Development of Hy-Quiz Learning Media Based on Android to Improve Students' Learning Motivation in Nomenclature of Hydrocarbon Derivative Compounds Sub Material

Abstract

This research aims to obtain a Hy-Quiz learning media based on Android as a learning media for nomenclature of Hydrocarbon Derivative Compounds sub material. The 4D development model is the method that has been used in this research. The instruments that have been used are validation sheet, students' response questionnaire sheet, student learning motivation questionnaire sheet, pretest, and posttest. The limited trial of this research was 27 students of SMA Negeri 3 Sidoarjo. The score of the validity test is more than three with good category. The score of practicality is more than three in every aspect with very practical category. The effectiveness of Hy-Quiz learning media is from students' learning outcomes and students' learning motivation questionnaire sheet. The classical completeness achieved is 82% and for the students' learning motivation get a response of ≥ 81% with a very effective category. So it can be concluded that the Hy-Quiz learning media has complied with the aspects of validity, practicality, and effectiveness as a learning media.

Keywords: *Learning Media, nomenclature of Hydrocarbon Derivative Compounds, students' learning motivation, Hy-Quiz learning media.*

INTRODUCTION

Chemistry is the study of matter, analyzing its structure, properties, and behavior to see what will happen in chemical reactions. Chemistry is a process that includes skills and attitudes possessed by scientists in acquiring and developing knowledge (Sukmawati, 2020). Many students have difficulty in understanding the concept of chemistry, especially hydrocarbon derivatives compounds. In hydrocarbon derivatives, there are five sub materials such as structure, nomenclature, properties, synthesis, and function. But some student has difficulty learning about the nomenclature and synthesis of hydrocarbon derivatives. Some students get confused when it comes to the nomenclature of hydrocarbon derivatives. This problem can occur because there are so many types of hydrocarbon derivatives. Each type of hydrocarbon derivative has different functional groups and has a different name. Based on the result of a survey conducted by Kartini and Putra (2021), cause of the students have difficulty learning nomenclature and synthesis of hydrocarbon derivatives is because the teacher does not use learning media and only uses the lecture method. This problem makes the students unable to study independently (Kartini & Putra, 2021). The lecture method can not attract students' attention so there are students who are often sleepy when the learning process is in progress.

This problem can be solved by developing learning media that is not limited by time and place. Learning media makes the learning process more interesting especially when the learning media has video, animation, and music (Hatimah & Khery, 2021). Permendikbud No. 65 of 2013 proclaimed that the learning media can be used during the learning process to relay the subject material (Permendikbud, 2016). The learning media that can be used by the student is learning media based on android. This learning media is based on android commonly called M-Learning or mobile learning (Georgiev et al., 2014). Mobile learning is a program that contains educational content including title, basic competencies, procedure, purpose, materials, learning videos, animation, music, and evaluation. Mobile learning allows the learner does not to stay in one place (Azmi et al., 2017).

Nowadays, the ownership of mobile devices with an android operating system is increasing (Azmi et al., 2017). e-Marketer publishes in 2016 says that there were 65.2 million smartphone users. Most internet users using smartphones come from the age group 15-19 years, while the second-largest group comes from the age group of 20-24 years and 5-9 years. So that 171.17 million internet users are obtained from teenagers (Irfan et al., 2020). Based on the survey conducted by KOMINFO (2017), high school students who use smartphones have a percentage of 79.56% (KOMINFO, 2017). Based on the survey conducted by Cahya, Suprapto, and Lusiana (2020), many students use Android in senior high school but they do not use it optimally. Most of them use Android only for games, watching movies, and chatting so it has nothing to do with the learning process (Cahya et al., 2020).

The growing number of people who use smartphones opens the opportunity to use mobile devices as a learning media. This mobile learning can create a fun and interesting learning process. Based on the research conducted by Feriatna, Pramuditya, and Aminah (2017), mobile learning is suitable as the learning media and it is very valid (Feriatna et al., 2017). Good learning media can improve students' learning motivation. So educators need to use information technology for the learning process (Wilson & Bolliger, 2013). Based on the research conducted by Lubis and Ikhsan (2015), mobile learning can be used for teaching and it can increase the students' learning motivation and students' learning outcomes (Lubis & Ikhsan, 2015).

