JPPIPA 8(2) (2022)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

The Effect of Gamification Media in Networks on Learning Outcomes and Thinking Attitudes in Learning

Lia Musnidar[1*], A. Halim[2], Ismul Huda[2], Muhammad Syukri[2], Elisa Kasli[2]

[1] Science Education Study Program, Postgraduate Program, Syiah Kuala University, Banda Aceh, Indonesia.
[2] Physics Education Study Program FKIP Syiah Kuala University, Banda Aceh, Indonesia.

DOI: 10.29303/jppipa.v8i2.1321

Article Info
Received: January 12, 2022
Revised: April 24, 2022
Accepted: April 27, 2022
Published: April 30, 2022

Abstract: The concept of physics material for some students is a difficult concept. In fact, students tend to like to work together and be critical in asking questions, but lacks in building ideas between each other for understanding the concepts of physics material. This affects learning outcomes, namely about 20% of students have not met the minimum completeness criteria for the overall Physics material. Based on the problems above, the purpose of this study is to determine the effect of network gamification media on student learning outcomes and to determine differences in students' thinking attitudes in learning after gamification-based media is applied in the network. Gamification is one that implements the game concept in a non-game context to create a fun learning process. Gamification has various designs, one of which is crossword and has a bulleted aspect. This study aims to determine the effect of gamification media in the network on student learning outcomes. The method used in this research is quasi-experimental with Non-Randomized Posttest-Only Control Group Design with random sampling technique. Data was collected through test and non-test data. The results of the study were tested with the Ancova test showing a significance value of 0.325 > 0.05 which indicates the application of gamification media has no effect on learning outcomes. This can happen because the learning process is short and students explore independently without monitoring by the teacher and this is something that is still new for students. Based on the results of the questionnaire analysis proves that students become the ideal SK means more argumentative and critical. This shows that there is a difference after being given gamification media treatment on thinking attitudes in learning.

Keywords: Learning outcomes; Connected Knower (CK); Separate Knower (SK).

Citation: Musnidar, L., Halim, A., Huda, I., Syukri, M., & Kasli, E. (2022). The Effect of Gamification Media in Networks on Learning Outcomes and Thinking Attitudes in Learning. *Jurnal Penelitian Pendidikan IPA*, *8*(2), 1005–1011. https://doi.org/10.29303/jppipa.v8i2.1321

Introduction

Regarding ICT, it is not awkward to talk about it in the learning process, because ICT is a human need in the current era which is also known as the era of globalization. Realizing environmental demands in the era of the industrial revolution 4.0 which requires humans to use virtual and sophisticated technology (Sutirman, 2018), educational innovation is needed in the form of ICT-based learning activities that are multimedia, mobile, and online learning (Darmawan, 2012: iii). The online learning process in the form of e-learning has been carried out in developed countries. The e-learning system is a form of technology implementation aimed at assisting the learning process, which is packaged in web-based digital form on an internet site.

Indonesia is required to implement an online learning process in the era of the COVID-19 pandemic. Especially in the red zone areas, this is intended to prevent the spread of the COVID-19 pandemic virus. All education providers must be ready with the new learning system. Several online applications that are applied to every school in various cities in Indonesia

* Corresponding Author: liamusnidar92@gmail.com

Copyright © 2022, Author et al.
This open access article is distributed under a (CC-BY License)

are in the form of zoom and jitsi, but these applications are general so that it is difficult for the government to access data reports to find out the progress of the learning process. An online learning platform is needed, namely e-learning.

Several schools in Banda Aceh already have their own online learning platforms. Schools that do not yet have an online learning platform can access a program belonging to the Directorate General of Higher Education called SPADA. Each e-learning platform has its own advantages and disadvantages and of course all aim to facilitate the needs of teachers, students and parents who take part in monitoring children's academic development.

