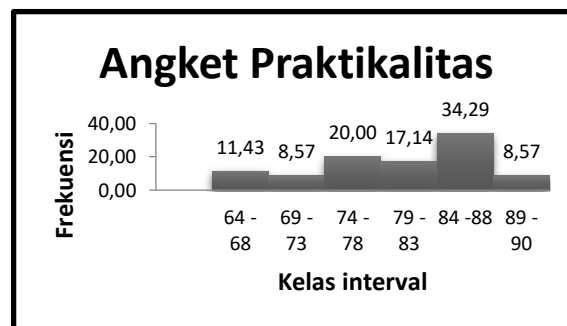
Data on the practicality of Android-based learning media through a trial of the validity of 35 students with a total of 18 questions seen an average value of 88.46%.2019/2020) [11].

To get a clear picture of the distribution of the validity questionnaire scores, it can be seen in Table 6 and Figure 10:

**Table 6.** Frequency Distribution of Practicality Questionnaire Score

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
	Amount	35	100

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



**Figure 10.** Histogram of Practicality Questionnaire

Based on Figure 10, it can be explained that the class interval length is 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 a 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.

### 3.8 Effectiveness Test Analysis

At this stage, activities are focused on evaluating whether the Android-based learning media used effectively increases learning activities. The aspects assessed in the effectiveness test consist of 40 questions. The assessment of 35 students for the Android-based learning media is excellent for students to use for learning Network Service Technology. The results of the effectiveness test of students using Android-based learning media whose data can be seen from the effectiveness value are in table 16 above, looking for data using the following formula:

$$S = \frac{R}{N} \times 100$$

$$NP = \frac{3634,29}{40} \times 100 = 90,86\% \text{ with very good criteria}$$

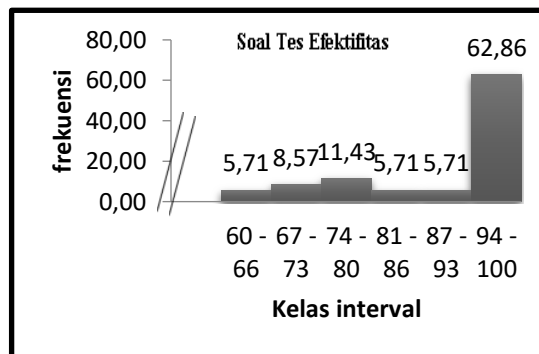
Data on the effectiveness of Android-based learning media through a trial test of the efficacy of 35 students with a total of 40 questions seen an effectiveness value of 90.86%. 12].To get a clear picture of the frequency distribution of the effectiveness test scores as shown in Table 7 and Figure 11:

**Table 7.** Frequency Distribution of Effectiveness Test Question Scores

No.	Class - Interval	F0	%F)
1.	60 – 66	2	5,71

No.	Class - Interval	F0	%F)
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
	Amount	35	100

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



**Figure 11.** Histogram Effectiveness Test Questions

In Figure 11, it can be explained that the class interval length is 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 a 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.

#### 4. CONCLUSION

Based on the description, data analysis, and development of Android-based learning media, it can be concluded validity through the assessment of the validator test on Android-based learning media is 94.28%, so the level of validity can be interpreted as very valid for use on the subject of Network Service Technology class XI TKJ in SMK. The practicality of Android-based learning media is 88.46%, so the level of practicality can be interpreted as very practical for use in the subject of Network Service Technology class XI TKJ in SMK. The effectiveness of Android-based learning media is 90.86%, so the level of effectiveness can be interpreted very well for use in the subject of Network Service Technology class XI TKJ in SMK. In using learning media to support better learning, the following are suggested, teachers should be required to be able to create a learning media that can generate interest in learning that can affect student learning outcomes that are satisfactory and by learning objectives, because from the research obtained by the author, currently, middle-level students do not like to study more, students feel bored, bored and not interested in learning. This is caused by several factors, such as the absence of exciting learning media, lack of interest and motivation to learn, and inadequate facilities and infrastructure. For policyholders in education, it is recommended that they provide sources of funds, facilities, and infrastructure, as well as other facilities so that educational goals can be adequately conveyed, maximum class learning activities and pieces of training are held to improve teacher professionalism so that they can be more creative in conveying learning.

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