International Journal on New Trends in Education and Their Implications
April 2019 Volume: 10 Issue: 2 ISSN 1309-6249

STUDENTS' LEARNING OUTCOME IN CHEMISTRY LEARNING USING ANDROID APPLICATION

Tika Rahmawati, S.Pd.
Graduate School, Yogyakarta State University
Yogyakarta- INDONESIA

Dr. Crys Fajar Partana, M.Si.
Faculty of Mathematics and Natural Science, Yogyakarta State University
Yogyakarta- INDONESIA

Abstract
The use of technology-based media on android devices has begun to be used in learning widely. The use of technology-based media on android devices has begun to be used in learning widely. This research aimed to develop an android-based learning media and to find out the effect of learning media to improve learning outcome. This research is Research & Development (R&D) which used the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). The instruments of data collection consisted of media validation sheet and learning outcome test. The result obtained in this research was that learning media on the subject matter of acid and base. Students' learning outcome data were analyzed by ANOVA. The result showed that the media feasibility assessment were categorized as good by material experts, media experts, peer reviewers and chemistry teachers and students in small-scale trials. ANOVA test showed that the use of android learning media in chemistry learning can affect students' learning outcome.

Keywords: Android application, learning media, learning outcome, chemistry learning.

INTRODUCTION

The advancements of technological in the 21st century have an impact on all aspects of life, including in education (Qi, 2018). The development of this technology requires innovation in the use of technology in learning (Özdener & Demirci, 2019). So that the teachers are expected to improve the quality of learning by utilizing technology in learning according to the 2013 curriculum. Based on the facts in the field, the condition of education in Indonesia still does not utilize technology during the learning process. Research conducted by Rivalina (2014) shows that some teachers have problems in applying technology-based learning. Obstacles encountered include the lack of mastery of technology possessed by teachers, inadequate school facilities, full teacher teaching hours in schools, and inadequate internet connections. Therefore, teachers must prepare themselves to face challenges in learning along with technological developments.

The use of this technology can be applied through the use of technology-based learning media during the learning process. The use of technology as a learning media has a positive impact and very effectively applied in learning (Adnan, Prasetyo, & Nuriman, 2017). Technology-based learning media can also improve students' learning outcomes (Chuang, 2014). Android-based smartphone is one of the technologies that can be used in the learning (Calimag, Mugel, Conde, & Aquino, 2014). Android-based smarthphone is used as a learning media that can support the learning process of students (Nurohmah, Wahyudin, Partono, 2014). Android-based smartphones also provide facilities for students to access subject matters and to learn anytime and anywhere (González, et al., 2015). The existence of these mobile devices makes the learning process more interesting and fun. It shows that mobile devices that are used as learning media can influence the learning process (Sung, Chang, & Liu, 2016).

The use of android learning media to support the learning process is able to make students more interested in following the learning process. Interactive media, easily accessible and fun are characteristics of the android learning media (Hanafi & Samsudin, 2012). The use of android applications in chemistry learning provides very satisfying result. The use of android application in chemistry learning is able to make improvements of students' cognitive learning outcome and learning motivation (Putra, Wijayati & Mahatmanti, 2017). However, research conducted by Yusrizal, Safiah, Nurhaidah (2017) states that there are still teachers who are less able to utilize technology-based learning media and still use conventional media found in the surrounding environment. The learning media used are Student Worksheets and chemical text books for high school. The use of LCD in the learning process is only a power point. The use of videos or illustrations of learning about chemistry and teaching aids as supporting chemical learning has never been applied in the learning process by teachers. So that guidance is needed in utilizing technology-based learning media evenly in various regions (Hanafi & Samsudin, 2012).

Chemical learning is a learning process about chemical material that some students have difficulty understanding. The subject material of acid and base is one of the subject matter of chemistry that has to be studied by students in middle school (Wilson, 1998). It is one of the basic concepts to understand the subject matter of the buffer solution and solubility (Jauhariningsih, 2017). It explains about the definition of acid and base, the strength of acid and base, pH and pOH and the reaction of acid and base (Ültay & Calik, 2016). Most acid and base subject matter includes a number of abstract concepts. It is difficult for students to understand the subject material of acid and base (Özmen, Demircioğlu, & Coll, 2009). Students' difficulties in learning the subject matter of acid and base have affected on students' learning outcome.

