Chem-USG Learning Media to Increase Students' Learning Interest in High School Chemical Equilibrium Material: A Case Study

Pingky Nirmala Pradita & Achmad Lutfi[*]

Department of Chemistry Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Surabaya, Jl. Ketintang, Surabaya, Indonesia 60231

[*] Corresponding Author e-mail: achmadlutfi@unesa.ac.id

Abstract
The aim of this research is to obtain Chem-USG learning media which is feasible to use in learning high school chemical equilibrium material to increase students' learning interest. The type of research used is research and development (R&D) with the 4D development model but only until the third stage. The stages carried out by researchers are define, design, and develop. The data collection techniques used by researchers are interviews, observations, questionnaires, and tests, while the data analysis used is quantitative descriptive. Validity is based on the learning media validation questionnaire. Practicality is based on activity observations and student response questionnaires. Effectiveness is based on a questionnaire of learning interest and student learning outcomes. The validation result of learning media yielded mode scores 3 and 4 with valid categories. At the trial stage, the average percentage score on the activity observation results was 80%-100% with a good category, and received good responses from students with mode scores of 3 and 4 with good categories so that Chem-USG media could be declared practical. And obtained an increase in the percentage of students' learning interest on the post-learning interest questionnaire reached above 80% with a good category and supported by improved student learning outcomes so that make the Chem-USG media effective. So, based on the results obtained, Chem-USG learning media can be said to be feasible to use to increase students' interest in learning high school equilibrium material because it meets the eligibility requirements, namely validity, practicality, and effectiveness

INTRODUCTION

Chemistry is one of the branches of science in which various aspects related to matter are studied, such as the structure, properties, form, changes, classification, and composition of matter, along with the energy involved in these changes. Based on the decision of the Ministry of Education and Culture and Research Number 8 of 2022 concerning Learning Outcomes in Early Childhood Education, Primary Education Level, and Secondary Education Level in the Merdeka Curriculum, the characteristics of chemical equilibrium material are that students are able to understand and explain aspects of energy, rate and equilibrium of chemical reactions. At the high school level, if the teacher only conveys material without involving students in the learning process, while the chemistry subject contains interrelated theories and concepts, this can make students have difficulty understanding the material being taught or even students feel bored.

Based on chemistry teacher interview and pre-research questionnaires of students regarding learning difficulties, student conditions and learning media which show that 69.7% of 11th

grade students of SMAN 1 Krian Sidoarjo consider the submaterial of chemical equilibrium shift difficult to understand and confusing. In research by Simarmata, et al., (2024) which suggests that students have difficulty understanding the submaterial of chemical equilibrium shift and the learning process that makes students passive so that their interest in learning is low (Simarmata, Selly, Sari, Jasmidi, & Zubir, 2024). Students sometimes feel bored and bored if the teacher does not use interactive learning media, resulting in low student interest in learning. Learning media is an important tool because it can be used to convey messages to students. In this case, learning media can serve as a tool for teachers in the learning process to convey material that aims to stimulate creative thinking, emotions, attention and interest in learning (Tafonao, 2018).

Chemistry learning at SMAN 1 Krian Sidoarjo still uses monotonous media that is not interactive with students, lack of student activity, and the use of learning media has been limited in variety. Teachers use LCD media, LKPD, videos and speakers and mics. Teachers also never care about students' interest and motivation to learn. This causes a lack of interest and enthusiasm of students in participating in learning activities which can result in low student learning outcomes. In the world of education, it can be a problem if interest in learning is low because it can hinder the achievement of learning objectives (Friantini & Winata, 2019).

Interest in learning in question is a motivation that can encourage students to pursue their desires without coercion. Interest can be defined as a high sense of interest and passion, coupled with self-awareness in something that is considered to provide personal benefits and satisfaction, so that individuals can be encouraged to engage in these activities without coercion or pressure (Falah, 2019). According to Slameto, a person's interest can be shown through activities related to their interests so that they can make individuals active in an activity. According to Slameto, there are 4 indicators of learning interest, namely happy feeling, student engagement, interest and attention in learning. Internal factors that can affect student learning outcomes are psychological factors related to a person's mental state including motivation and student interest in learning. High learning interest usually results in high learning outcomes, while low learning interest results in low learning outcomes. So, it can be concluded that interest in learning can affect student learning outcomes (Lutfi & Nugroho P, 2019).

Nowadays, games are very popular with various groups because they have a strong appeal so that a lot of time can be spent just playing games. Playing does not always have a negative impact, because games can provide benefits when combined with the learning process. Games can be useful as learning media that greatly supports the learning process in the classroom (Lutfi, Aftinia, & Permani, 2023). By using this media, learning can be structured so that students understand the material more easily, do not feel bored or anxious, and ensure that all material is conveyed. Based on the findings of chemistry teacher interviews and students' pre-research questionnaires regarding game media, students will be interested if the learning process is interspersed with playing and practicing questions in the form of games. Chemistry teachers also agree if games are used as learning media because chemistry teachers have never used game media so that it will make students interested.

