Implementation Of *The Adventure of Element* Game As Learning Media During Covid-19 Pandemy

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Abstract. *This research aimed to examine the effect of The Adventure of Element game as a learning media for online learning during the COVID-19 pandemic. The research targeted one Class XII, consisting of 27 students at Senior High School 2 Ngawi. This research employed an experimental approach using a one-group pretest-posttest design. The data was gathered during the month of May, during the second semester of the 2019/2020 academic year. During the pandemic, data was gathered through online learning, with tests and questionnaires administered via Google Forms. The Adventure of Element game was made available for download through Google Drive. Students completed a pretest before using the game as a learning medium and a posttest afterward. Additionally, students were asked to complete a response questionnaire to share their opinions on online learning with the game. The results of this research indicated that students' learning outcomes improved after using The Adventure of Element game, with a classical completion rate of 88.8%. The average of pretest score was 40.74, while the posttest score increased to 87.40, reflecting a high n-Gain score of 0.8. The students' response to the game as a learning medium was also positive, with a satisfaction rate of 86.49%. Based on conclude of this research, The Adventure of Element effectively improved students' learning outcomes, particularly in chemical elements topic, during online learning in the pandemic.*

Keywords: *learning media game, elements, The Adventure of Element, corona pandemy*

INTRODUCTION

The coronavirus has attracted global attention at the beginning of 2020. According to the WHO, COVID-19 (Coronavirus 2019) has been declared a public health emergency, becoming the focus of international attention. Over 200 countries, including Indonesia, have been impacted by the coronavirus outbreak. [1]. On March 2, 2020, the corona virus pandemic was recognized in Indonesia. Then, The Health Ministry of Indonesia has taken various actions, such as encouraging the public to maintain hygiene, providing handwashing stations, supplying tissues or masks for staff and visitors, promoting healthy living habits, and implementing other precautionary measures [2].

One of the global impacts of COVID-19 on education was the widespread closure of schools, madrasahs, Islamic boarding schools, and universities. On March 4, 2020, UNESCO advised the implementation of virtual learning and the establishment of educational platforms that students could access [3]. In an effort to control COVID-19's spread, the government implemented a circular on March 18, 2020, which temporarily suspended all activities, both indoors and outdoors. Then, The Education and Culture Minister of Indonesia stated which outlined guidelines for education during the COVID-19 emergency, including a shift to online and distance learning methods. [4]. Based on UNESCO's monitoring, 191 countries enforced nationwide school closures, impacting 91.3% of the student population worldwide. [5].

The learning approach should be implemented in an interactive, engaging, stimulating, and motivating manner, encouraging active participation from students. It should also offer opportunities for the expression of ideas, creativity, innovation, and independence, while aligning with the students' interests, abilities, and both their physical and intellectual development [6].

Every learning process involves learning media as a tool for teachers to deliver material.

In the learning process, media plays a crucial role. Media functions to guide students in gaining various learning experiences. Learning media is a supporting tool used as a bridge between the teacher and the students in mastering the concepts being studied [7].

Learning media provides various benefits in learning process, such as increasing students' enthusiasm for learning, which consequently enhances their enthusiasm to engage and participate more actively. It aids in making the presentation of material clearer, assisting students in gaining a more profound understanding and mastery of the subject. Additionally, it diversifies teaching methods and encourages students to be involved in various learning exercises [8]. Learning media has the advantage of increasing students' excitement and engagement in learning, allowing students to develop based on their interests, enabling direct interaction with the environment, serving as a motivator in learning process, and promoting a shared understanding of concepts [9].

Based on the preliminary data from research at Senior High School 3 Sidoarjo, it was stated that 87.5% of students reported that the media commonly used in direct learning was just the whiteboard. Furthermore, 61.5% of students indicated that PowerPoint media was used during face-to-face lessons at Senior High School 1 Blitar. Meanwhile, 90.9% of students used worksheets in their face-to-face learning at Senior High School 1 Sambit Ponorogo, [10]. As many as 69.44% of students at Senior High School stated that chemistry learning is boring [11].