Currently, there is no mobile learning in the nomenclature of hydrocarbon derivatives sub-material so the researcher will develop learning media based on android in the nomenclature of hydrocarbon derivatives sub-material, which is expected to be an alternative learning media for the nomenclature of hydrocarbon derivatives sub-material. This study aims to obtain a Hy-Quiz learning media based on Android as a learning media for nomenclature of Hydrocarbon Derivative Compounds sub material. The feasibility of Hy-Quiz learning media is obtained from the validity, practicality, and effectiveness.

METHOD

The method for this study is the 4D development method written by Thiagarajan (Sugiyono, 2018.). This study produces a Hy-Quiz learning media based on android to improve students' learning motivation in nomenclature of hydrocarbon derivatives sub-material. The method for this study is described as follow:

a. Define
   Define is the first stage to get information about the students' problem during the learning process, learning method, and learning media.
b. Design
   Design is the second stage to obtain video, learning materials, background, animation, music, and learning evaluation. The researcher also prepares the research instrument, including a learning media validation sheet, student response questionnaire sheet, student learning motivation questionnaire sheet, pretest, and posttest questions.
c. Develop
   Develop is the third stage to obtain a validated Hy-Quiz learning media and has been revised based on the suggestions from three validators. Validators from this research are two chemistry lecturers and one chemistry teacher. In addition, this learning media has been passing a limited trial to students of 3 Sidoarjo Senior High School, especially in 12 MIPA 7. Limited trials were conducted on 27 students. The limited trial used one-group pretest-posttest design. The limited trial was conducted without a comparison group. The following scheme is shown below:

   $$O_1 \; X \; O_2$$

   Notes:
   O_1 = Pretest
   X = Treatment, Learning process using Hy-Quiz learning media
   O_2 = Posttest
d. Disseminate
   Disseminate is the final stage to disseminate the developed product to the students and chemistry teachers in 3 Sidoarjo Senior High School.

The analysis used in this research is analysis of the validity, analysis of practicality, and analysis of the effectiveness. Three validators will validate the learning media using the Likert scale (Riduwan, 2015). The Likert scale is presented in Table 1 below:

Table 1. Likert Scale

Values	Assessment
1	Very Bad

2	Bad
3	Fairly Good
4	Good
5	Very Good

Based on these criteria, if the score reaches ≥ 3, Hy-Quiz learning media can be said to be valid.

Practicality test of Hy-Quiz learning media was obtained using students' response questionnaires. The result of students' response questionnaires was analyzed using the Likert scale (Riduwan, 2015) The Likert scale is shown in Table 2 below:

Table 2. Likert Scale

Values	Assessment
1	Strongly Disagree
2	Disagree
3	Agree
4	Strongly Agree

Based on these criteria, Hy-Quiz learning media can be declared practical if the score reaches ≥ 3.

Effectiveness analysis data of Hy-Quiz learning media can be obtained using students' learning motivation questionnaires, pretest, and posttest questions. The Hy-Quiz learning media in the nomenclature of hydrocarbon derivatives sub-material can be said to be effective from the result of the pretest and posttest questions. If the individual completeness values have reached KKM (Minimum Completeness Criteria) which is ≥ 70, students are declared complete (Azizah, 2016). The classical completeness is achieved if the percentage is more than ≥ 75% (Azizah, 2016). The formula used to analyze the result completeness of learning outcomes is stated as follows:

$$\text{Classical Completeness} = \frac{Number\ of\ students\ who\ complete}{The\ total\ number\ of\ students}\ x\ 100\%$$

The data of pretest and posttest were analyzed using normality test and paired sample test using IBM SPSS Statistics 23. If the significance value is more than 0,05, the normality test can be said to be normally distributed (Kumala et al., 2022). Paired Sample Test data is said to have a difference in the average score between pretest and posttest if the significance value (2-tailed) is less than 0,05 (Saputri, 2016).

The percentage of students' learning motivation questionnaire data was analyzed using the Guttman scale. The Guttman scale is presented in Table 3 below (Lutfi et al., 2021):

Table 3. Guttman Scale

Statement	Answer Score "Yes"	Answer Score "No"
Positive	1	0
Negative	0	1

The formula used to process students' learning motivation questionnaire data is stated as follows:

$$P = \frac{Student\ choice\ score}{Total\ number\ of\ students}\ X\ 100\%$$

The percentage of students' learning motivation questionnaire data was converted to the interpretation criteria score. The interpretation score of the Guttman scale is presented in Table 4 below (Sudjana, 2014):

Table 4. Interpretation Score of Guttman Scale

Percentage (%)	Category
0-20	Very Ineffective
21-40	Less Effective
41-60	Quite Effective
61-80	Effective
81-100	Very Effective

If the percentage is ≥ 61%, the learning media based on android can be declared effective.

