Instagram-Based Element Chemistry Poker Card Game in Improving Students' Critical Thinking

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Abstract. Learning media in chemistry subjects is needed so that students can better understand chemical materials that are very complex. Instagram-based Poker Chemistry Card game media as an alternative media in learning elemental chemistry. Critical thinking is a whole series of cognitive activities that are used by individuals in dealing with problems. This study aims to analyze the effect of applying the Instagram-based poker Chemistry Elements card game to increasing students' critical thinking. This media development research uses a quasi-experimental research method with a non-equivalent Pretest-Posttest Control Group Design type. This research was tested in class XI SMA using two classes with a total of 70 students. The test instrument was developed based on critical thinking indicators with a total of 10 questions. Critical thinking indicators used are basic clarification, basic support, inference, further clarification, strategy and tactics. The test data results were analyzed using a single ANCOVA with pretest as a covariate. The test results show that Ho is rejected which means there is a significant difference and influence in the application of Instagram-based chemical element poker cards on students' critical thinking abilities in elemental chemistry material. The results of this research confirm that Instagram-based elemental chemistry poker card media can improve students' critical thinking skills in elemental chemistry material.

1 Introduction

The learning process can be fun or very boring for students. Play activities are a good means of socialization for students. By playing, the level of social interaction will increase. The level of social interaction starts from playing alone and continues with playing together [1]. Therefore, in this context it will appear that children who are accustomed to playing will more easily accept the presence of others and interact with others. The selection of game media aims to achieve a fun learning [2]. Students have embedded Learning is fun in their minds so there will be no more passive students in the classroom, feeling pressured by assignment deadlines, the possibility of failure, limited options, and of course boredom.

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Media development by incorporating game elements is one of the innovative solutions to improve chemistry learning in the classroom. Development of deep learning media the learning process in the classroom as an effort to improve the quality of good and enjoyable education. Moreover, at this level of education, students usually still like to play, still learning to understand and think to operate logical rules and concepts that are concrete. This ability is realized in understanding complex material concepts. The ability that can be done to improve these learning conditions is by making changes in the learning process by using innovative game media [5].

Based on the illustration above, efforts are needed to improve monotonous learning and increase students' active attitudes by using better media and methods. One alternative that researchers do is to use poker card game media which will be associated with elemental chemistry material, especially the transition group. The poker cards developed will adapt like a poker card game in general. However, for this research, the poker cards used contain various transitional elements (Group B). Poker in general has four types of parts, namely curls, hearts, diamonds and spades. This is in accordance with the transition element by having 4 main periods, namely periods four to seven with 10 columns of groups I-VIII B. The similarity of the same parts between poker cards and transitional elements is the main idea in making the concept of elemental chemistry poker card game media. To be more meaningful to students, the chemistry material will be integrated with local wisdom in Madura [6].

Real examples in chemistry learning can also be associated with activities or things that are close to the lives of students in the community. Local wisdom is an activity of transforming knowledge with community knowledge related to all fields, especially elemental chemistry materials. Local wisdom in chemistry materials can create an environment to facilitate learning by linking science materials and the culture of the surrounding community [7]. Chemistry learning that is connected to Madurese local wisdom can provide real examples to students. This is because students find it easy to learn and understand chemistry material by being connected to things that exist in the students' environment.

In elemental chemistry material, there are sub-materials related to the use of elements in each period of transition elements. Each of these elements will be associated with things that are worth Madura metal wisdom. For example, the element Fe (iron), where Madura island is an island famous for iron collectors [8]. This is a typical livelihood that has the value of metal wisdom in Madura. In addition, there are iconic monuments on the island of Madura that use a mixture of iron such as the Suramadu Bridge etc. This is an example if there is a relationship between elemental chemistry materials that integrate with Madura's metal wisdom. This wisdom can be in the form of Madura natural resources, Madura culinary, Madura culture or others. There are still many things that need to be explored in Madurese culture. In order to maximize the local wisdom is associated with the concept of utilization of elemental chemistry, especially in this case the transition element [7]. Madura metal wisdom content will be posted on an Instagram social media account.

The use of Instagram in learning can provide a new creative and interactive way to deliver subject matter. As a visual-based platform, Instagram has many features that can be utilized for teaching and learning activities. Instagram focuses on images and videos, making it suitable for delivering visual materials, such as diagrams, concept maps, infographics, and explainer videos [9]. The use of Instagram social media in chemistry learning can provide significant benefits to increase student engagement and facilitate understanding of the material. Using Instagram, teachers or students can share pictures, diagrams, short videos, or infographics that explain chemical reactions, molecular structures, periodic tables, or reaction mechanisms in a more visual and interesting way. Instagram can also be used as a discussion platform, where students can comment on posts, discuss experiments conducted,

or discuss difficult chemistry problems [10]. This gives students the opportunity to learn collaboratively. The use of social media such as Instagram in chemistry learning provides a creative space for teachers and students to deepen the understanding of the material in a fun and interactive way. This can be a stimulus for students to improve their critical thinking skills [11].