Learning outcomes are the results obtained from a learning and teaching interaction between students and teachers (Dimyati & Mudjiono, 2013). Student learning outcomes are the main indicators in evaluating the quality of learning. Based on the data of National Examination result of Senior High School in 2017/2018 academic year in Yogyakarta, Indonesia from PAMER application shows that students' learning outcome on acid and base subject matter obtained an average score of 45.18. The low student learning outcomes need an effective solution to optimize students' understanding and motivate students to study chemical material. One way is to make learning media, so that chemical material can be simplified and concretized with the help of technology-based learning media or android media (Yektyastuti & Ikhsan, 2016). This research was conducted to develop android-based learning media on acidic and basic material and to know the learning outcomes of students.

METHOD

Research Design

The research is Research and Development (R & D). The development model used refers to the development model of ADDIE which consists of five stages: analysis, design, development, implementation, and evaluation.

Procedure and Participants

The procedure for developing research uses the ADDIE development model which consists of five steps: collecting data on needs analysis through observing the learning process and analyzing the curriculum and syllabus (Analysis); media planning by making a storyboard and flowchart (Design); manufacturing android learning media and media validation to the one material expert, one media expert, three peer reviewers, three chemistry teachers. Furthermore, a small-scale trial was conducted on 32 students of XII grade State High School 5 Yogyakarta (Development); field trials for students (Implementation); evaluation of media assessment and students' learning outcome (Evaluation). The research subjects were students of grade XI in State High School 5 Yogyakarta (Yogyakarta, Indonesia): 65 students of grade XI were selected and divided into two groups. First half as an experimental class and the second half as a control class.

Data Collection

The data collected in this study is the feasibility of android media and students' learning outcome. Feasibility assessment of android media using the validation sheet of modified media from Crozat, Hû, & Trigano (1999); Nesbit, Belfer, & Vargo (2002), and Botha (1990). The media validation sheet was developed using a 1-5 Likert scale. The media validation sheet by material experts consists of material aspects and learning aspects. Media validation by media experts consists of audio and visual aspects as well as aspects of software engineering. The media feasibility validation sheet by the teacher and peer reviewer consists of visual and audio aspects, software engineering, learning, and material.

The data of learning outcome were obtained from the test of learning outcome. The test of learning outcome consisted of 30 multiple choice questions about the subject matter of acid and base. The test was used as a post-test question which was given after learning by using android-based learning media. Validation of the contents of the test of learning outcome was carried out by asking for expert judgment of the instrument which included aspects of substance, constructs, and language. While the empirical validation was tested on 219 students. Empirical validation data was analyzed using the QUEST program. Based on the results of the validity analysis there are 30 questions that are fit with the QUEST program. This means that there are 30 multiple choice questions that are used as student learning outcome measurement instruments. In addition, the results of the analysis show a reliability value of 0.96.

Data Analysis

The data were analyzed by calculating the average score for each aspect of the assessment. The average score was compared with the category of media quality (Widyoyoko, 2011) described in Table 1. ANOVA test with prerequisite test (normality and homogeneity) was used to analyze the learning outcome data of students in the experimental class and control class.

Table 1: Quality of Validation Media

Score Range (i)	Category
$X > \bar{X} + 1{,}8\ Sbi$	Excellent
$\bar{X} + 0{,}60\ SBi < X \leq \bar{X} + 1{,}80\ SBi$	Good
$\bar{X} - 0{,}60\ SBi < X \leq \bar{X} + 0{,}60\ SBi$	Fair
$\bar{X} - 1{,}80\ SBi < X \leq \bar{X} - 0{,}60\ SBi$	Poor

max score + ideal min score)

FINDINGS

The development of android-based chemical learning media on acidic and basic material is arranged in color and image display and sound using supporting applications Construct 2 and Photoshop. The software product was in the form of file with an extension of Android Package (.apk) that could be opened in android device. The android application developed can be used as one of the learning media innovations for class XI students in accordance with the 2013 curriculum. Android media consisted of competency, learning objectives, and learning indicators; explanation of the meaning of acid and base, acid and base indicators, and pH of the solution; some exercises that were packaged in the form of games with four levels to improve learning outcome; and information about android learning media developers. The display of android learning media can be seen in Figures 1, 2, 3 and 4.

