The Effect of Using Kahoot Media on Chemistry Material on Student Interest and Learning Outcomes

Desi Lisa Rosanna[1*]

[1] Department of Chemistry Education, Faculty of Tarbiyah and Teacher Training Sciences, Syekh Ali Hasan Ahmad Addary State Islamic University, Padangsidimpuan, Indonesia

E-mail*: *rosanna@uinsyahada.ac.id*

Article Info	ABSTRACT
	The purpose of this study was to determine the effect of using kahoot media on chemistry material on interest and learning outcomes. This researched used a quantitative quasi-experimental. The study population was class X IPA learners consisting of 5 classes totalling 154 people and the sample in the study of class X IPA totalling 30 people as an experimental class and 30 people as a control class. The data collection used were questionnaires and questions. The research shows that there are differences in learning outcomes. Before the t-test was carried out, the data was found to be normally distributed and homogeneous. The results of hypothesis testing using the t-test with a significance value of 0.000 means that the sig value <0.05. So that H_0 is rejected and H_1 is accepted. So it can be concluded that there is an effect of Kahoot users as learning media on learning interest and learning outcomes of learners in chemistry material. This kahoot media can be one of the recommended media that increases student interest and learning outcomes. Hopefully the next writer can develop this kahoot media with the latest animation and be applied to the elementary school level to the college level.

INTRODUCTION

21st century education aims to motivate learners to control the skills an important and useful for them to responsive of changes and developments of the times. This requires learners and educators to form learning that can improve the 6C, namely collaboration, communication, critical thinking, critizenship, creativity, and connectivity. In addition, students need have knowledge, skills, and abilities in the field of technology. Education is very important to support students' future by conducting guidance or training activities. The quality of education can be seen with an education system that provides relevant and quality learning for students. It includes various aspects, namely learning outcomes, skills, curriculum, learning methods, and the availability of educational resources. Learning interest is included in the main factors to support student learning success. Interest comes from the student himself. Teachers have a very important role in increasing students' interest in learning by providing fun and motivating teaching (Yunitasari & Hanifah, 2020).

Chemistry is one of the subjects taught to students for students' thinking skills and creative thinking patterns (Abd.Rachman et al., 2017). But in reality, many

students have difficulty learning chemistry and find chemistry lessons boring and unpleasant. So that interest in learning becomes reduced and does not have the desire to learn chemistry seriously. In addition, according to chemistry is one of the fields of science because most students find the subject difficult and boring. The evidenced by the relatively low learning outcomes of students in chemistry lessons (Watoni, 2019). The low learning outcomes in chemistry lessons doesn't only occur in one school, but in several schools in Sumbawa Regency. This lesson is closely related to contextual. This lessons that students are less interested in because it is often considered difficult plus the concept of chemistry is abstract (Sulistio et al., 2022). Chemistry material is one of the materials whose concepts are abstract and difficult to understand (Farikha et al., 2015).

Learners find conventional learning boring so that innovation is needed in learner-centred learning, one of which is by using learning media. According to (Utami, A.K.Z, 2020) the use of smartphones and laptops by learners in their daily activities is one of the advantages for educators to increase learner motivation in the learning process. When used in education, game-based learning gives learners the opportunity to apply critical thinking in problem solving (Yeh et al., 2017). In order to improve learners' understanding of science, game-based learning offers games that address scientific issues. It was determined that game-based learning can offer knowledge acquisition that is considered more efficient than using other learning techniques.