Utilization of e-learning in the learning process is a strategic step to explore potential, in order to construct students through the use of various online learning resources. The sources in question are video, audio, website, text, visual, multimedia which are stored digitally so that they can be accessed anytime and anywhere. Along with the need for e-learning-based learning, innovators continue to strive to update features on the e-learning platform as an online learning resource, so that learning is fun and not monotonous even though it is done online, which means without direct supervision from the teacher. One of these features is games. Yaumi (2018: 72) argues that games are one of the learning strategies to create a dynamic learning atmosphere, attract attention, and encourage fun learning enthusiasm. However, the available games must be integrated for the development of students' attitudes and skills towards learning objectives.

One of the features of e-learning games is gamification. Romdhoni & Wibowo (2014) say that gamification is a process of using game design techniques and game mechanisms in non-game contexts, to bind users in achieving a goal, namely learning objectives with the teacher acting as a facilitator. Gamifacation itself is a question game feature with varied designs that has a bulleted aspect for students who can solve challenging questions. With points, students compete to get the highest points by answering all the questions in the game correctly. This requires students to learn because the questions in the game are in the form of subject matter. The teacher's task as a facilitator in applying gamification is to prepare a collection of questions according to the subject matter, to be done by students through the e-learning game feature, namely gamification.

Crossword is one of the gamification features that is applied in the e-learning-based learning process for practice questions. Crosswords themselves are not uncommon to find in newspapers, magazines, and various other media. Crossword is one of the popular features that becomes an alternative to facilitate teachers in motivating students involving theoretical concepts (Khedif et al., 2014). Patrick et al. (2018) said that crossword provides vocabulary expansion, stimulates thinking capacity, increases self-confidence, and accelerates learning capacity, and especially reduces the undue burden of passive memorization. In addition, the application of crosswords in the learning process can help students improve memory, indication, and fun learning content so that it can affect learning outcomes. Pradana et al, (2018) said that increasing efficiency, effectiveness, motivation and student involvement in e-learning can be achieved by utilizing the gamification feature.

One of the unique features of gamification is in the form of a crossword, which displays a different display, giving the impression that each display has a different command, so that this allows students to work independently and actively. It can be assumed that if students are actively involved in a fun learning process, it can stimulate learning outcomes in the form of students' cognitive abilities. The cognitive domain gets the most attention from teachers, because learning outcomes in this domain measure the presence or absence of student progress in mastering lesson materials or materials.

The learning process reaches its peak in student learning outcomes by performing (Silalahi, 2018). The performance in question as expressed by Maisaroh & Rostrieningsih (2012) that learning outcomes appear in an achievement given by students based on the responses given by students to the stimulus (stimulus) given by the teacher in the form of answers in the form of oral, written, test or implementation of tasks. Duty.

Practice questions are often considered only to test the extent of understanding the material. In fact, practice questions can increase the retention rate (how much material is remembered) in the long run. Setiyawan (2013) says that asking students to repeat reading only has a temporary effect on memory, there is another way so that reading can be maintained for a long time in long-term memory, so that it can improve student learning outcomes is the frequency of giving tests. This has been practically practiced by Jews to educate their offspring, starting in the womb as stated by Kasana & Sari (2017) to stimulate IQ growth during the prenatal period. The method used by the Jews is quite unique, namely that mothers are advised to read more math books and study them. In addition to studying it, the pregnant woman also does the questions in it, so that the fetal brain will be honed well.

A material that is only reread means the process of receiving information is called passive learning. However, when doing practice questions, which means the process will stimulate memory more during the learning process, it is called active learning. It will be

more efficient if you combine passive learning with active learning. In addition, when working on practice questions, there will be a memory that is recalled in the brain. Every time you take in information, new connections are established between synapses in the brain, strengthening connections and consolidating memories. When a connection between synapses in the brain is strong, then the memory will be more attached to the brain and easier to recall in the future.