Figure 1: Main menu of android learning media

Figure 2: One example of the display of acid and base material on android learning media

Figure 3: Display of practicum determining acid and base solution using litmus paper

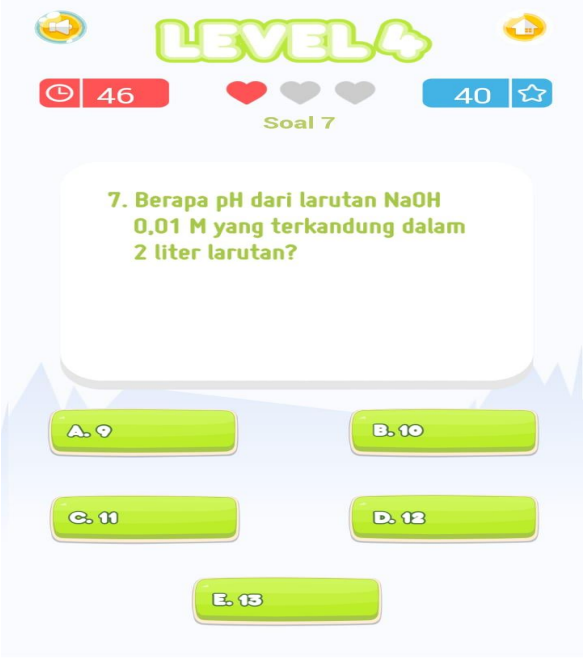

Figure 4: Games of acid and base material on android learning media

Android-based chemistry learning media which was developed was validated toward one material expert and one media expert. The validation result of material expert and media expert can be seen in Table 2.

Table 2: Media validation assessment by material expert and media expert

Aspects	Score	Max Score	Category
Learning	24	25	Excellent
Material	32	40	Good
Visual and audio	43	55	Good
Software engineering	17	20	Excellent

Based on Table 2 the validation result of the material expert, the learning aspect obtained a percentage of 96% with a score of 24; aspects of learning material obtained a percentage of 80% with a score of 32. The validation result of the material aspects and aspects of learning by material experts including the excellent category. The validation result of the media expert showed that the audio visual aspect obtained a percentage of 78.18% with a score of 43 and software engineering aspects at 85% with a score of 17. The validation result of the media expert showed that all aspects of android-based chemistry learning media were categorized as Good.

Media feasibility assessment is also carried out by peer reviewer and chemistry teachers. The media feasibility assessment of peer reviewer and chemistry teacher can be seen in Table 3.

Table 3: Media media feasibility assessment of peer reviewer and chemistry teacher

Validator	Score	Max Score	Quality
Peer reviewer	130.20	140	Excellent
Chemistry teachers	117.75	140	Excellent

Based on Table 3, the validation result of peer reviewer showed that all aspects of android-based chemistry learning media were categorized as Excellent with a total score obtained 130.20, which was 93% of the maximum score. The validation result by chemistry teachers showed that all aspects were categorized as Excellent with a total score of 117.75, which was 84.11% from the maximum score.
Android-based learning media were also tested in a small-scale trials by 32 students of grade XII high school. The results of trials to students can be seen in Table 4. Based on the results of the assessment of media readability by students in the learning aspects obtained an average score of 17.13 with a percentage of 85.65% and the display aspect of the media obtained a score of 30.38 with a percentage of 86.8%. Based on the result of validation by material experts, media experts, peer reviewers and chemistry teachers, it was shown that android-based chemistry learning media on the subject material of acid and base was considered as appropriate to be used in the learning process of chemistry in senior high school.

Table 4: Readability of the media in small-scale trials

Aspect	Score	Max Score	Category
Learning	17.13	20	Excellent
Display	30.38	35	Excellent

Furthermore, it was carried out field test to find out media's impact toward students' learning outcomes by using quasi-experimental with post-test only design. The sample of this research was selected randomly on two classes, those were experiment class (by using android-based chemistry learning media) and control class (by using conventional media that was used to be applied in the school). The results of average score of post-test in the experiment class and control class can be seen in Figure 5.