The benefit of technology in learning is necessary to achieve learning objectives. The technology as a support for the learning which results in learning becoming more fun, interesting, and become more enthusiastic in the learning (Hartanti, 2019). Kahoot game is an educational platform or learning application that uses the internet containing questions with an attractive appearance. Kahoot games are unpaid or free and are used online. This game can make students become active directly and make the atmosphere fun, lively, not boring, and more lively. Although this Kahoot game is free, the use of Kahoot games in learning media is still rarely used. This is because teachers still lack knowledge about learning media in technology and also teacher motivation is still lacking in learning technology for learning (Rohmah, 2019). Since learning is learner-centred and can promote and strengthen the problem-solving ability of each learner, the quiz in Kahoot application can be said to be successful learning. By adopting game-based learning materials, it is expected to increase students' interest in learning so that learning outcomes become better (Sakdah et al., 2022)

Learning is learner-centred and can promote and strengthen the problem-solving ability of each learner, so the quiz on Kahoot application can be said to be successful learning. By adopting game-based learning materials, it is expected to increase learners' interest in learning. The advantages of Kahoot game compared to other games are (1) Kahoot game makes the classroom atmosphere more fun, (2) learners are trained to use technology as a learning medium, (3) learners are trained in their motor skills in operating Kahoot, (4) learners more enthusiastic and will be conducive (Sakdah et al., 2022). One of the game-based response platform learning websites is Kahoot. Kahoot can be utilised to create quizzes, games, discussions and surveys on any subject area for learners. In the online learning process, an effective

evaluation media is needed to improve learners' learning outcomes. The innovations in online evaluation media is Kahoot (Sastrakusumah et al., 2018). Another advantage of kahoot is that it can make students more focused in lessons because it has interesting features such as videos, images, graphics that can be added to questions (Ahmed et al., 2022). Based on this, the application of game-based learning media using the kahoot application can increase student interest in learning (Zuraida, 2022) and kahoot media also affects student learning outcomes (Sakdah et al., 2022).

Based on the preliminary study conducted, there was an improve in learning each cycle between the pre-test and post-test. The increase was also in the percentage of completeness of learning outcomes where initially 83% became 100%. Students' process skills also increased, so this games in addition to increase student process skills. Kahoot game can also increase interest in learning, it can be seen in the enthusiasm and excitement of students (Wigati, 2019). Learning that uses Kahoot game as learning media has a higher level than direct learning models. The application of Kahoot game media also has an influence on learning interest and learning outcomes compared to conventional learning (Puspitasari, 2022). The purpose of the authors conducted this researched to knowing the effect of using kahoot media on chemistry material on interest and learning outcomes.

METHODS

This study used a quasi-experimental method to examine the effect of using Kahoot game media on student interest and learning outcomes in chemistry lessons and compare the level of students in experimental and control classes (Ramadhan, 2021). The pseudo-experimental method is a form of design using two groups. One group as an experimental group and the other as a control group. The experimental group is given treatment with a media and the control class with an existing learning strategy. The quasi-experimental design used a nonequivalent control group design to compare the experimental group with the control group. The experimental group and control group were given a pre-test then given treatment and finally given a post-test (Rukminingsih, 2020).

Table 1. Research Design

Kelompok	Pretest	Perlakuan	Pretest
Experiment	O1	X1	O2
Control	O3	X2	O4

Description:
O1 = Learning Interest before and after learning (Experimental group)
O2 = Learning Outcomes before and after learning (Experimental group)
O3 = Pre-test (Control group)
O4 = Post-test (Control group)
X1 = Using Kahoot game media
X2 = Using conventional learning

The sample was taken in class XI students totalling 60 students. The sampling technique was purposive sampling that used for sampling in small numbers. Data collection used in this research, namely:

1) Questionnaire Distribution.

This study was in the form of distributing questionnaires or questionnaires. Questionnaire by distributing a complete list of statements and according to research variables addressed to respondents to obtain the information needed by researchers. The questionnaire using Kahoot game media contains 25 statements, namely 16 positive statements and 9 negative statements. For scoring questionnaires of learning interest using a Likert scale with a scale of 4. As for the indicators in the assessment of learning interest consists of 6, namely:

a) students' interest in learning;
b) students' feelings of pleasure in participating in learning;
c) students' involvement in learning;
d) students' attention to learning; and
e) students' motivation for learning.

2) Observation This study uses the observation method. This observation aims to see student learning interest from student activeness during teaching and learning activities.

3) Written Tests Research uses test techniques by giving test questions for measuring student abilitie students in learning.