Low critical thinking skills in learning are often a challenge in many educational environments. Critical thinking is essential as it enables students to analyze information in depth, make evidence-based decisions, and solve problems effectively [12,13]. If students have low critical thinking skills, they may struggle to understand concepts, apply knowledge in new contexts, or evaluate information objectively. Students may find it difficult to deal with situations or problems that require problem solving, especially if the situation is different from examples they have been taught directly [14,15]. Students who lack critical thinking skills more often rely on memorization without really understanding the concepts. This makes them prone to forgetting and unable to apply knowledge in new contexts. In today's information age, it is important to train students how to critically evaluate sources of information, especially from the internet and social media. This includes verifying sources, recognizing bias, and comparing different points of view. Improving critical thinking skills requires an active, problem-based and reflective approach. Teachers play an important role in creating a learning environment that encourages students to analyze, evaluate, and argue logically [16,17]. The use of strategies such as open-ended questions, debates, evaluation of information sources, and collaborative learning can help develop critical thinking skills among students.

The use of educational games in improving critical thinking skills is an effective strategy, as educational games are able to combine entertainment aspects with learning, encouraging students to think analytically and solve problems in a fun context. Educational games allow students to engage in challenges that require critical reflection, evaluation and decision-making, while strengthening logical and cognitive thinking skills (Aktamiş & Yenice, 2021; Normore et al., 2024). Many educational games require players to solve problems by utilizing the knowledge they have. This involves analyzing situations. Many educational games require decision-making where each choice has different consequences [20]. This requires students to consider various factors before making a decision and think deeply about the outcome of their actions. Games that require long-term strategy, planning and resource management can improve students' critical thinking skills[21]. Students are invited to think about the many variables that affect each other, plan the steps ahead, and estimate the impact of their actions. Educational games are a very effective tool for improving students' critical thinking skills as they provide an interactive, challenging and fun learning experience. Utilizing games that require students to solve problems, make decisions based on evidence, design strategies, and collaborate, teachers can help students develop critical thinking skills needed in academic and daily life. Based on the description above, the researcher will conduct research on "Instagram-Based Element Chemistry Poker Card Game in Improving Students' Critical Thinking".

2 Methods

This media development research uses a quasi-experimental research method with a non-equivalent Pretest-Posttest Control Group Design type.

Table 1 Research Design

Pretest	Treatment	Posttest
O1	Elemental Chemistry Poker Card	O2
O3	Conventional Method	O4

The independent variable in this research is the use of elemental chemical poker cards, while the dependent variable is students' critical thinking abilities. This research was tested on class XII students of State High Schools in Bangkalan. The sample selection used the Non Probability Sampling Technique, thereby determining two classes with balanced student abilities, especially in chemistry subjects. This research used two classes, namely the experimental class which used Instagram-based Elemental Chemistry Poker Cards and the control class which used conventional learning with a total of 35 students in each class.

The test instrument used was designed to measure students' critical thinking abilities on elemental chemistry material. This instrument was developed based on five indicators of critical thinking, namely basic clarification, basic support, inference, further clarification, strategy and tactics. Each indicator contains two questions, so there are a total of 10 questions. This test was tested on control and experimental class students before and after the learning implementation. All instruments and learning tools used in the research have been validated based on media and material aspects.

Data analysis of students' critical thinking results was tested using ANCOVA with pretest results as a covariate. Data homogeneity was carried out using the Levene test and data normality test was carried out using the Kolmogorov-Smirnov test.

3 Result and Discussion

3.1 Results

ANCOVA test results on the effect of applying chemical element poker card games on ability students' critical thinking in elemental chemistry material is presented in Table 2.

Table 2. Summary of Ancova Test of Critical Thinking of Students in Experimental and Control Classes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2383.657[a]	2	1146.779	30.625	.000
Intercept	9339.079	1	9438.069	252.042	.000
Class	1339.444	1	1438.494	38.415	.000
Error	3359.842	67	37.446		
Total	644626.000	70			
Corrected Total	5452.389	69			

The results of the ANCOVA test show a significance p-value <0.05 (H0 is rejected) so that the use of Instagram-based elemental chemistry poker cards in learning influences the results of students' critical thinking abilities on elemental chemistry material. The following are the results of the percentage increase in students' critical thinking skills in the experimental class and control class in terms of the n-gain score analysis category:

Table 3. Results of n-gain score of Students' Creative Thinking in Experimental and Control Classes

Category n-gain	Experiment	Control
High	33	5
Medium	2	27
Low	-	3

Table 3 shows that there are differences in the results of increasing students' critical thinking skills in the control class and the experimental class. The experimental class obtained the high category (94%) and the medium category (6%). The control class received the high category (14%), medium category (77%), and low category (9%).