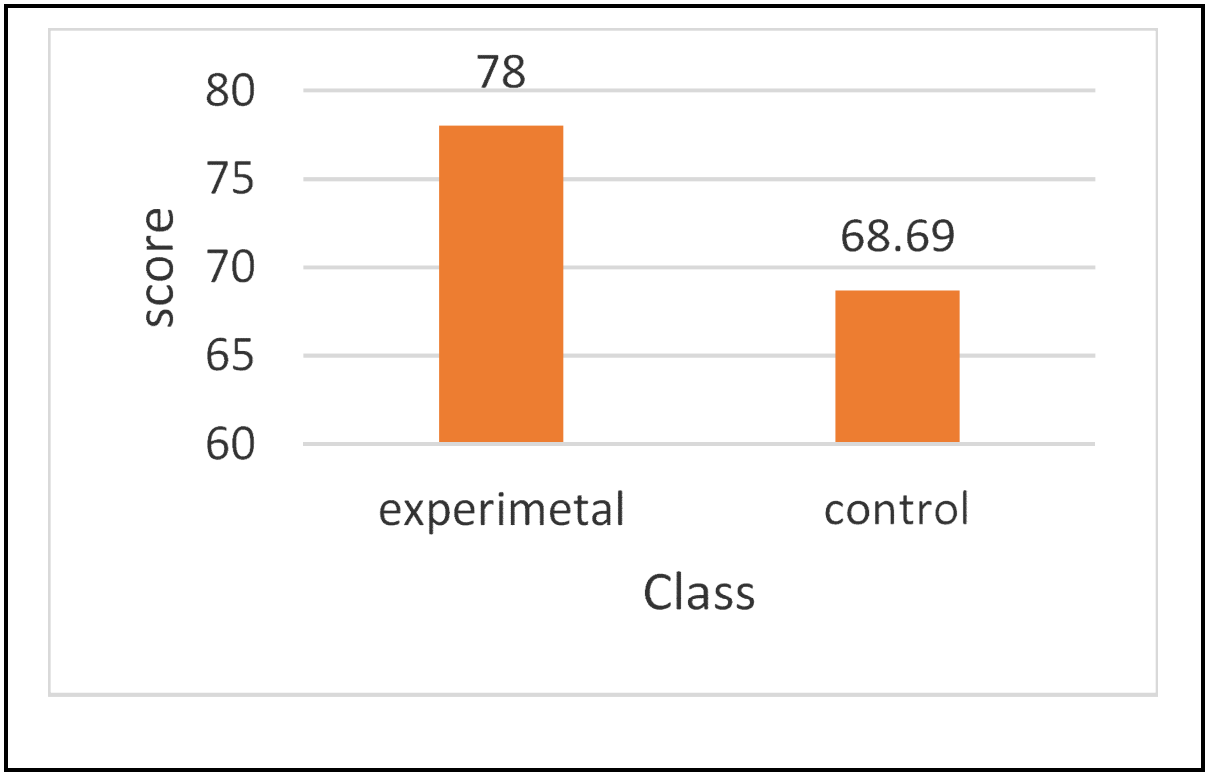

Figure 5: Student learning outcomes in the experimental class and control class

Based on Figure 5, it shows that cognitive learning outcome in the experimental class had an average score (78). It is higher than the control class (68.69). It showed that android-based chemistry learning media was able to improve students' cognitive learning outcome.
The statistical test which was used to find out media's impact toward students' learning outcomes was ANOVA test, with the program of SPSS 24. ANOVA would be applied if the prerequisite test (normality and homogeneity) was fulfilled. The normality of the distribution of the data of students' learning outcomes in the experimental group and the control group was tested by using the Shapiro-Wilk Test. Homogeneity of variance data was tested by using Levene's Test. The results of the analysis of normality tests can be seen in Table 5. Based on Table 5, score data on student learning outcomes from the experimental class and the control class are normally distributed. This is indicated by the significance value of the normality test > 0.05 which is equal to 0.477 (experimental class) and 0.195 (control class).

Tabel 5: Normality Test Result

Class	N	Sig. of Shapiro-Wilk
Experimental	33	0.477
Control	32	0.195

The results of the homogeneity tests can be seen in Table 6.

Tabel 6: Homogenity Test Result

Variable		Levene Statistic	Sig.
Learning outcome	Based on Mean	0.550	0.461

Based on Table 6, the variance of data homogeneity is homogeneous. This is evidenced by the significance value of the homogeneity test > 0.05 which is 0.461. After the prerequisite test was fulfilled, the ANOVA test was performed. The result of the ANOVA test can be seen in Table 7.

