Development of android based chemical comics integrated Qur’ani values in the main structure of atomic for high schools

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Abstract. This study aims to determine the improvement of student learning outcomes with integrated Qur'an learning using comic chemistry media compared to power point media. The ADDIE design was used for this study. The sample was selected by purposive sampling technique. The experimental group was taught using comic chemistry media, while the control group was taught using power point media. The data were collected by pretest and posttest which consisted of 20 multiple choices and were statistically analyzed using the Rasch model using the help of the SPSS and Winstep programs. The results showed that the increase in learning outcomes using comic chemistry media was better than power point media.

1. Introduction

Article 36 on the curriculum suggests that the curriculum is structured by taking into account the increase in the faith and piety of students, which is very appropriate because increasing faith and piety are the most important moral education goals in accordance with human potential (fitrah). One way to form a human being who is faithful and devoted can be done by presenting the spiritual aspect of religion into the subject of chemistry teaching [1]. Chemistry as a science, contains values that can be applied contextually and actually to student life, so that it can add to the Islamic in students [2].

Based on the results of research observations at the MAN 2 Pakam school, it was stated that learning chemistry, especially on atomic structure material, had not applied learning based on quranic values. This fact illustrates the low application of quranic values in schools within the Ministry of Religion through the Al-Quran. The application of low Islamic values will have an impact on the low absorption of students to study chemistry through the Al-Qur'an which they should be able to find in Madrasah Aliyah [3]. Therefore, it is considered very important for chemistry teachers at Madrasah Aliyah to teach chemistry based on the Qur'an. Especially when viewed from the characteristics of chemistry which is part of the science of science which studies natural phenomena which are widely described in the Al-Qur'an. [4].

According to Ibn Khaldun quoted by Kartanegara (2005), religious sciences (or naqliyyah as he calls them) are based on “authority” not reason. And what is meant by authority here is the Al-Qur'an and hadith which act as tasfir on it. Thus, the main source of religious knowledge is the holy book, which was revealed directly by God to His prophets, in terms of Islam to Prophet Muhammad SAW. The source of the general sciences is the universe that stretches out wide in front of us, from very large galaxies to very small atoms and ourselves as humans [5]. One of the ways to build people of faith and
piety can be done by presenting the spiritual aspects of religion or religious values. This causes teaching materials to have a very important role in learning activities. Presenting the spiritual aspects of teaching materials will not reduce the quality of the scientific level of chemistry itself. However, it can be an effort to provide students with an understanding that the scientific discoveries that have been discovered are predetermined destiny of what happened. Chemistry learning today is required to be more meaningful and oriented towards character building [6].

One of the supporting factors for the learning process in the 2013 curriculum is the use of technology-based learning media. The development of multimedia technology has a positive impact on changing the way of learning by obtaining, adjusting, and using information in the learning process. [7]. There are two types of learning media, namely abstract learning media and concrete learning media. Abstract learning media is identical with spiritual, while concrete learning media is identical with the physical. Abstract learning media includes habituation, praise, punishment, orders, and prohibitions. Concrete learning media includes graphic, projection, and audio media. Learning media that can be used in learning, for example, is graphic media, where graphic media is concrete media to meet physical needs. Graphic media is a visual medium that communicates facts and data in the form of ideas or verbal words with pictures, where graphic media can be in the form of charts, diagrams, graphics, posters, cartoons, and comics [8]. Graphic media in the form of comics is one of the media that is considered an effective medium for use in learning. Comics have unique character images, have storylines, and have their own appeal to readers. Comics are cartoon-shaped graphic media to depict characters and systematic stories, which are closely related to images and aim to provide entertainment to readers [9]. However, the reading interest of the Indonesian people is still low. It is proven that the results of a UNESCO survey in 2011 showed the reading level index of the Indonesian people was only 0.001 percent. This means, there is only one person out of 1000 who still wants to read books seriously. In March 2016, Most Literate Nation in the world, released an international literacy ranking. On this ranking, Indonesia ranks 60th in a total of 61 countries [10]. Technological developments have a major influence on the needs and enthusiasm for student learning [11]. Android is a mobile operating system that grows in the midst of other operating systems that are currently developing.

Mobile comics are a form of conservation, namely because they are packaged in the form of an Android application software. This chemical comic application is a form of saving on paper usage. The development of this application as a learning supplement is also equipped with an online test that allows practicality in test activities or practice questions to hone students’ abilities [12].

2. Methods
This study uses an R & D (Research and Development) approach with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. These steps include: (1) Analysis (analyzing the feasibility of existing multimedia), (2) Design (understanding and compiling the initial product or product design), (3) Development (developing a product design), (4) Implementation (using new learning media that have been developed in real learning in class), (5) Evaluation (measuring the final competency of learning media). The stages of developing chemical comic media based on android using android studio version 3.5 Integrated Development Environment (IDE) with the Java programming language on the atomic structure material are illustrated in FIGURE I. The research instrument used to collect data was a media validation sheet based on BSNP criteria and an objective test of learning outcomes. This research was conducted at MAN 2 Pakam. The population in this study were all students of class X MAN 2 Pakam in the 2020/2021 school year. The sample was selected using a purposive sampling technique, that is, from all students, 30 students were taken for classes taught with Android-based chemical comics media (Experiment I) and 30 students for classes taught with power point media (Experiment II).