Data collection techniques in this study, namely written tests that will be given to students in the form of pre-test and post-test. The instruments were questionnaires, observation sheets or observations of student activeness, and pre-test and posttest sheets (learning outcomes tests). This instrument is adapted from previous research. The questionnaire instruments were tested again with several analyses, namely:

a) validity test wiht Pearson Product Moment technique;
b) reliability test by the Chronbach's Alpha formula;
c) and test the level of difficulty with the difficult and easy categories; and
d) test the differentiation of questions with excellent, good, moderate, and less categories. After that, hypothesis testing with the t-test. If the significance value of the hypothesis test <0.05 then H_1 is accepted and H_0 is rejected.

RESULT AND DISCUSSION

The learning process in the classroom lasted for 3 meetings. The time was 2 x 45 minutes. The results of descriptive analysis of learning interest of experimental and control classes using a questionnaire with 25 statements are presented in Table 2.

Table 2. Experimental class learning interest results

No.	Data	Experiment Class Statisticcs (%)	Control Class Statisticc (%)
1	Number of Samples	30	30
2	Lowest Score	70	55
3	Highest Score	100	90
4	Average	88	75

Based on Table 2. the experimental class obtained an average value of 88 and the control class 75, so that student interest learning in the experimental class was very high. The specific analysis of learning interest based on indicators are show in Table 3. Based on Table 3, learning interest of the experimental class has a higher value learning interest. Assessment of the implementation of learning was done by one observer.

Table 3. Specific results of learning interest

No.	Indicator	Experimental Class		Control Class	
		Percentage	Category	Percentage	Category
1	Student interest towards learning	90	Very high	75	High
2	Students' feelings of pleasure in participating in learning	85	Very high	80	Very high
3	Student engagement towards learning	85	Very high	75	High
4	Students' attention to learning	90	Very high	80	Very high
5	Student motivation towards Learning	90	Very high	75	High

Table 4. Percentage data of the implementation of learning

Meeting	Implementation of Learning Steps	
	Experiment Class (%)	Control Class (%)
1	90	85
2	90	85
3	95	90
Average	91.67	86.67

Data on learners' initial ability was obtained from the pretest scores conducted at the first meeting before the learning began. The effect of using Kahoot online game on learning interest can be analyzed with an independent t-test. Hypothesis testing requirements using data must be normal and homogeneous, so the test was conducted to know normality and homogeneity.

Table 5. Initial learner ability score (pretest)

Description	Class	
	Experimental	Control
Number of learners	30	30
Average	50	53
Highest Score	75	75
Lowest Score	25	30

Based on Tables 6 and 7, the interest data of experimental classes that apply Kahoot online games and control classes that do not apply Kahoot are normally distributed, have homogeneous variants. Meanwhile, based on Table 6, the t test analysis of learning interest data shows the sig. (2-tailed) is less than 0.05. The effect of using Kahoot media based on Game-based learning on learner interest in the material of the periodic system of elements. Classes that apply Kahoot media have a higher influence on learning interest than classes that do not apply Kahoot media. This is also in accordance with the results of the mean interest and the percentage of interest in learning of the experimental class > control class.

Table 6. Results of normality test of interest

Class	Df	Significance	Conclusion
Experimental	30	0.095	Normal
Control	30	0.102	Normal

Table 7. Results of interest homogeneity test between experiment and control groups

Levene Statistic	df1	df1	Sig.	Conclusion
.0933	1	60	.679	Homogen

The effect of using this media on learning outcomes can be analysed with a t-test. Hypothesis testing requirements using data must be normal and homogeneous, so it is necessary to test for normality and homogeneity. The result can be seen in Table 8. Table 9 shows learning outcome data.