According to an interview at Senior High School 2 Ngawi with the chemistry teacher, online learning has become an obstacle in delivering material. This is due to the lack of media for presenting material, especially the topic of elements. During online learning, students were given material or assignments. However, during the COVID-19 pandemic, there was still no available learning media for online/distance learning to assist in delivering the material. The media commonly used during synchronous learning was the whiteboard.

Considering the fact that there is a lack of available media in learning, there is a need for engaging media to be utilized in online/distance learning throughout the pandemic. The selection of appropriate learning media Is designed to support students in improving their understanding of concepts. One type of learning media that can be utilized throughout the pandemic in online/distance learning is educational games. Games are activities that can enhance students' skills, desires, thinking, and emotions. When used correctly, games can help alleviate students' stress during the learning process [13].

Educational games are a type of game designed to both educate and entertain players. Through the years and across various studies, it has been concluded that educational games offer greater levels of engagement, motivation, and enjoyment than other types of both new and traditional educational media [14, 15].

Computer-Assisted Instruction (CAI) refers to the use of computers in delivering material, providing practice exercises, and improving learning outcomes. CAI serves as a tutor that can replace a teacher in the classroom. There are several types of Computer-Assisted Instruction (CAI), which vary based on the design and development of the learning process. One such type is game-based CAI, which incorporates abstract concepts that are converted into animations. [16].

The learning media that can be utilized is the computer-based game *The Adventure of Element*. This computer-based game has been deemed theoretically feasible. This game falls under the RPG (Role-Playing Game) category. RPG is a type of game where players assume the roles of characters or figures in an adventure story. RPG games are widely used in Indonesia as they are among the most popular types of games. According to a survey by Agate Studio, the favorite game types in Indonesia include RPG, strategy, and FPS (First-Person Shooter) games [17].

The Adventure of Element is a game adapted from Final Fantasy 3 and Earthbound, embodying RPG characteristics. The game is designed around the topic of elements, with the goal of enhancing students' learning outcomes, especially in understanding the topic of elements. This computer-based game consists of three levels, each corresponding to different learning objectives. Level 1 covers alkali elements, Level 2 covers alkaline earth metals, and Level 3 covers halogens. Players are required to enter their name before starting the

game. There are learning indicators and game rules that students must understand as players. Players must gather information about the material through element cards and educational videos. In each level, there are enemies that must be defeated to earn points. Players must answer questions correctly in order to advance to the next level [10].

During the COVID-19 pandemic, game-based media has not been utilized for online/distance learning, particularly in the topic of elements. As a result, the objective of this research is to evaluate the influence of The Adventure of Element on the topic of elements for Class XII students, specifically through online/distance learning throughout the pandemic.

METHODS

This research follows a one-group pretest-posttest design, which is presented below [18].

$$O_1 \; X \; O_2$$

Description:

O_1 = pretest score (before using *The Adventure of Element* game)

X = Learning with *The Adventure of Element* game

O_2 = posttest score (after using *The Adventure of Element* game)

In May, during the even semester of the 2019/2020 academic year, the data were collected, with class XII MIPA 7 at Senior High School 2 Ngawi being the target of the research, consisting of one class. The students had already received the topic of elements before being given the pretest. The data gathered included the students' learning outcomes, represented by their scores before and after using the game, as well as students' responses through a questionnaire. Before being introduced to the game, the students took a pretest via Google Forms. After completing the pretest, the students downloaded *The Adventure of Element* game from Google Drive and played it individually using a laptop or computer. Following the game-based learning, the students completed the posttest, which was provided through *Google Forms*. The pretest and posttest scores were analyzed using SPSS software. Paired t-test results were used to determine if learning outcomes improved after using the game through distance learning. The change in learning outcomes was measured through the n-Gain analysis. This n-Gain scores were calculated after performing a normality test, followed by a paired t-test To evaluate whether a significant change occurred between the pretest and posttest scores. These scores were also used to assess the classical mastery level.

This study also employs a response questionnaire that students are required to complete. The questionnaire aims to collect students' feedback on their online learning experience using The Adventure of Element game during the COVID-19 pandemic. A response rate of 61% or higher will indicate a positive response to the game [19].