Physics is the study of matter in scope and time, with the aim of obtaining unique physical products. The products of physics consist of theories, laws, formulas and concepts. The law of thermodynamics is part of the scope of physics material that is considered difficult for students to learn. Studying only one law and concept in a physical material is already considered confusing, while the discussion on the topic of the law of thermodynamics includes various related laws and concepts. This can cause incompleteness in working on questions as a form of final evaluation of a material so that it affects learning outcomes.

Based on an interview with one of the physics teachers at the Unsyiah Laboratory High School, the concept of physics material for some students is a difficult concept. In fact, students tend to like to work together and be critical in asking questions, but they are lacking in building ideas between each other for understanding the concepts of physics material. This affects learning outcomes, namely about 20% of students have not met the minimum completeness criteria for the overall Physics material. The minimum completeness criteria determined by the school is 75. For some people think that the figure of 20% is normal and not a problem, but not for the Unsyiah Laboratory High School level school whose brief history can be seen on the official website http://labschoolunsyiah.sch .id/history-short/.

This is confirmed by the distribution of questionnaires that have been carried out at the Unsyiah Laboratory High School, which proves that students have not met the ideal criteria, either as connected knowers (CK) or separate knowers (SK). A CK tends to find a more enjoyable way of learning, and is always more cooperative, fun and has a greater desire to build on other people's ideas. Meanwhile, a SK tends to be more critical and argumentative in learning.

The results of interviews with students at the Unsyiah Laboratory High School also obtained information that practice questions were one of the scourges for students to find out whether or not their understanding of the material they had learned was increasing. It takes a special strategy in working on the practice questions. So far, the practice questions that are often done are in the form of stuffing, multiple choice and essays. Crossword is one of the gamification features that is applied in the e-learning-based learning process for practice questions. Crosswords themselves are often found in newspapers, magazines, and various other media.

Physics is a part of science that is oriented towards applicative abilities, developing thinking skills, learning abilities and curiosity. Teachers are required to prepare future generations who are ready and adaptive to respond to all demands, assist students in the thought process, formulate questions, and find answers. One of the strategies used is by utilizing learning media according to needs. Learning media provide stimulus for students to think skills, motivate and interest in learning.

The results of observations at the Unsyiah Laboratory High School that the e-learning learning process uses the https://spada.aceh.web.id/ platform. The e-learning platform is under the auspices of one of the Unsyiah research lecturers. The platform is equipped with gamification features which are the basis for research. The material that will be studied in this research is the law of thermodynamics. The material is studied in even semesters where the effectiveness of the learning process is reduced compared to odd semesters. Based on the existing problems, this research was initiated with the title The Effect of Gamification Media in Networks on Learning Outcomes and Thinking Attitudes in Learning.

Method

This research is a type of quantitative research because it presents numbers. The method used is a quasi-experimental design method using two classes, namely the experimental class and the control class. The design used in this study is Non-Randomized Posttest-Only Control Group Design (Sugiono, 2017). The research design is described in Table 1.

Table 1. Posttest-Only Control Group Design

Groups	Treatment	Posttest
Experiment	X	O
Control	C	O

(Sugiyono, 2018)

Description:
X = Treatment with a lot of media gamification
C = Treatment with a little of media gamification
O = Giving Posttest

The population in this study were all students of class XI Science at SMA Laboratorium Unsyiah in the even semester of the 2020/2021 academic year totaling 114 students consisting of 4 classes, namely class XI IPA 1, class XI IPA 2, class XI IPA 3 and class XI IPA 4. While the sample selection technique in this study was carried out by random sampling, referring to the physics exam scores for the odd semester for the

2020/2021 academic year which have homogeneous abilities. Based on this, 2 classes were chosen as the research samples. Research instruments using a written test. Data analysis technique using Microsoft excel. Hypothesis testing using normality test, homogeneity test, and hypothesis testing using t test.

Result and Discussion

Normality Test of Learning Outcomes

The post-test normality test of the experimental class and control class students learning outcomes on the material of the Law of Thermodynamics, can be seen in Table 2.