RESULTS AND DISCUSSION

The result of this study are described for each stage of the 4D development model as follows:

1. Define

In this stage, the researcher starts to get information about the students' problems during the learning process, learning method, and learning media. In addition, the researcher also tries to arrange the content of learning media, including learning materials, learning videos, and learning evaluation. Based on the direct observation, it was found that (1) The lecture method makes students less enthusiastic in the learning process; (2) Students need learning media so the learning process will be more attractive.

2. Design

Design is the stage where the researcher tries to obtain learning materials, video, and learning evaluation. In addition, the researcher begins to devise the design and content of the learning media so that it can be attractive and suitable with the concept of nomenclature of hydrocarbon derivatives. The researcher also prepares the research instruments including a learning media validation, student response questionnaire, student learning motivation questionnaire, pretest, and posttest questions.

These learning media is made using Adobe Flash CS6 (Action Script 3.0) and converted to Android using Adobe Animate CC 2019. Design on this learning media includes basic competence, indicators, purposes of the learning media, procedure, learning materials, learning videos, learning evaluation, and author profile. The researcher uses https://canva.com/ to design the background of the learning media. This web can be accessed online using Google Chrome or other application. Learning materials can be obtained using a module of chemistry, and PowerPoint. These learning materials are under the basic competence 3.9 Analyze the structure, nomenclature, properties, synthesis, and the function of carbon compounds but it is limited to the nomenclature of hydrocarbon derivatives.

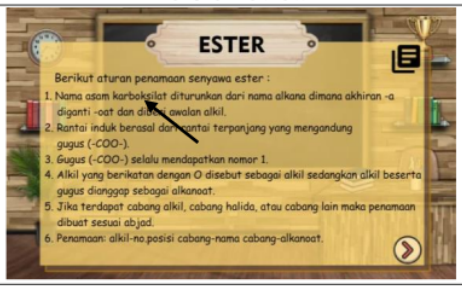
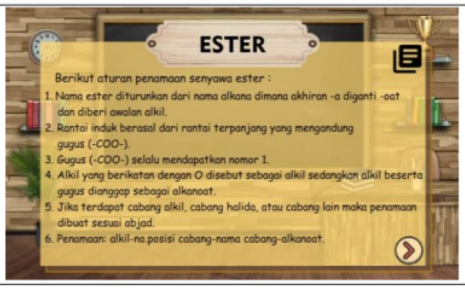
Animations can be obtained using Canva and Google. Animations are added to attract the students' attention in learning hydrocarbon derivatives. The researcher used YouTube to download 7 learning videos including alkyl halide video, alcohol video, ether video, aldehyde video, ketone video, carboxylic acid video, and ester video. Learning videos are used for students to understand the synthesis of hydrocarbon derivatives.

Learning evaluation is made by the researcher. There are ten questions with a cognitive level of C4 in this learning media. These learning evaluation objects to make students more understanding of the nomenclature hydrocarbon derivatives sub materials. Based on the research conducted by Huda, Purnomo, Anggraini, and Prameswari (2021), High Order Thinking Skill (HOTS) questions with cognitive levels C4, C5, and C6 can help students to think critically (Huda et al., 2021).

3. Develop

Develop is the third stage to produce a validated Hy-Quiz learning media and it has been revised based on the suggestions from validators. The result of the validation is there are suggestions from the validators to get the appropriate Hy-Quiz learning media (Rusdi, 2018). In this study, validation will be conducted by two lecturers and one chemistry teacher with two validity criteria, namely content validity and construct validity. The revision from validators can be seen in Table 5 below:

Table 5. Revision table of media review result

Before Review	After Review
	

The result of the validity test can be seen in Figure 1 below:

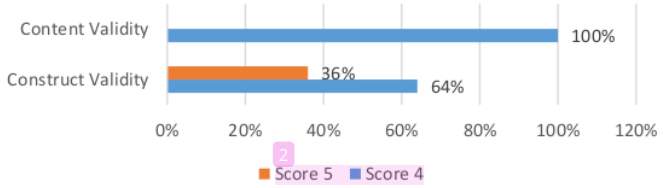


Figure 1. The Result of Validity Test

Based on Figure 1, the construct validity gets an assessment from the validators, getting a score of 4 with the percentage of 64% and a score of 5 with the percentage of 36%. It shows that the developed Hy-Quiz learning media in the aspect of construct validation can be declared valid. Construct validity includes four components, namely, 1) Validity of presentation in Hy-Quiz learning media 2) The suitability of the language in Hy-Quiz learning media 3) Display quality in Hy-Quiz learning media 4) Audio-visual communication. For content validity, get a score of 4 with a percentage of 100% in every aspect. It shows that the developed Hy-Quiz learning media in the aspect of content validation can be declared valid. There are two components in content validity, namely, 1) The validity of the concept of materials 2) The suitability of material, video, and question with the learning purpose. It can be said that the Hy-Quiz learning media in the aspect of construct validation and content validation can be declared valid. Based on the research conducted by Al-mira and Hidayah (2020), the construct validity of mobile learning got a percentage of 87,98% with a very valid category and the content validity of mobile learning got a percentage of 90% with a very valid category. So mobile learning can be said to be very valid (Al-mira & Hidayah, 2020).

In addition, Hy-Quiz learning media has been passing a limited trial to students of SMA Negeri 3 Sidoarjo. The limited trial was conducted on 27 students of 12 MIPA 7. The result of the limited trial can be seen as shown below:

1. **Practicality Test**

   The practicality of Hy-Quiz learning media can be determined using students' response questionnaires. Students are given students' response questionnaire by the researcher to see the responses of students after using Hy-Quiz learning media. The questionnaire contains students' responses based on the indicators. The data of the result of the practicality test are shown in Table 6 below:

Table 6. The Result of Students' Response Questionnaires

No.	Aspects	Score
1.	The explanation of the material from the Hy-Quiz learning media is following the learning objectives.	4
2.	The explanation of the material from the Hy-Quiz learning media is very easy to learn.	3
3.	Questions from the Hy-Quiz learning media can help improve students' understanding of the concept of nomenclature of hydrocarbon derivatives.	4
4.	All buttons in the Hy-Quiz learning media are easy to use.	4

5.	Button icon in the Hy-Quiz learning media has an attractive design.	4
6.	The sentences in the Hy-Quiz learning media are clear and easy to understand.	4
7.	The text of the Hy-Quiz learning media based on Android can be read easily because of the accuracy in choosing the type of text and size.	4
8.	The display in the Hy-Quiz learning media is presented in a very interesting way.	4
9.	I am interested in the design of Hy-Quiz learning media.	4
10.	Animation in the Hy-Quiz learning is interesting and can increase learning motivation.	4
11.	The music used in the Hy-Quiz learning media is appropriate.	4
12.	The video used in the Hy-Quiz learning is following the material.	4
13.	Instructions for using the Hy-Quiz learning media are easy to understand so I can use it to study the nomenclature of hydrocarbon derivatives sub-material.	3
14.	I can use Hy-Quiz learning media as a learning resource anywhere and anytime.	4
15.	Hy-Quiz learning media is flexible to use.	4
16.	I use this quiz in the Hy-Quiz learning as a reference for practice about the nomenclature of hydrocarbon derivatives sub-material.	4
17.	Hy-Quiz learning media based on Android makes it easier to learn about the nomenclature of hydrocarbon derivatives sub-material.	4
18.	The Hy-Quiz learning media based on Android will be my motivation to learn about the nomenclature of hydrocarbon derivatives sub-material.	4
19.	The Hy-Quiz learning media based on Android caught my attention and made chemistry lessons less difficult.	4

Based on Table 6, the practicality test gets a score of 4 in 17 aspects with a percentage of 89,5%. It means that the learning video of Hy-Quiz learning media is following the materials and learning objectives. In addition, the material and quiz of the Hy-Quiz learning media are following the learning objectives and this learning media can be used anywhere and anytime. The practicality test is also getting a score of 3 in 2 aspects with a percentage of 10,5%. It means that the explanation of the material from the Hy-Quiz learning media is very easy to learn and instructions for using the Hy-Quiz learning media are easy to understand. Based on the research conducted by Kusumadewi (2016), the students' response questionnaire of learning media based on Android got a percentage of 92,53% with vey good category (Kusumadewi, 2016).

This learning media has animation, music, and learning videos to improve the students' learning motivation. Based on the research conducted by Nurwahidah, Zaharah, and Sina (2021), learning videos can be used to attract students' attention, improve learning motivation, and simplify the process of understanding the material (Nurwahidah et al., 2021). In addition, research conducted by Upsiswanto and Nanda (2020) shows that when students use learning media based on Android, the learning process is more fun so the students can understand the concept of learning material (Apsiswanto & Nanda, 2020).