3.1 Discussion

The results show that there is a significant increase in the results of students' critical thinking abilities after using elemental chemistry poker cards. Educational games can be a very effective tool in improving students' critical thinking skills [7]. Elemental chemistry poker cards are designed with challenges or problems that players must solve using transition element cards. The process of solving this problem encourages students to think critically, look for creative solutions, and test various strategies to achieve goals. Students must make decisions quickly and consider the consequences of each action in the game. It trains students to think logically and analytically before making decisions, which is an important skill in critical thinking [23,24]. Educational games are not only entertaining but can also create an engaging environment for the development of critical thinking skills, which is very beneficial in the long-term learning process.

Fig. 1. Instagram-Based Elemental Chemistry Poker Card

Critical thinking ability has five indicators, namely elementary clarification, basic support, inference, advances clarification, strategies and tactics [25]. These five indicators will show students' critical thinking abilities in a subject matter. Elemental chemistry poker cards are designed to train students' critical thinking skills with playing concepts. In the elementary clarification indicator, students will have the ability to analyze arguments in a phenomenon. The elemental chemistry poker cards consist of basic information about the concept of transition elements. This card will familiarize students with understanding general information on transition elements. Phenomena in a chemical compound in nature can be explained by the chemical properties of the element itself [26].

The basic support indicator will show students' ability to consider the results of observations in the field. Elemental chemistry poker cards are equipped with trigger statements that connect scientific phenomena with the concept of transition elements that exist in nature. Analyzing phenomena by connecting learning concepts will train students to build basic skills on a material concept [27,28]. Inference indicators will show students' ability to deduce a scientific concept that refers to conclusions from general to specific. Elemental chemistry poker cards are designed based on groups and periods of transition elements. This grouping will train students in providing conclusions on the main concept of grouping into groups and periods in transition elements. The concept of grouping by

analyzing the specifications of a material will train students to provide conclusions about the learning process itself [25,29].

The advances clarification indicator is the ability to define a term by considering appropriate criteria and identifying any existing assumptions [22,30]. The chemical element poker card is equipped with a barcode that is integrated with the ethnochemical content of transition elements in metal culture on Madura Island. Students will be trained to understand and analyze the concept of transition elements in their use based on their use in Madurese culture by playing chemical element poker cards. Each transition element has a unique characteristic in combining with other elements so that it becomes a stable compound and can be used by humans. This game will help students identify criteria and assumptions in explaining the concept of transition elements when used in everyday life [31].

The strategies and tactics indicator is the ability to integrate one concept with other concepts. The playing process will train students in organizing strategies to understand the flow of a game [5]. Elemental chemistry poker cards are played based on the period of each transition element. Each period has its own characteristics based on the size of the main shell that becomes the orbital for an electron, which will have an impact on the periodic properties of the transition elements. Students will be trained to integrate the periodic properties of transition elements based on phenomena found in the uses of the elements themselves [32]. Integrating a transition element in developing a perfect product based on periodicity is the main thing in this game. The concept of group and period for transition elements will show the unique information about each element in producing a compound.

Combining card games with digital content on Instagram social media will provide new experiences for students to improve their critical thinking skills. Teachers can give assignments that involve students creating content on Instagram. This task can be in the form of making an explanatory video, infographic, or creative photo related to the lesson. Instagram provides space for students to be creative through photos, videos and text [33,34]. By combining creativity in presenting material, students can better understand lessons in different ways. Students and teachers can look for inspiration from professional accounts or educational communities that post innovative content [17,30]. This can motivate them to explore topics further outside of class. Overall, Instagram offers a new way to make learning more interesting and relevant for students, especially in this digital era. By utilizing its features effectively, Instagram can become a powerful tool for more interactive, visual and collaborative learning.

4 Conclusion

Instagram Based Elemental Chemistry Poker Card Game shows a significant influence on students' critical thinking abilities in class XII high school chemical element material. Elemental chemistry poker cards can improve students' critical thinking abilities. Learning with elemental chemistry poker card game successfully trained five indicators of critical thinking consisting of basic clarification, basic support, inference, advance clarification, strategy and tactics. The combination of learning with game media is a good alternative in improving students' critical thinking skills.

Acknowledgments

Many thanks to all parties who have helped and supported the process of carrying out this research, especially to LPPM Trunojoyo University, Madura, who helped fund this research activity.

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