Tabel 2. Posttest Normality Test Student Learning Outcomes (One Kolmogorov-Smirnov)

Sumber Data	Classes	Mean	Df	Sig.	Normalitas
Postest	Experiment	91.00	30	0.135	Sig. > 0.05 "Normal"
	control	85.67	30		

Based on Table 1 shows the results of the normality test using the One Sample Kolmogorov Smirnov Test, the posttest of student learning outcomes on the Law of Thermodynamics material in the experimental class and the control class, obtained p (0.135) > (0.05) (normal). This means that the research sample data is normally distributed.

The results of the normal P-Plot graph analysis obtained have shown a normal graphic pattern, namely the distribution of points that are not far from the diagonal line, presented in Figure 1.

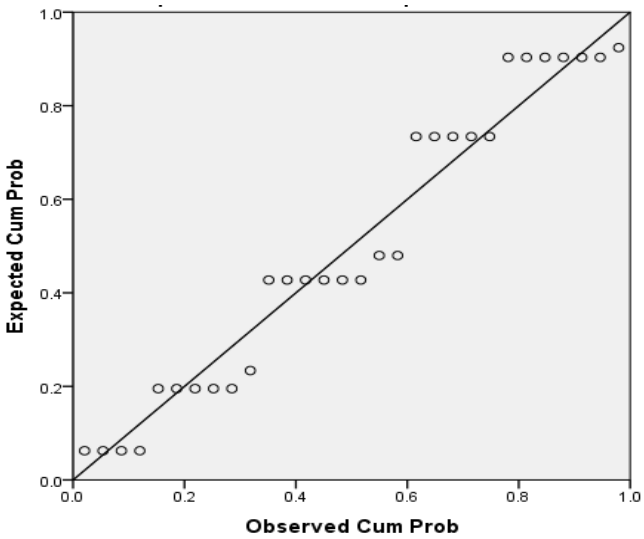

Figure 1. P-P Normality Testing Plot of *Regression Standardized Residual* (Posttest Student Learning Outcomes)

The results of the histogram normality analysis obtained have shown that there is a normal histogram pattern, namely the histogram shape follows the normal line starting from -2 to +2, presented in Figure 2.

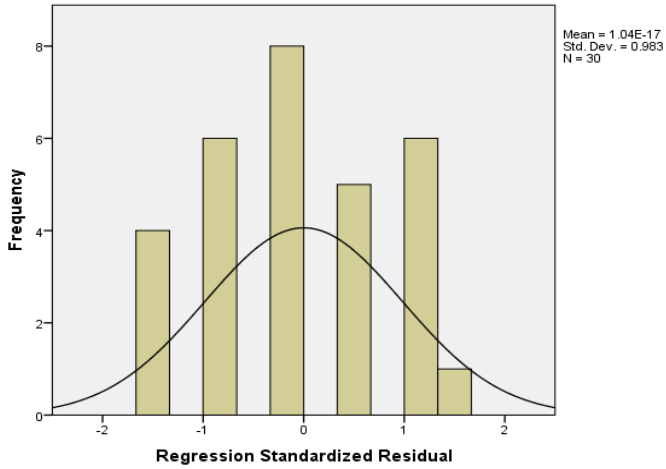

Figure 2. Histogram Normality Test (Posttest Student Learning Outcomes)

ANCOVA test

Assumptions of normality have been met, then to check the presence or absence of a significant effect, using analysis of covariance (ANCOVA). The calculation of the ANCOVA test was carried out with the help of the SPSS program. The data tested are report cards and learning outcomes after being given the application of gamification media in the learning process on the material of the Law of Thermodynamics. The results of the analysis can be seen in Table 2.

Table 3. Results of Covariance Analysis (ANCOVA)

Variabel	Classes	N	Sig. (α = 0.005)
Learning Outcome	Experiment	60	0.325
	Control	60	

Table 2 shows that the value of sig. sig value. > 0.05 (0.325 > 0.05) indicates that the treatment of gamification media has no effect on learning outcomes.