Table 7: ANOVA Test Result

	Sum of Square	Df	Mean Square	F	Sig
Beetween Group	1521.089	1	1521.089	13.06	0.001
Within Group	7362.511	63	116.865		
Total	8883.600	64			

Based on Table 7, the significance value of the One Way ANOVA test is 0.001 <0.05 which indicates that there are differences in cognitive learning outcomes between students in the experimental class and the control class. It shows that the android-based chemistry learning media developed was able to improve students' learning outcome.

DISCUSSION AND CONCLUSION

The development research which has been carried out produced media product, in the form of android-based chemistry learning media. The media has been validated by media experts, material experts, chemistry teachers, and peer reviewers. Based on the results of the assessment, it showed that the android-based chemistry learning media developed could be used as one of the learning media in the subject matter of acid and base in XI grade of Senior High School.

The use of technology-based learning media can be used to attract students' attention in learning so that they were more interested in following the learning process (Lesmono, Bachtiar, Naryani, & Muzdalifah, 2018). In addition, to support the 21st century learning, the use of technology has an important role in the learning process. Teachers are required to master technology and apply it in the learning process, either inside the classroom or outside the classroom (Franklin, 2011). For the teacher, the use of technology in learning makes it easier to deliver learning materials so that technology-based learning media are able to build and train students to study subject materials deeply and provide the meaningful learning (Leow & Neo, 2014).

Android-based learning media, as an effective learning media provide opportunities for students to access subject materials anywhere and anytime (Chung, 2019). So that, for students it makes learning more flexible and provides positive learning experience. In addition, it also can make the learning atmosphere more interactive and fun so that they can build their own knowledge and increase their conceptual understanding. According to the research which was conducted by Lubis & Ikhsan (2015) about the development of android-based chemistry learning media, it showed that the learning outcomes and the motivation of students that used android learning media were higher than students who used conventional learning. In addition, research conducted by Putra, Wijayati, & Mahatmanti (2017) showed that android-based learning media had positive impact on learning and increased students' learning outcomes.

The android-based learning media developed in this research contained menu of basic competencies and learning objectives to be achieved in the subject materials of acid and base, summaries of acid and base subject material, and exercises which were packaged in the form of game. Providing games in learning is able to give students a pleasure in learning and influence students' learning outcomes (Jabbour, 2013). Android learning media, with game is a learning media which was useful to provide a fun learning atmosphere, easy to be understood and easy to be accessed for students (Cahyana, Paristiowati, Savitri, & Hasyrin, 2017).

Learning outcome is one of the main indicators in evaluating the learning process which has been carried out. It is the result obtained by students through the learning process between teachers and students (Dimyati & Mudjiono, 2013). It had an important role to find out how far students' understanding toward subject materials was. Students with high learning outcomes tended to have a high understanding of the subject materials. In this research, by using android media, students in the experimental class continued to try to complete the tasks presented in the android media and they

were motivated to take part in learning. This was what caused them to have higher learning outcomes. In addition, they could also access android-based chemistry learning media anywhere and anytime without the limitations of space and time. They could repeat the subject materials which have not been understood through android learning media so that they could increase their understanding toward subject materials and their learning outcomes (Cahyana, Paristiowati, Savitri, & Hasyrin, 2017). Thus, an android-based learning media could be used as an effective learning media in the learning process either inside or outside the classroom (Lin, Chen & Liu, 2017). The use of appropriate learning media in the learning process would help students in receiving learning materials. So that the teacher had to be able to improve the quality of learning supported by various types of media (Isnaini, Himawanto, & Yusuf, 2017). For educators, the use of information technology provided opportunities to create technology-based chemistry learning media in supporting the learning process.

BIODATA AND CONTACT ADDRESSES OF AUTHORS

Tika Rahmawati is a graduate student of Chemistry Department, Graduate School, Yogyakarta State University, Indonesia. Her interest of researcher are educational development such as application supplement technology as learning innovation including the implementation of media in the learning chemistry, and teaching-learning of various chemistry teaching method, learning outcome in chemistry education.