RESULTS AND DISCUSSION

This research was conducted in May 2020 with a sample of 27 grade XII students from Senior High School 2 Ngawi. The research data included both learning outcomes from cognitif test and student responses results. Before being introduced to *The Adventure of Element* game, the students first completed a pretest simultaneously via *Google Forms*. The pretest consisted of 10 multiple-choice questions. After completing the pretest, the students downloaded *The Adventure of Element* game from *Google Drive*, which had been provided. Students who had downloaded the game could directly open and play it without needing to install any additional software. During this distance learning session, the students played through to the final level of the game. Below is a display of *The Adventure of Element* game.

Figure 1. Display of *The Adventure of Element* game

In the display shown in Figure 1, the game title is presented along with several options,

including starting a new game, continuing the game, changing settings, or opening the game creator's profile. The game consists of three levels, each containing important material to achieve the learning objectives. The content is provided in the form of summaries, videos, tables, and element cards that explain the chemical and physical properties of the elements. Each level has a different difficulty based on the enemies that must be defeated. The "weapons" used to defeat the enemies involve accessing materials such as videos, tables, or element cards. Students are allowed to replay the game if they encounter failure. They can also return to previous levels if there is material they wish to review.

To ensure effective online learning, monitoring was conducted through a WhatsApp group to track the students' progress in the game and identify any difficulties they encountered while operating the game during the learning process. After using *The Adventure of Element* game during the online learning session, the students completed a posttest available via Google Forms. The learning results of the students, before and after engaging with The Adventure of Element game during online/distance learning amid the COVID-19 pandemic, are as follows.

Table 1. The Learning Outcomes (*Pretest-Posttest*)

Condition	Average Score	Lowest score	Highest score	Number of students
Pretest	40,74	0	80	27
Posttest	87,40	50	100	27

According to the Table 1, average of pretest score was 40.74, with scores ranging from 0 to 80. In comparison, the average of posttest score was 87.40, with scores ranging from 50 to 100. The Kolmogorov-Smirnov normality test, conducted with SPSS version 20, was used to assess the normality of the data. The purpose of this test was to check if the data distribution in the population was normally distributed. The results of the normality test are as follows.

Table 2. Results of the Normality Test

	Pretest	***Posttest***
N	27	27
significant	0.337	0,153

According to the normality test performed using the SPSS program, the significance value for the pretest score was 0.337, and the significance value for the posttest score was 0.153. Since both values exceed 0.05, the data can be considered to follow a normal distribution, based on the Kolmogorov-Smirnov normality test decision rule. As a result, the normality assumption for the regression model is met. Subsequently, the paired t-test was applied to analyze whether a significant difference occurred between the pretest and posttest scores. The results of the paired t-test are presented in the table below.

Table 3. Result of paired T-test

		T	*df*	*Sig* (2 *tailed*)
Pair 1	*Pretest-posttest score*	-12.753	26	.000

The calculated t-value was 12.753, which falls within the rejection region of the null hypothesis (Ho) and the acceptance region of the alternative hypothesis (Ha). This indicates that a significant difference exists between the average pretest and posttest scores, with the significance value of 0 (which is below 0.05). This strengthens the evidence of a significant difference between the pre- and post-game scores. Following this, the n-Gain was computed to evaluate the progress in students' learning outcomes. The n-gain value obtained was 0.8, which falls within the high category. In addition to analyzing the improvement in learning outcomes, a classical completeness analysis was also conducted. The Minimum Criteria of Mastery Learning (KKM) applied at Senior High School 2 Ngawi is ≥76. The classical completeness of the pretest and posttest scores is displayed in the following figure.