Analysis of Thinking Attitudes in Student Learning

Questionnaire of thinking attitude in learning used by ATTLS, was given after carrying out physics learning by applying gamification media. The questionnaire consists of 2 indicators, namely CK and SK. Each indicator has 10 questions. The sum of all the statements of the thinking attitude questionnaire in students' learning consists of 20 statements that must be responded to by students who have carried out physics learning.

Attitude of Thinking in Learning Experiment Class

The display of the results of the questionnaire for the experimental class obtained is described in Table 4 and Table 5 as follows.

Table 4. Experimental Class CK Analysis

Indicator	Before	Category ATTLS	After	Category ATTLS
Responsible	70	Low	135	Very High
Flexible	90	Low	142	Very High
Responsive	60	Very Low	133	Very High
Tolerant	62	Low	125	Very High

Table 5. Analysis of SK Experiment Class

Indicator	Before	Category ATTLS	After	Category ATTLS
Antusias	75	Low	141	Very High
Kritis	60	Low	140	Very High
Analitis	60	Very Low	143	Very High

Based on Table 4 and Table 5, it can be seen that in general there is an influence of thinking attitude in students' learning before and after learning, both in terms of CK and SK indicators. Before being given treatment, the average CK score obtained was 71 and the average SK score was 63. This proves that before being given treatment, students become ideal CK, meaning it is easier to interact and work together. The average CK value obtained was 134 and the average SK value was 141 after being given treatment. This proves that after being treated as an ideal SK student, it means that they are more argumentative and critical.

Attitude of Thinking in Learning Control Class

The display of the results of the questionnaire for the control class obtained is described in Table 6 and Table 7 as follows.

Table 6. Analysis of CK Control Class

Indicator	Before	Category ATTLS	After	Category ATTLS
Responsible	65	Low	132	Very High
Flexible	63	Low	131	Very High
Responsive	59	Very Low	129	Very High
Tolerant	62	Low	128	Very High

Tabel 7. Control Class SK Analysis

Indicator	Before	Category Motivation	After	Category Motivation
Antusias	65	Low	134	Very High
Kritis	65	Low	133	Very High
Analitis	60	Very Low	135	Very High

Based on Table 6 and Table 7, it can be seen that in general there is an influence of thinking attitude in students' learning before and after learning, both in terms of CK and SK indicators. Before being given treatment, the average score for CK was 62 and the average score for SK was 63. This proves that before being treated, students become the ideal SK, meaning they are more argumentative and critical. The average CK value obtained was 134 and the average SK value was 141 after being given treatment. This proves that after being given treatment, they are still ideal SK students, meaning they are more argumentative and critical.

Hypothesis testing

The previous discussion aims to prove the initial hypothesis "there is an influence of gamification media in the network on student learning outcomes", in the Physics Subject matter of the Law of Thermodynamics class XI at SMA Laboratorium Unsyiah. Based on the results of the analysis indicate that the value is less significant on student learning outcomes with a confidence level of 0.050 or 95% (sig. <0.05 = 0.325 <0.05), then H0 is accepted, which means that the application of gamification media has no effect on the results. study.

According to Pradana, et al (2018) this can happen because the learning process is short and students explore independently without monitoring by the teacher and this is something that is still new for students. Students are accustomed to learning conventionally accompanied by a teacher (instructor) in carrying out all learning activities in the classroom, so that the conventional application of gamification media provides increased results on learning outcomes (Wardana, 2019).

Proof of the last hypothesis "there is a difference in students' thinking attitudes in learning after being treated with gamification media in the network", in the Physics Subject matter of the Law of Thermodynamics class XI at SMA Laboratorium Unsyiah. There are 2 indicators of thinking attitude questionnaire in learning, namely connected knower (CK) and separate knower (SK). Based on the average value obtained, there was an increase in both CK and SK after being given gamification media treatment. Based on the results of the analysis proves that students become the ideal SK means more argumentative and critical. This shows that there is a difference after being given gamification media treatment on thinking attitudes in learning.