Tika Rahmawati, S.Pd.
Graduate School, Yogyakarta State University
Yogyakarta- INDONESIA
E. Mail: tikarahmawaty@gmail.com

Crys Fajar Partana is a lecturer and researcher in Chemistry Departement, Faculty of Mathematics and Natural Science, Yogyakarta State University, Indonesia. His interest of researcher are educational media development in chemistry teaching learning and focused expertise in the field of Chemical Physics, Computational Chemistry, Chemical Education Workshop, Chemistry Learning Media Development, Quantum Chemistry, Chemical Dynamics.

Dr. Crys Fajar Partana, M.Si.
Faculty of Mathematics and Natural Science, Yogyakarta State University
Yogyakarta – INDONESIA
E. Mail: crsfajar@gmail.com

REFERENCES

Adnan, F., Prasetyo, B., & Nuriman, N. (2017). Usability testing analysis on the bana game as education game design references on junior high school. *Jurnal Pendidikan IPA Indonesia, 6*(1), 88-94. https://doi.org/10.15294/jpii.v6i1.9597.

Botha, J.J. (1990). Evaluating educational courseware: Principles and guidelines. *Perlinguam, 6*(1), 55-70. http://dx.doi.org/10.5785/6-1-357.

Cahyana, U., Paristiowati, M., Savitri, D. A., Hasyrin, S. N. (2017). Developing and application of Mobile Game Based Learning (M-GBL) for High School Students Performance in Chemistry. *Eurasia*

Journal of Mathematics, Science and Technology Education, *13*(10), 7037-7047. https://doi.org/10.12973/ejmste/78728.

Calimag, J., Mugel, P., & Conde, R. (2014). Ubiquitos learning environment using android mobile application. *IMPAC: International Journal of Research in Engineering & Technology, 2*(2), 119-128. Retrieved from http://impactjournals.us/journals.php?jtype=2&id=78.

Chuang, Y. (2014). Increasing learning motivation and student engagement through the technology-supported learning environment. *Creative Education*, *5*(23), 1969-1978. doi: 10.4236/ce.2014.523221.

Chung, C., J., Hwang, G., J., & Lai, C., L. (2019). A review of experimental mobile learning research in 2010-2016 based on the activity theory framework. *Computer & Education, 129*, 1-3. https://doi.org/10.1016/j.compedu.2018.10.010.

Crozat, S., Hû, O. & Trigano, P. (1999). A method for evaluating multimedia learning software. *Proceedings IEEE International Conference on Multimedia Computing and Systems, 1,* 714-719. Italy: IEEE. doi: 10.1109/MMCS.1999.779287.

Dimyati, & Mudjiono. (2013). *Belajar dan pembelajaran*. Jakarta: PT. Rineka Cipta.

Franklin, T. (2011). Mobile learning: At the tipping point. *Turkish Online Journal of Educational Technology, 10* (4), 261-275. Retrieved from https://www.learntechlib.org/p/53326/.

González, M. Á., Martín, M. E., Llamas, C., Martínez, O., Vegas, J., Hergeudas, M., & Hernández, C. (2015). Teaching and learning physics with smartphones. *Journal of Cases on Information Technology, 17*(1), 31–50. DOI 10.4018/JCIT.2015010103.

Hanafi, H. F., & Samsudin, K. (2012). Mobile Learning Environment System (MLES): The case of android-based learning application on undergraduates' learning. *International Journal of Advanced Computer Science and Applications (IJACSA), 3*(3), 1-5. http://dx.doi.org/10.14569/IJACSA.2012.030311.

Isnaini, M., Aries H., D., & Yusuf, M. (2017). Interactive Multimedia to Enhance Early Reading Skill on Children with Light Mental Retardation at 5th Grader SLB Autis Mitra Ananda Karanganyar Indonesia in Academic Year 2016/2017. *European Journal of Special Education Research, 2*(2), 1-13. Retrieved from https://oapub.org/edu/index.php/ejse/article/view/440.

Jabbour, K. K. (2013). An analysis of the effect of mobile game based learning (M-GBL) on Lebanese Higher Education. *Bulgarian Journal of Science and Education Policy, 7*(2), 280-301. Retrieved from http://bjsep.org/getfile.php?id=145.

Jauhariningsih, R. (2017). Upaya meningkatkan hasil belajar kimia materi asam dan basa dengan menggunakan Inquiry Based Learning (IBL) pada kelas XII IPA 2 SMA Negeri 5 Makasar. *Jurnal Nalar Pendidikan, 5* (2), 165-170. https://doi.org/10.26858/jnp.v5i2.4876.