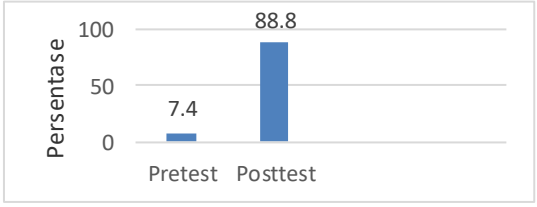

Figure 2. Classical Mastery Percentage of Pretest and Posttest Scores

Based on the percentage of classical completeness presented above, 7.4% of students completed the pretest successfully, while 88.8% of students completed the posttest successfully after using *The Adventure of Element* game. Students who successfully completed the pretest also completed the posttest with higher scores than their pretest results. The use of The Adventure of Element game during the pandemic in online learning achieved a classical completeness rate of over 85%, demonstrating that the learning objectives were effectively accomplished. The implementation of the game in learning had a positive impact, as reflected in the learning outcomes. Students reported feeling satisfied with the computer-based game as a learning tool [20]. The application of games in education helped students overcome difficulties in understanding the material [21]. Additionally, the implementation of computer-based games as a chemistry learning media was shown to effectively enhance the learning process [22, 23].

In addition to evaluating learning outcomes, a response questionnaire was also administered to gather students' feedback regarding their online learning experience using The Adventure of Element game. The questionnaire was distributed through Google Forms to ensure easy access and participation. The responses collected from the students are summarized and presented in the following table.

Table 4. Students' Responses Results

Statement		Answer	
		(%)	category
a.	I am able to play *The Adventure of Element* game smoothly	86,11	Very good
b.	I do not feel bored when online learning uses *The Adventure of Element* game media during COVID-19	85,18	Very good
c.	The *The Adventure of Element* game media is fun to play during COVID-19 through online learning	85,18	Very good
d.	I want to play *The Adventure of Element* game continuously during COVID-19 through online learning	84,26	Very good
e.	The *The Adventure of Element* game contains important material that I need to understand	90,74	Very good
f.	The Adventure of Element game helps me better understand the material on main group elements.	87,96	Very good
g.	I study diligently through online learning by utilizing *The Adventure of Element* game media during COVID-19.	84,26	Very good
h.	The *The Adventure of Element* game motivates me to stay enthusiastic about learning during COVID-19 through online learning	87,03	Very good

Based on the students' responses, 85.18% agreed that online learning using *The Adventure of Element* game was not boring and was enjoyable. Students expressed that they were happy using the game because they could play while learning. Utilizing computer games can provide an interactive chemistry learning experience, promote student-centered learning, improve understanding of the material, and inspire students to engage more with chemistry [21].

A total of 84.26% agreed that *The Adventure of Element* game could be played continuously during the COVID-19 pandemic. "Being played continuously" means that students can replay the game after it ends until they successfully reach the final level. Computer-based games act as motivators for students to play repeatedly. Therefore, games can be seen as innovative tools that allow students to play and support learning [24]. The use of games makes learning fun and encourages repeated engagement, making the learning process more effective [25]. One of the advantages of using games as a learning medium is that it makes learning exciting and more engaging [26]. This indicates *that The Adventure of Element* game can spark students' curiosity and interest.

A total of 86.11% of students agreed that *The Adventure of Element* game ran smoothly, allowing students to play individually at home during online/distance learning. Students were able to use the game and ask questions during the online learning sessions. They were able to play the game smoothly because detailed game rules were provided at the initial levels. Additionally, 90.74% of students agreed that *The Adventure of Element* included important material that needed to be understood. New information in the game is connected with knowledge already stored in long-term memory. If the information is considered useful, it will be retained in long-term memory and can be recalled when needed [27]. *The Adventure of Element* game facilitated students' understanding of the material, as reflected by an 87.96% response rate. Furthermore, 84.26% of students agreed that they studied earnestly during the pandemic using the game. Based on these results, there is clarity in the material presented within the game, with an average percentage of 89.35%. The material in the game is presented in the form of videos, tables, and element cards available at each level. As a learning medium, the game supports active learning and helps students maintain focus on the material presented in the game, whether in the form of summaries or videos [28].