The Hy-Quiz learning media obtained a percentage of 89,5% on a score of 4 in 17 aspects and a percentage of 10,5% on a score of 3 in 2 aspects. So it can be said that Hy-Quiz learning media can be declared practical because the score has met the criteria.

2. Media Effectiveness Test

a. Students learning motivation

Effectiveness analysis data of Hy-Quiz learning media can be obtained from students' learning motivation questionnaires. Students' learning motivation questionnaire was used to see the improvement of students' learning motivation Student learning motivation questionnaires have 24 statements in the form of positive statements and negative statements. These questionnaires include six indicators, namely 1) There is a desire for success 2) There is a motivation and a need to learn 3) There is hope in the future 4) There is an appreciation in learning 5) There is an interest in learning 6) There is a conducive learning environment. The result of students' learning motivation questionnaires are shown in Table 7 below:

Table 7. The Result of Student Learning Motivation Questionnaires

No.	Indicators	Percentage (%)	Category
1.	There is a desire for success	87	Very Effective
2.	There is a motivation and a need to learn	98	Very Effective
3.	There is hope in the future	100	Very Effective
4.	There is an appreciation in learning	100	Very Effective
5.	There is an interest in learning	94	Very Effective
6.	There is a conducive learning environment	85	Very Effective

Based on Table 7, the indicator of "There is a desire to success" got 87% which falls into a very effective category. It shows that Hy-Quiz learning media can make students more active during the learning process, both in answering a question from the teacher and asking a question to the teacher. This situation can occur because Hy-Quiz learning media makes the learning process more fun so that students remain enthusiastic about learning chemistry. Based on the research conducted by Muyaroah and Fajartia (2017), learning process becomes more fun by using learning media based on Android, and students can use the learning media anytime and anywhere (Muyaroah & Fajartia, 2017).

The indicator of "There is a motivation and a need to learn" gets a percentage of 98% which falls into a very effective category. It shows that students agree with that indicator, which means they feel motivated after using Hy-Quiz learning media in their learning process and students feel that it is necessary to use Hy-Quiz learning media while studying chemistry. Based on the research conducted by Muyaroah and Fajartia (2017), learning media based on Android can increase students' motivation in learning chemistry (Muyaroah & Fajartia, 2017).

The indicator of "There is a hope in the future" gets a percentage of 100% which falls into a very effective category. It shows that all of the students agree that they like learning activity using Hy-Quiz learning media because they hope that they can be a student who is good in chemistry and technology. Based on the research conducted by Yunus and Fransisca (2020), students are happy when the learning process uses learning media based on Android because it has features that can be seen, read, and heard so that the students can remember and understand the concept of materials easily (Yunus & Fransisca, 2020).

The indicator of "There is an appreciation in learning" got 100% which falls into a very effective category. It shows that all of the students agree that students feel happy when the teacher gives appreciation to students who are active during the learning process. Based on the research conducted by Sari, Murtono, and Ismaya (2021), giving appreciation to students can increase students' learning motivation (Sari et al., 2021).

The indicator of "There is an interest in learning" got 94% which falls into a very effective category. It shows that Hy-Quiz learning media can attract students' attention and always actively participate in practice. Based on the research conducted by Kusumadewi (2016), learning media based on Android can attract students' attention so that students are more enthusiastic during the learning process (Kusumadewi, 2016).

The indicator of "There is a conducive learning environment" got 85% which falls into a very effective category. It shows that the Hy-Quiz learning media is very helpful for students during the learning process because this learning media can adapt to the students'

learning styles. Based on the students' learning motivation questionnaires, there is some student who prefers to study alone rather than in a group. Hy-Quiz learning media can be used, both individually and in a group. Based on the research of Perbawa, Adiarta, and Ratnaya (2020), learning media based on Android help students in carrying out the learning process individually. In addition, this learning media can also be used for group and interactive learning (Perbawa et al., 2020).

b. Learning Outcomes

Effectiveness analysis data of Hy-Quiz learning media can be obtained from the result of pretest and posttest. The pretest is conducted before using Hy-Quiz learning media to obtain information about students' knowledge. Posttest is conducted after using Hy-Quiz learning media to see the impact of Hy-Quiz learning media. The result of the pretest and posttest are presented in Figure 2 below:

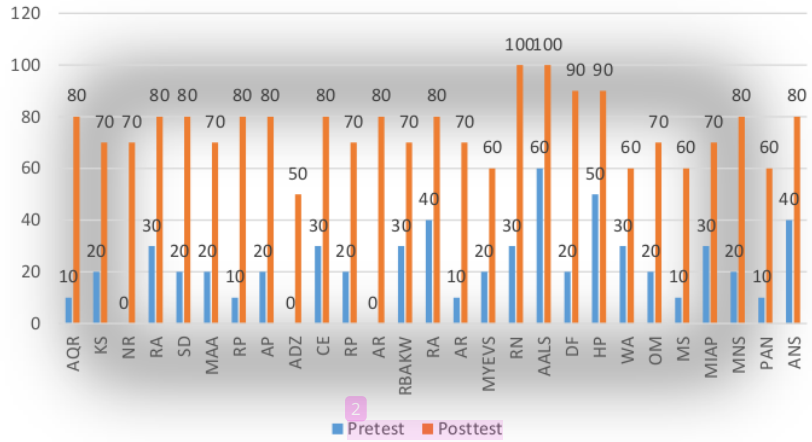


Figure 2. Graph of Students' Learning Outcomes

Based on Figure 2, shows that the students who complete the pretest were 0, or the percentage of classical completeness was 0%. The number of students who did not complete the pretest was 27 with a percentage of 100%. Those percentage is less than 75%. So it can be said that it is not complete on classical completeness because the percentage of classical completeness is ≥ 75%.

Meanwhile, the students who complete the posttest were 22 or the percentage of classical completeness was 82%. The students who did not complete the posttest was 5 with a percentage of 18%. So it can be said that the classical completeness is achieved because the percentage is more than ≥ 75% (Azizah, 2016).

IBM SPSS Statistics 23 will be used to analyze the normality of the pretest and posttest. The Shapiro-Wilk test was used in the normality test because the number of students is less than thirty students. The result of the Shapiro-Wilk test are presented in Table 8 below:

Table 8. Result of Normality Test

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
pretest	.191	27	.013	.931	27	.072
posttest	.195	27	.010	.929	27	.065

a. Lilliefors Significance Correction

Based on Table 8, Sig. value of the Shapiro-Wilk test for pretest is 0,072 and Sig. value of the Shapiro-Wilk for posttest is 0,065. The data is normally distributed because both get the same result that is > 0,05. Based on the research conducted by Kumala, Dwitiyanti, and Widiyatun (2022), the data is normally distributed because of the normality test using the Shapiro-Wilk with a significance level of > 0,05 (Kumala et al., 2022).

The normality test result was tested with Paired Sample Test to determine the significant difference between pretest and posttest scores. Paired Sample Test data is said

to have a difference in the average score between pretest and posttest if the significance value (2-tailed) is less than 0,05 (Saputri, 2016). The result of the Paired Sample Test are presented in Table 9 below:

Table 9. Result of The Paired Sample Test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	pretest - posttest	-52.963	12.654	2.435	-57.969	-47.957	-21.749	26	.000

Based on Table 9, the result of Paired Sample Test is known that Sig. value (2-tailed) for pretest and posttest is 0,000. The result is less than 0,05 which means that Ha is accepted and Ho is rejected. Based on the hypothesis used in the Paired Sample Test, Ho proclaimed that there was no significant difference between the pretest and posttest. Ha revealed that there was a significant difference between the pretest and posttest. So it can be concluded that Hy-Quiz learning media can be declared very effective in improving students' learning outcomes on the sub material of the nomenclature of hydrocarbon derivatives. Based on the research conducted by Saputri (2016), learning media based on Android can increase students' learning outcomes (Saputri, 2016).

CONCLUSION

Based on this research, Hy-Quiz learning media is suitable as a learning media on the nomenclature of hydrocarbon derivatives sub material because Hy-Quiz learning media has complied the aspects of validity, practicality, and effectiveness. The result showed that Hy-Quiz learning media could help the students to learn the nomenclature of hydrocarbon derivatives sub material. In addition, this learning media could improve students' learning motivation and students' learning outcomes.

RECOMMENDATION

The researcher expects teachers to develop learning media, especially mobile learning that attracts students' attention and interest so that the students will be more enthusiastic in learning. In addition, teachers can also choose the right learning method to help students understand the learning material.

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