Conclusion

Based on the results of research that has been carried out through the application of gamification media in the network to determine learning outcomes and students' thinking and learning attitudes at SMA Laboratorium Unsyiah, it can be concluded that, there is no significant effect after being given the application of gamification media on student learning outcomes, in

subjects Physics material Law of Thermodynamics, with a confidence level of 0.050 or 95% then H0 is accepted. There is a significant difference in students' thinking and learning attitudes, after being given the application of gamification media in the Physics Subject matter of the Law of Thermodynamics, with a confidence level of 0.050 or 95%, Ha is accepted.

Acknowledgments

Thank you to the leadership, teaching staff, and teachers in the field of Physics at the Unsyiah Laboratory High School who have provided opportunities and service facilities while conducting research and thank you to the supervisor who has guided in completing this article.

References

Anggraeni, D. M., & Sole, F. B. (2020). Developing creative thinking skills of STKIP weetebula students through physics crossword puzzle learning media using eclipse crossword app. *Journal of Physics: Conference Series*, *1521*(2). https://doi.org/10.1088/1742-6596/1521/2/022045

Ariyanto, M. (2018). Peningkatan hasil belajar IPA materi kenampakan rupa bumi menggunakan model scramble. *Profesi Pendidikan Dasar*, *3*(2), 133. https://doi.org/10.23917/ppd.v3i2.3844

Edriati, S., Handayani, S., & Sari, N. P. (2017). Penggunaan teka-teki silang sebagai sebagai strategi pengulangan dalam meningkatkan pemahaman konsep matematika siswa SMA kelas XI IPS. *Jurnal Pelangi*, *9*(2), 71–78. https://doi.org/10.22202/jp.2017.v9i2.2047

Firdaus, T. (2018). *Pemanfaatan Media Berbasis Teknologi dalam Pembelajaran*. https://doi.org/10.31219/osf.io/46ckj

Galotti, K. M., McVicker Clinchy, B., Ainsworth, K. H., Lavin, B., & Mansfield, A. F. (1999). A new way of assessing ways of knowing: The attitudes toward thinking and learning survey (ATTLS). *Sex Roles*, *40*(9–10), 745–766. https://doi.org/10.1023/A:1018860702422

Galotti, K. M., McVicker Clinchy, B., Ainsworth, K. H., Lavin, B., & Mansfield, A. F. (1999). A new way of assessing ways of knowing: The attitudes toward thinking and learning survey (ATTLS). *Sex Roles*, *40*(9–10), 745–766. https://doi.org/10.1023/A:1018860702422

Jufri, W. (2013). *Belajar dan Pembelajaran Sains*. Pustaka Reka Cipta.

Jusuf, H. (2016). Penggunaan gamifikasi dalam proses pembelajaran. *Jurnal TICOM*, *5*(1), 1–6. Retrieved from https://media.neliti.com/media/publications/92772-ID-penggunaan-gamifikasi-dalam-proses-pembe.pdf

Khedif, L. Y. B., Engkamat, A., & Jack, S. (2014). The evaluation of users' satisfaction towards the multimedia elements in a courseware. *Procedia - Social and Behavioral Sciences*, *123*, 249–255. https://doi.org/10.1016/j.sbspro.2014.01.1421

Maisaroh, -, & Rostrieningsih, -. (2012). Peningkatan hasil belajar siswa dengan menggunakan metode pembelajaran active learning tipe quiz team pada mata pelajaran keterampilan dasar komunikasi di SMK negeri 1 Bogor. *Jurnal Ekonomi Dan Pendidikan*, *7*(2), 157–172. https://doi.org/10.21831/jep.v7i2.571