The Adventure of Element game was able to enhance students' enthusiasm for learning, with a response rate of 87.03%. The game positively influenced motivation, learning experience, memory retention, and academic performance. According to the results from the students' response questionnaire, each aspect reached an excellent category, indicating that The Adventure of Element game can be used as an effective medium for delivering content and achieving positive results in learning [28]. Students felt enthusiastic while using the game, even though it was played at home, showing that the game sparked their excitement for learning [29]. High student motivation impacts their learning methods and leads to improved learning outcomes, as evidenced by the increased learning results and classical completeness previously analyzed [30]. The response results indicate that learning through play can boost motivation and drive for learning. There is a need for new techniques to overcome boredom on online platforms, one of which is gamification that can be easily accessed by students. Gamification is a concept that can be used in online/distance learning and deserves further exploration [31].

CONCLUSION AND SUGGESTIONS

The findings of the research indicate that the use of The Adventure of Element game for teaching the topic of elements during the pandemic on online learning significantly enhanced students' learning outcomes. The classical completeness rate was 88.8%. Learning outcomes showed significant improvement, with the average pretest score increasing from 40.74 to an average posttest score of 87.40, and the n-Gain score was 0.8, which falls into the high category. The result is reinforced by the students' feedback on the game for the topic of elements. *The Adventure of Element* game is an engaging game that provides clear material and increases students' enthusiasm for learning, with an average percentage of 86.49%.

According to the results of the research, the following suggestions are provided for future research.

1. For teachers, *The Adventure of Element* game can be an alternative learning media for online learning, specifically for the topics of alkali metals, alkaline earth metals, and halogens. This game can serve as an alternative learning media during the corona virus pandemic.
2. For students, *The Adventure of Element* game can be used as an alternative media to understand the topics of alkali metals, alkaline earth metals, and halogens, which can be done at home during the COVID-19 pandemic.
3. For researchers, when using *The Adventure of Element* game, it is recommended that students be properly conditioned and provided with guidance and rules during the gameplay.

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REFERENCES

[1] World Health Organization. Coronavirus disease (Covid-19) situation Dashboard. https://experience.arcgis.com/experience/685d0ace521648f8a5beeeee1b9125cd, accessed on 24 April 2020.

[2] Yurianto, Ahmad. & Wibowo, Bambang. (2020). Pedoman Pencegahan dan Pengendalian Corona virus disease (Covid-19). Jakarta: Kementerian Kesehatan RI.

[3] UNESCO. 290 Million Students Out Of School Due To Covid-19: UNESCO Releases First Global Numbers And Mobilizes Response. https://en.unesco.org/news/290-million-students-out-school-due-Covid-19-unesco-releases-first-global-numbers-and-mobilizes, accessed on 24 April 2020

[4] Kementrian Pendidikan dan Kebudayaan. (2020). Surat Edaran Nomor 3 Tahun 2020 tentang Pelaksanaan Pendidikan dalam Masa Darurat Corona Virus (Covid-19).

[5] UNESCO. Covid-19 Educational Disruption and Response. https://en.unesco.org/themes/education-emergencies/coronavirus-school-closure, diakses pada 24 April 2020.

[6] Kemendikbud. (2014). *Permendikbud Nomor 103 Tahun 2014 Tentang Pembelajaran Pada Pendidikan Dasar dan Pendidikan Menengah*. Jakarta: Kementerian Pendidikan dan Kebudayaan RI.

[7] Kemendikbud. (2013). *Permendikud Nomor 65 Tahun 2013 Tentang Standar Proses Pendidikan Dasar dan Menengah*. Jakarta: Kementerian Pendidikan dan Kebudayaan RI.

[8] Sudjana, N. (2009). Penilaian Hasil Proses Belajar Mengajar. Bandung: PT. Remaja Rosdakarya.

[9] Sadiman, A.S., Rahardjo,R., Haryono, A., & Rahadjito. (2010). Media Pendidikan: Pengertian, Pengembangan, dan Pemanfaatan. Jakarta: PT. Raja Grafindo Persada.

[10] Apriyanto, & Lutfi, A. 2018. Development Of The Adventure Of Element Based On Role Playing *Game* As A Learning Media On Element Chemistry Matte. *Advances in Engineering Research* (h. 172-176). Surabaya: Atlantis Press.

[11] Rahmawati, Annisa. & Lutfi, Achmad. The Development of Super Chem *Game* Oriented Android as Instructional Media Electrolyte dan Non Electrolyte. *Journal of Chemistry Education Research*.