Leow, F., T. & Neo, M. (2014). Interactive multimedia learning: Innovating classroom education in a Malaysian university. *The Turkish Online Journal of Educational Technology, 13* (2), 99–110.

Lin, M., Chen, H., Liu, K. (2017). A Study of the Effects of Digital Learning on Learning Motivation and Learning Outcome. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(7), 3553-3564. https://doi.org/10.12973/eurasia.2017.00744a.

Lubis, I., & Ikhsan, J. (2015). Pengembangan media pembelajaran kimia berbasis android untuk meningkatkan motivasi belajar dan prestasi kognitif peserta didik. *Jurnal Inovasi Pendidikan IPA, 1*(2), 191 - 201. doi:https://doi.org/10.21831/jipi.v1i2.7504.

Nesbit, J., Belfer, K., & Vargo, J. (2002). A convergent participation model for evaluation of learning objects. *Canadian Journal of Learning and Technology, 28*(3), 105-120. http://dx.doi.org/10.21432/T25C8C.

Nurohmah, S., Partono & Wahyudin. (2014). Perancangan aplikasi media pembelajaran fisika kelas VII berbasis android. *Jurnal Algoritma Sekolah Tinggi Teknologi Garut*. *11*(1), 1-10. Retrieved from http://sttgarut.ac.id/jurnal/index.php/algoritma/article/view/124.

Özdener, N and Demirci, F. (2019). Determining students' views about an educational game-based mobile application supported with sensors. *Technology, Knowledge and Learning, 24*(1), 143–159. https://doi.org/10.1007/s10758-018-9368-x.

Özmen, H., Demircioğlu, G., & Coll, R., K. (2009). A comparative study of the effects of a concept mapping enhanced laboratory experience on Turkish high school students' understanding of acid-base chemistry. *International Journal of Science and Mathematics Education, 7* (1), 1-24. https://doi.org/10.1007/s10763-007-9087-6.

Putra, R. S., Wijayati, N., & Mahatmanti, F.W. (2017). Pengaruh penggunaan media pembelajaran berbasis aplikasi android terhadap hasil belajar siswa. *Jurnal Inovasi Pendidikan Kimia*, 11(2), 2009-2018. https://journal.unnes.ac.id/nju/index.php/JIPK/article/view/10628.

Qi, A. (2018). A study of the effect of implementing intellectual property education with digital teaching on learning motivation and achievements. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(6), 2445-2452. https://doi.org/10.29333/ejmste/89498.

Rivalina, R. (2014). Kompetensi teknologi informasi dan komunikasi guru dalam peningkatan kualitas pembelajaran. *Jurnal Teknodik*, *18*(2), 165–176. Retrieved from https://jurnalteknodik.kemdikbud.go.id/index.php/jurnalteknodik/article/view/121.

Sung, Y. T., Chang, K. E., & Liu, T. C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education*, *94*, 252-275. https://doi.org/10.1016/j.compedu.2015.11.008.

Ültay, N., Calik, M. (2016). A comparison of different teaching designs of 'acids and bases' subject. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(1), 57-86. https://doi.org/10.12973/eurasia.2016.1422a.

Widoyoko, E. (2011). *Evaluasi Program Pembelajaran.* Yogyakarta: Pustaka Pelajar.

Wilson, J. M. (1998). Differences in knowledge networks about acids and bases of year-12, undergraduate and postgraduate chemistry students. *Research in Science Education, 28* (4), 429-446. https://doi.org/10.1007/BF02461508.

Yektyastuti, R., & Ikhsan, J. (2016). Pengembangan media pembelajaran berbasis android pada materi kelarutan untuk meningkatkan performa akademik peserta didik SMA. *Jurnal Inovasi Pendidikan IPA, 2* (1), 88-99. http://dx.doi.org/10.21831/jipi.v2i1.10289.

Yusrizal, Y., Safiah, I. & Nurhaidah, N. (2017). Kompetensi guru dalam memanfaatkan media pembelajaran berbasis Teknologi Informasi dan Komunikasi (TIK) di SD Negeri 16 Banda Aceh. *Jurnal Ilmiah Pendidikan Guru Sekolah Dasar FKIP Unsyiah*, 2(2), 126- 134. Retrieved from http://www.jim.unsyiah.ac.id/pgsd/article/view/4573.