Table 8. T-test results of learning interest

Class	Class Number	Mean	Nilai Sig. (2-tailed)
Experimental	30	128	0.001
Control	30	105	

Table 9. Learning outcome data

Class	Class Number	Highest Score	Lowest Score	Average
Experimental	30	95	75	80
Control	30	85	65	70

Based on Tables 10 and Table 11, the data on student learning outcomes are normally distributed and have homogeneous variants. Table 12 shows the T-test results of learning outcomens. The sig. value for learning outcomes shows 0.000 <0.05 that means that there are effects of using kahoot media on student learning outcomes in chemistry. From the mean results it can also be seen that the experimental group value is greater than the control group. With the game mode in this media, we can maximize learning. Can give assignments from the live that we just played together. Then students can review today's learning by using this mode. Considering user convenience, it is designed to be user friendly, both for educators and students. It is

the various choices of interactive learning media that make the learning process fun, both for students and educators.

Table 10. Posttest normality test results

Class	df	Significance	Conclusion
Experimental	30	0.101	Normal
Control	30	0.230	Normal

Table 11. Results of variance homogeneity test

Levene Statistic	df1	df1	Sig.	Conclusion
1.225	1	60	.507	Homogen

Table 12. T-test results of learning outcomes

Class	Class Number	Mean	Sig. (2-tailed)
Experimental	30	80	0,000
Control	30	70	

The descriptive statistical analysis of student interest questionnaire in the experimental class obtained an average value of 88 while the control class of 75. The level of student interest in learning in the experimental class fell into a very high category, while in the control class fell into the high category. The experimental class obtained a higher score than the control class. Learning interest has 5 indicators, namely student interest, feelings of pleasure, student involvement, student attention, and student motivation for learning. The specific descriptive analysis of learning interest in the indicator of student attention to learning, the experimental class got a percentage of 90 including a very high category, while in the control class it was 80. So that the experimental class got a higher score than the class.

The quiz presented with Kahoot game media is more interesting so that it makes students become more motivated and increases students' curiosity to take the quiz. This research conducted by previous studies that Kahoot can increase curiosity (Puspitasari, 2022), because learning becomes more creative, not boring, and fun (Rohmah, 2019) and The use of Kahoot game media makes students more active and feel more involved because students take part in Kahoot game media (Indriani & Desyandri, 2022). It is a type of visual learning media. As a visual learning media, this game has an attention function. The attention function is that visual media is the core, interesting, and directs learning attention to concentrate on the content of the lesson related to the visual meaning displayed or accompanying the text of the lesson material. It can be used as a teaching medium that can meet the demands of the digital generation.

The application of kahoot as a game-based learning media increases learner interest, the t test analysis of data show a sig value (2-tailed) less than 0.05, meaning that applying as kahoot media on interest in learning chemistry. The learning interest of experimental and control class learners is high, but the learning interest of the experimental class (91.67) compared to the control class (86.67), so it can be concluded that there is a significant influence between the use of kahoot media on students'

learning interest. This is due to the existence of interesting learning activities, a comfortable learning atmosphere can make learners able to learn well.

This study are also supported by research findings that this media provides a sig. difference between classes that use kahoot learning media compared to classes that use conventional media (Setiawati et al., 2018). Also showed in their research that the kahoot interactive learning media can increase learners' interest in learning through innovations that involve learners being more enthusiastic in learning (Irwan et al., 2019). Then it is said that kahoot learning media can be used as an alternative learning media because it is proven to significantly increase learners' interest in learning. In line with research conducted) the development of scratch game media in grade V science learning material on respiratory organs in animals is very effective for improving learning (Wardani et al., 2017).

By choosing the right media from kahoot mobile app, learners can foster a cool learning environment and an engaged, productive and innovative learning spirit of learners. Maximum use of smartphones for learning is promoted by using technology-based learning materials. So that learners utilise their smartphones for learning rather than playing. It is envisaged that technology-assisted learning will make it possible to deliver educational content as fun quizzes, as opposed to using lecture techniques when delivering lessons. The educational games in the kahoot programme are intended to arouse learners' curiosity and excitement in learning so the information delivered by the learner. Games are actually used in the classroom to make learning interesting, entertaining and not boring.