[12] Mulyati, Y. (2005). *Permainan Edukatif Pada Anak.* Yogyakarta: Pustaka Pelajar.

[13] Meier, D. (2005). *Panduan Kreatif Merancang Pembelajaran.* Bandung: Mirzan Pustaka.

[14] Prensky, M. (2007). *Digital Game-Based Learning*. Paragon: House.

[15] Quinn, C. (2005). *Engaging Learning: Designing e-Learning Simulation Games*. San Fransisco: Pfeiffer.

[16] Daryanto. (2013). *Media Pembelajaran Peranannya Sangan Penting Dalam Mencapai Tujuan Pembelajaran*. Yogyakarta: Gava Media.

[17] Agate Studio. 2012. Hasil survey *Game*r Indonesia-Februari 2012.

[18] Sugiyono. (2012). *Metode Penelitian Kuantitatif, Kualitatif, dan R & D.* Bandung: Alfabeta.

[19] Riduwan. (2015). *Dasar-dasar Statistika. Bandung*: Alfabeta.

[20] Nordby, Anders., Kristine Øygardslia, Ulrik Sverdrup, & Harald Sverdrup. 2016. The Art of Gamification; Teaching Sustainability and System Thinking by Pervasive *Game* Development. *Education. The Electronic Journal of e-Learning* (h. 152-168).

[21] Lutfi, A., Suyono, Erman, & Hidayah, R. 2019. Edutainment with Computer *Game* as A Chemistry Learning Media. *Jurnal Penelitian Pendidikan Sains* (h. 1684-1689).

[22] Lutfi, A & Hidayah, R. 2018. Activating Student to Learn Chemistry using Chemmy Card 6-1 Game as an Instructional Medium in IUPAC Nomenclature of Inorganic. *The 2nd International Joint Conference on Science and Technology (IJCST)* (h. 1-6). IOP Conf. Series: Journal of Physics.

[23] Rosyida, S., Munzil, & Joharmawan, R. (2017). Pengaruh Penggunaan Media Audio Visual dalam Pembelajaran Problem Posing Terhadap Motivasi dan Hasil Belajar Larutan Penyangga. *Jurnal Pembelajaran Kimia*. (h 41-52). Malang: UM.

[24] Junior. 2017. Stereo*game*: An Interactive Computer *Game* That Engages Stundents in Reviewing Stereochemistry Concepts. *Journal of chemical Education* (h. 248-250).

[25] Fotaris, Panagiotis., Theodoros Mastoras., Richard Leinfellner., Yasmin Rosunally. Climbing Up The Leaderboard: An Empirical Study of Aplying Gamification Techniques to a Computer Programming Class. *Education. The Electronic Journal of e-Learning* (h. 94-110).

[26] Freitas, S. (2013). *Learning in Immersive Worlds: a Review of Game –Based Learning*. London: Curve.

[27] Slavin, R. A. (2017). *Educational Psychology: Theory and Practice*. New York: Pearson.

[28] Rastegarpour, Hassan & Poopak, Marashi. 2011. The Effect of Card Games and Computer Games on Learning Of Chemistry Concepts. *Procedia-Social and Behavioural Sciences*, (h. 597-601).

[29] Agarwal, M., & Saha, S. 2011. Learning Chemisry Through Puzzle Based Game: Atoms to Molecule. *9th IEEE International Conference on Emergin e-Learning Technologies and Application*, (h-189-193) The High Tratas, Slovakia: Star's Lesna.

[30] Winarto, Ratih Tri., & Sukarmin. 2012. Penerapan Zuma Chemistry Game dengan Kooperatif tipe TGT (Teams Games Tournament) Pada Materi Unsur, Senyawa, Campuran di MTsN Surabaya II. *Unesa Jornal Of Chemical Education*, (h. 180-188).

[31] Oisson, Marie., Mozelius, Peter,. & Collin, Jonas. 2015. Visualisation and Gamification of e-Learning and Programming Education. *The Electronic Journal of e-Learning* (h. 441-454).