Miyazoe, T. (2010). *Learning styles and gender online: The Attitudes Towards Thinking and Learning Scale (ATTLS) and the Classroom Community Scale (CCS)*. *7*(1986), 3413–3422. Retrieved from http://members3.jcom.home.ne.jp/t.miyazoe/ED-MEDIA_2010_with page.pdf

Miyazoe, T. (2010). *Learning styles and gender online: The Attitudes Towards Thinking and Learning Scale (ATTLS) and the Classroom Community Scale (CCS)*. *7*(1986), 3413–3422. Retrieved from http://members3.jcom.home.ne.jp/t.miyazoe/ED-MEDIA_2010_with page.pdf

Ni Putu Jati Dinar Wulan1, Ignatius I Wayan Suwatra2, I. N. J. (2019). Pengembangan media permainan edukatif teka-teki silang berorientasi pendidikan karakter pada mata pelajaran IPS. *Jurnal EDUTECH Universitas Pendidikan Ganesha. Vol.7*, *7*, 66–74. Retrieved from https://ejournal.undiksha.ac.id/index.php/JEU/article/viewFile/20009/11981

Patrick, S., Vishwakarma, K., Giri, V. P., Datta, D., Kumawat, P., Singh, P., & Matreja, P. S. (2018). The usefulness of crossword puzzle as a self-learning tool in pharmacology. *Journal of Advances in Medical Education & Professionalism*, *6*(4), 181–185. Retrieved from https://pubmed.ncbi.nlm.nih.gov/30349830/

Romdhoni, F. H., & Wibowo, R. P. (2014). Penerapan gamification pada aplikasi interaktif pembelajaran SQL berbasis web. *Jurnal Teknik Pomits*, *1*(1), 1–6.

Ryan, M. K., & David, B. (2003). Gender Differences in Ways of Knowing: The Context Dependence of the Attitudes toward Thinking and Learning Survey. *Sex Roles*, *49*(11–12), 693–699. https://doi.org/10.1023/B:SERS.0000003342.16137.32

Setiyawan. (2013). Pengaruh frekuensi pemberian tes terhadap memori jangka panjang bacaan pada siswa SMA. *Journal of Chemical Information and Modeling*, *53*(9), 1689–1699.

Silalahi, W. (2018). Upaya meningkatkan motivasi belajar siswa dengan menggunakan metode role play pada pelajaran IPS Kelas IV SD swasta Xaverius Padang Sidimpuan. *SEJ (School Education Journal) Vol. 8. No 2*, *8*(2), 112. https://doi.org/10.24114/sejpgsd.v8i2.9780

Sunarya, P. A., Rahardja, U., Aini, Q., & Khoirunisa, A. (2019). Implementasi gamification sebagai manajemen pendidikan untuk motivasi pembelajaran. *Edutech*, *18*(1), 79. https://doi.org/10.17509/e.v18i1.14697

Sutirman. (2018). Inovasi pembelajaran kearsipan digital di era revolusi industri 4 . 0. *Orasi Ilmiah Disampaikan Pada Upacara Dies Natalis Ke-7 Fakultas Ekonomi Universitas Negeri Yogyakarta*, *June*, 0–20.

Sutrisno, V. L. P., & Siswanto, B. T. (2016). The teaching and learning of automotive electrical. *Jurnal Pendidikan Vokasi*, *6*(1).

Tafonao, T. (2018). Peranan media pembelajaran dalam meningkatkan minat belajar mahasiswa. *Jurnal Komunikasi Pendidikan*, *2*(2), 103. https://doi.org/10.32585/jkp.v2i2.113

Wardana, S., & Sagoro, E. M. (2019). Implementasi gamifikasi berbantu media kahoot belajar, dan hasil belajar. *Jurnal Pendiidikan Akuntansi Indonesia*, *XVII*(2), 46–57. https://doi.org/10.21831/jpai.v17i2.28693