Kahoot and Quizizz apps increase student activity, which helps students to be active in class and have collaborative learning, which also increases student engagement in the learning process (Chaiyo, 2017). It can motivate learners to play an active role in answering questions. The quizzes in the kahoot application are not only of images, but can also be embedded with videos, so that they strongly support the objectives of the 2013 curriculum, namely the learning process that prioritises high order thinking skills. It is designed for group and individual games. This game don't require installing software on a laptop because it is made through web-based software specifications for its use. it is only necessary to register an account as an educator (trainer). Registering an account will be easier if you have a Facebook or gmail. As a user, students need to access URL address and enter the PIN that the educator's account. For access via smartphone, it is available in the form of an application and downloaded for free via the Google Playstore. Participants who use Kahoot, the questions given will be displayed on the screen, then the participants are given a time limit to answer. Each correct or incorrect answer will be displayed directly on the screen and get points at the end of each question, the five highest point positions will be displayed on the screen, the end of the game Kahoot only displays the top three points.

The characteristics of chemistry learning that require understanding of concepts, are abstract, memorised, calculated, and applicative understanding in everyday life make students have difficulty in learning the material (Yerimadesi et al., 2023). There is a special pride for students when their names are displayed on the projector screen. This makes learners more eager to answer questions, so their learning activity increases. Score accumulation is based on the speed and accuracy of learners

in answering questions. This can trigger the critical thinking level of learners. Learners feel proud, especially when their names are displayed on the LCD screen. According to previous research, kahoot is able to make learners actively participate in learning activities.

However, it affects the learners' ability to concentrate when listening to the learner's explanation. Some learners rush to the next question so that they know their score faster. Therefore, when answering the question, sometimes the learners do not give the right answer. The learners concentrate on finishing the question quickly and getting the best score. The result has an impact on the learners' final ability which is represented in their learning outcomes. Kahoot usually impacts the dynamics and creates a more engaging learning environment of insights made during the research. Learning using Kahoot can grab learners' attention and make them concentrate. This makes managing conditions in the classroom simple.

Constraints on learning activities were learners who were too eager to learn while playing and made noise in class when using kahoot media. In addition, there was a network problem that sometimes interfered with the quiz, but it was fixed. After teaching in the experimental class using kahoot as a game-based learning media and the control class using conventional-based powerpoint media, it was seen that posttest showed a difference. This is shown from the significance value of 0.000 <0.05, meaning that simultaneously kahoot as a good learning media affects the learning outcomes of learners on the material of the periodic system of elements, and that the experimental class achieved better learning outcomes (77.25) than the control class (71.63).

The relationship between interest and learner learning outcomes is calculated through a correlation test that is adjusted to the research data. Based on the correlation test data for the experimental class that applied Kahoot online game, the correlation coefficient value was 0.861 with a significant value of 0.000 (smaller than 0.05) which means there is a positive and significant relationship. If seen from the results of the learning interest questionnaire, some learners with low interest have low learning outcomes. The correlation is strong category. This is in correspond with the several characteristics to describe learner interest in learning, including increased focus and attention, a sense of pleasure while learning, and stronger motivation to learn. Someone who has a high interest in learning will have a greater desire and try harder than someone who has a low interest, so someone who has a higher interest is likely to get better learning results than learners who have a low interest in learning.

The games in the classroom can help learners learn scientific ideas more effectively and with greater interest. The implementation of this games can significantly increase learners' interest because all learners love to learn through games. The game is a fun learning for the learners because it relaxes the learners and certainly affects the improvement of learners' concept understanding. The previous research also shows that learners who have high interest in learning will certainly contribute to improving learners' concept understanding. The learners will continue to be motivated to study hard, so that they will understanding of natural science concepts.

The preliminary study conducted, the results show that in the application of Kahoot game there is a sig. effect on learning. Kahoot games are effective for increasing student learning motivation, and also attract student interest in learning. Based on the

background above, researchers are interested in conducting a study entitled "The Effect of Kahoot Game Media on Student Interest and Learning Outcomes in Chemistry Lessons". The use of Kahoot as a learning media is very helpful for teachers in providing innovation and creativity in learning and can support students in the use of good and correct technology so that students are trained to follow technological developments. Teachers can create questions or tests with an attractive appearance that can make students comfortable and motivated to do questions or tests well.