Data were analyzed descriptively based on the average score of learning outcomes, then inferential statistical tests were carried out with t-test. Before the t-test is carried out, the prerequisite test is carried out first, namely the normality test and the homogeneity test. The results of testing the learning outcome data for each sample from the population were normally distributed and homogeneous at the time (p>
0.05). Then then proceed to parametric analysis of hypothesis testing using the independent sample T-test with the SPSS 22 for Windows program.

**Figure. 1. Research Design**

3. **Results and discussion**

In this study, the development of learning media for chemical comics based on android on atomic structure material has been carried out. Before developing the media, first an analysis of the learning media circulating on the internet is carried out on the atomic structure material. This analysis was conducted to determine the feasibility of learning media circulating on the internet and the developed android-based chemical comic media. The questionnaire used to determine the feasibility of the media being developed is the BSNP (National Education Standards) questionnaire. The questionnaire consists of 3 eligibility criteria, namely content eligibility, language eligibility, and presentation feasibility. The average value of each aspect will show the level of validity of the developed chemical comic media. The eligibility criteria for the developed Android-based chemical comic media are presented in Table 1.
Table 1. Eligibility Criteria

| Average | Eligibility Criteria |
|---------|----------------------|
| 3.26 – 4.00 | Very Feasible |
| 2.51 – 3.25 | Feasible |
| 1.76 – 2.50 | Less Feasible |
| 1.00 – 1.75 | Not Feasible |

After the product has been developed, the media's feasibility test is carried out by an expert validator using BSNP standard instruments. The results of the feasibility test for chemical comic media based on android on atomic structure material based on BSNP standards by expert validators obtained content feasibility 3.20 (feasible), language feasibility 3.0 (feasible), presentation feasibility 3.70 (very feasible), and feasibility of integration al-qur'an 4.0 (very feasible) The results of the feasibility test for interactive multimedia based on Android can be seen at Fig. 2.

Figure 2. Feasibility test results for chemical comic media based on Android on atomic structure material

Based on the figure 2, shows that the results of the analysis of chemical comic media based on android based on the BSNP instrument have an average, namely: (1) content feasibility test of 3.20 (feasible); (2) the language feasibility test is 3.0 (feasible); (3) presentation feasibility test of 3.70 (very feasible); and feasibility test for integration of al-qur'an 4.0 (very feasible). Thus, overall, the results of the analysis of chemical comic media have an average value of 3.47 which belongs to the very feasible category. These results indicate that android-based chemical comic media on atomic structure material is feasible to use in chemistry learning as a support for student learning resources in studying chemistry on the topic of atomic structure[13].

Based on the data on the students' pretest and posttest scores, the value of student learning outcomes improvement is obtained. The increase in student learning outcomes (N-gain) can be seen

| Group         | Pretest Value | Posttest Value | Standard Deviation |
|---------------|---------------|----------------|--------------------|
|               | Pre-test      | Post-test      | Pre-test           | Post-test       |
| Experiment 1  | 55.17         | 85.17          | 13.739             | 8.039           |
| Experiment 2  | 58.167        | 80.00          | 11.997             | 9.37            |

Based on the data on the students' pretest and posttest scores, the value of student learning outcomes improvement is obtained. The increase in student learning outcomes (N-gain) can be seen
from the difference in the average pretest and posttest scores. The results of the student's average N-gain score can be seen in Table 3.

| Group           | Average Value N-gain | Standard Deviation |
|-----------------|----------------------|--------------------|
| Experiment 1    | 0.68                 | 0.176              |
| Experiment 2    | 0.50                 | 0.229              |

Based on Table 3, it shows that the N-gain of students in the buffer solution material for the experimental class I obtained an average of 0.68 while for the experimental class II an average of 0.50 was obtained. The improvement of student learning outcomes is visualized in Figure 3.

**Figure 3.** Graph of average student learning outcomes improvement

Based on Table 3, it shows that the N-gain of students in the buffer solution material for the experimental class I obtained an average of 0.68 while for the experimental class II an average of 0.50 was obtained. The improvement of student learning outcomes is visualized in. From the distribution table of learning outcomes improvement (N-gain), both samples are normally distributed and the data is homogeneous, then hypothesis testing is carried out. This test was conducted to support the success of the chemistry learning media developed in improving student achievement by using the independent sample T-test. The results of hypothesis testing are presented in Table 4.

| Hypotesis                                      | Sig. (2-tailed) | α  | Kesimpulan   |
|------------------------------------------------|-----------------|----|--------------|
| There are differences in the improvement of student learning outcomes taught with Android-based comic media and power point media on atomic structure material. | 0.002           | 0.05 | Ha diterima  |

Based on the results of hypothesis testing presented in TABLE IV, the sig value (0.002) <α (0.05) is obtained, so H0 is rejected and Ha is accepted. So that there is a difference in the improvement of student learning outcomes taught with chemical comics media based on android and power point media on atomic structure material.

4. Conclusion

Android-based chemical comic media on atomic structure material that has been developed obtain validation results with an average value of 3.47 which are classified as very suitable for use based on instruments that refer to the BSNP, so that android-based chemical comic media on atomic structure material is suitable for use, used in chemistry studies and does not need revision. The increase in student learning outcomes approved by android-based chemical comic media is better than students
who support android-based chemical comic media. Based on the results of validation and effectiveness, it shows that the chemical comic media based on android is feasible to apply atomic structure media for middle school students.

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