This research itself certainly need to be improved in future studies, namely an inadequate or poor network that results in learning using the Kahoot application not running optimally and limited letters in the form of questions and answers in Kahoot so that learners feel incomplete and satisfied. The research was conducted to improve educators' understanding of game-based learning media that can be used in the learning, so as to increase learners' interest in learning. Learners should use a variety of learning media, it can use game-based learning media that use technology such as quiz, baamboozle, wordwall and so on. This research provides the information needed to some solve problems and make decisions. The benefits of research are that the results of research can be used for programme development and for scientific purposes.

CONCLUSION

The Kahoot learning media provides a sig. difference between classes that use this learning media compared to classes that use conventional media. The learning interest questionnaire in the experimental class which has an average value of 88 and control class is 75. From the learning outcomes, it can also be seen in the T-test results that the a sig value (2-tailed) <0.5. This means that the use of the learning media-based on games learning affects the learner are higher than conventional media. Using Kahoot as a game-based learning tool can generally improve learners' interest and learning outcomes while updating the research findings. Technology can be used in game-based learning to fulfil the needs of the learning process. Researchers recommend Kahoot media can be a valuable tool for educators who want to increase student engagement and improve learning outcomes. The researcher also hopes that other researchers can use Kahoot by comparing its effectiveness with other game-based learning tools.

REFERENCE

Abd.Rachman, F., Ahsanunnisa, R., & Nawawi, E. (2017). Pengembangan LKPD Berbasis Berpikir Kritis Materi Kelarutan dan Hasil Kali Kelarutan pada Mata Pelajaran Kimia di SMA. *Alkimia, 1(1)*, 16–25.

Ahmed, A. A. A., Sayed, B. T., Wekke, I. S., Widodo, M., Rostikawati, D., Muneam Hussein Ali, 7 Hamed Ali Abdul Hussein, & Azizian, M. (2022). An Empirical Study on the Effects of Using Kahoot as a Game-Based Learning Tool on EFL Learners' Vocabulary Recall and Retention. *Education Research International, 1(1)*.

Chaiyo, Y., & Nokham, R. (2017, March). The effect of Kahoot, Quizizz and Google Forms on the student's perception in the classrooms response system. In *2017 International conference on digital arts, media and technology (ICDAMT)* (pp. 178-182). IEEE. 10.1109/ICDAMT.2017.7904957

Farikha, L. I., Redjeki, T., & Utomo, B. (2015). Penerapan Model Pembelajaran Predict Observe Explain (POE) disertai Eksperimen pada Materi Pokok Hidrolisis

Garam untuk Meningkatkan Aktivitas dan Prestasi Belajar Siswa Kelas XI MIA 3 SMA NEGERI 4. *Jurnal Pendidikan Kimia (JPK)*, *4*(4), 95–102.

Hartanti, D. (2019). *Pembelajaran Interaktif Game Kahoot Berbasis Improving Student Learning Motivation with Interactive Learning Media of Hypermedia-Based Game*. *September*, 78–85.

Indriani, E., & Desyandri. (2022). Pengaruh Game Kahoot Terhadap Minat Belajar Siswa Pada Pembelajaran IPAS Kelas IV di Sekolah Dasar. *Didaktik : Jurnal Ilmiah PGSD FKIP Universitas Mandiri*, *08*(02), 1934–1942.

Irwan, I., Luthfi, Z. F., & Waldi, A. (2019). Efektifitas Penggunaan Kahoot ! untuk Meningkatkan Hasil Belajar Siswa [Effectiveness of Using Kahoot ! to Improve Student Learning Outcomes]. *Pedagogia*, *8*(1), 95–104. https://doi.org/10.21070/pedagogia.v8i1.1866

Puspitasari, R. (2022). Pengaruh Media Pembelajaran Kahoot Berbasis Game Based Learning terhadap Minat dan Hasil Belajar Peserta Didik. *Edukatif: Jurnal Ilmu Pendidikan*, *4*(6), 8214–8226.

Ramadhan, M. (2021). Metode Penelitian. Surabaya: Cipta Media Nusantara

Rohmah, O. M. (2019). Pengaruh Media Pembelajaran dan Minat Belajar Siswa terhadap Hasil Belajar Kimia Siswa (Eksperimen Pada Sekolah Menengah Atas Negeri di Kabupaten Tangerang). *Alfarisi: Jurnal Pendidikan MIPA*, *2*(1), 39–49.

Rukminingsih. (2020). Metode Penelitian Pendidikan Penelitian Kuantitatif, Penelitian Kualitatif, Penelitian Tindakan Kelas. Yogyakarta: Erhaka Utama.

Sakdah, M. S., Prastowo, A., & Anas, N. (2022). Implementasi Kahoot sebagai Media Pembelajaran Berbasis Game Based Learning terhadap Hasil Belajar dalam Menghadapi Era Revolusi Industri 4 . 0. *Edukatif : Jurnal Ilmu Pendidikan*, *4*(1), 487–497.

Sastrakusumah, E. N., Suherman, U., Darmawan, D., & Jamilah, J. 2018. Pengaruh media pembelajaran interaktif berbantuan aplikasi ISpring presenter terhadap kemampuan. Teknologi Pembelajaran. 3(1): 462-485

Setiawati, H. D., Sihkabuden, & Adi, E. P. (2018). Pengaruh Kahoot! terhadap Hasil Belajar Siswa Kelas XI di SMAN 1 Blitar. *JKTP*, *4(4)*, 273–278.

Sulistio, D., Rasmawan, R., Ulfah, M., Sahputra, R., & Sartika, R. P. (2022). Pengembangan Aplikasi Interaktif Berbasis Inkuiri Terbimbing Materi Hidrolisis Garam. *Edukatif : Jurnal Ilmu Pendidikan*, *4*(4), 5629–5641.

Utami, A.K.Z, & D. H. (2020). Pengaruh Penggunaan Aplikasi Kahoot Terhadap Motivasi Belajar Bahasa Arab Siswa Kelas X MAN 4 Kebumen. Edulab: Majalah Ilmiah Laboratorium Pendidikan, 5(1), 20–31. https://doi.org/10.14421/edulab.2020.51-02

Wardani, S., Lindawati, L., & Kusuma, S. B. W. (2017). Android-System-Based Chemistry Board Game To Improve. *Jurnal Pendidikan IPA Indonesia*, *6*(2), 196–205. https://doi.org/10.15294/jpii.v6i2.8360

Watoni, M. S. (2019). Analisis Faktor-Faktor Penyebab Kesulitan Belajar pada Bidang Studi Akuntansi. *Manazhim : Jurnal Manajemen Dan Ilmu Pendidikan*, *1*, 64–80.

Wigati, S. (2019). Penggunaan Media Game Kahoot untuk Meningkatkan Hasil dan Minat Belajar Matematika. *Aksioma: Jurnal Program Studi Pendidikan Matematika*, *8*(3), 457–464.

Yeh, Y. T., Hung, H. T., & Hsu, Y. J. (2017, July). Digital game-based learning for

improving students' academic achievement, learning motivation, and willingness to communicate in an English course. In *2017 6th IIAI International Congress on Advanced Applied Informatics (IIAI-AAI)* (pp. 560-563). IEEE.

Yerimadesi, Y., Warlinda, Y. A., Rosanna, D. L., Sakinah, M., Putri, E. J., Guspatni, G., & Andromeda, A. (2023). Guided Discovery Learning-Based Chemistry E-Module and Its Effect on Students' Higher-Order Thinking Skills. *Jurnal Pendidikan IPA Indonesia*, *12*(1), 168–177. https://doi.org/10.15294/jpii.v12i1.42130

Yunitasari, R., & Hanifah, U. (2020). Pengaruh Pembelajaran Daring terhadap Minat Belajar Siswa pada Masa COVID-19. *Edukatif : Jurnal Ilmu Pendidikan*, *2*(3), 232–243.