Innovative and diverse learning media are essential to facilitate and enhance students' learning interest in understanding chemical equilibrium material. The Uno Stacko website suggests that the Uno Stacko game contains durable plastic blocks instead of Uno cards, which are colored red, blue, yellow, green, and purple. The blocks are numbered one to four with additional blocks labeled Reverse, Skip, Draw Two, and Wild for a total of 45 blocks, plus a tray-shaped cardboard to make it easier to put the blocks back into the container. Uno Stacko is suitable for 2 to 10 players. Uno Stacko Game is one of the game-based media that can be utilized as learning media in the classroom (Kumala, Sumarni, & Widiyatun, 2020).

Educational games are one of the media that can be used as a tool to assist students in understanding scientific concepts. The development of educational games has been widely applied in various fields of science. The learning process supported by learning media tends to produce better learning outcomes (Kumala, Sumarni, & Widiyatun, 2020). Therefore, a learning media was developed, namely Chemistry Uno Stacko Game, to increase students' learning interest in high school chemical equilibrium material.

The learning media developed is an application of the concept, namely exercise questions on the submaterial of chemical equilibrium shift. Chem-USG developed by researchers has the advantage of being provided with a set consisting of uno stacko, question cards, guidebooks, teaching materials, answer clues and totebag to make it more practical when carried. Previous similar media were mostly available in one language only, namely Indonesian. Guidebooks and question cards are provided in two languages, namely Indonesian and English. From this learning media, the playing activity is when students start taking Uno Stacko blocks, because in this activity there is a challenge so that the beam tower does not collapse. Not only playing activities, there are also learning activities, namely when students answer and explain the answers to questions, and if they are wrong, a material book is given as a reference for students and clues so that the learning process occurs.

METHOD

Researchers use the type of research and development which aims to obtain, process and test media products so that they are of good quality. In this study, the research design used was guided by the 4D development model. According to Thiagarajan (in Sili, J. U., et al, 1974), the stages of the 4D model include define, design, develop, and disseminate (Sili, Kurniasih, Nufida, & Khery, 2024). However, researchers only conducted up to the third stage, namely develop. Visually, here is the flow of the 4D development model.
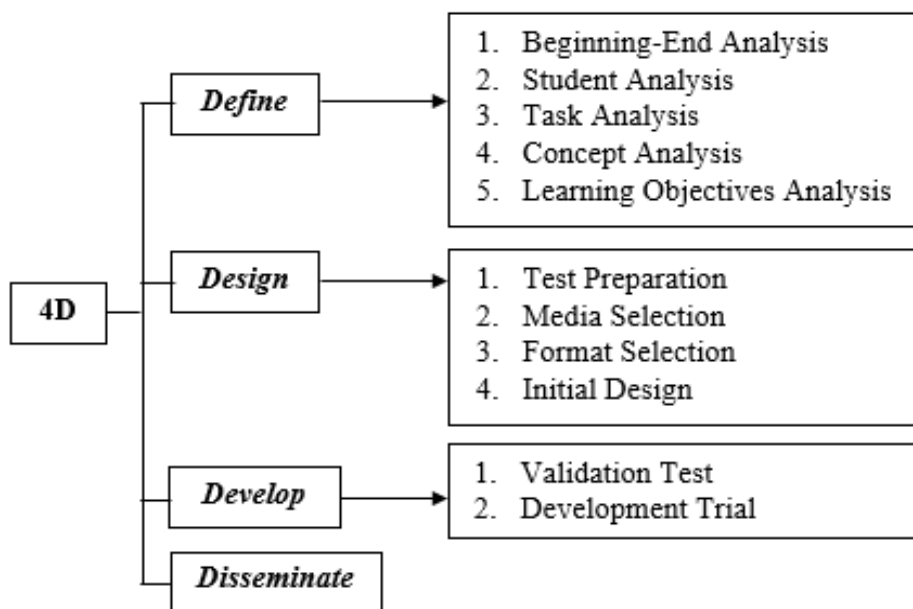
Figure 1. 4D Flow Stage

The development trial phase was carried out for two meetings during the even semester of the 2024/2025 school year in February 2025. The sample selection technique is random sampling which is carried out randomly without being based on a certain level. The research was conducted in class XI-1 SMA Negeri 1 Krian Sidoarjo with 33 students.

The data analysis methods employed in this study include validity, practicality, and effectiveness analysis. Data analysis was carried out using descriptive statistical tests based on the mode score results and percentage results. The validation sheet using Likert scale was used to determine the validity of Chem-USG media based on the mode score of the 3 expert validators. The validity data analysis is based on the results of the mode score with a Likert scale in the following table.

Table 1. Validation Likert Scale Score

Score	Description
1	Very Invalid
2	Invalid
3	Valid
4	Very Valid

(Sugiyono, 2019)

Learning media is said to be valid if the mode score meets the criteria with a score of each question ≥ 3. Furthermore, activity observation sheet and response questionnaire to measure the practicality of Chem-USG media. The following is how to analyze the percentage of learning media based on student activity observations.

$$P = \frac{\text{the count of observation for the examined aspect}}{\text{the highest number of observations for each aspect}} \times 100\%$$

Analysis of percentage results is based on the following scale of practicality criteria.

Table 2. Percentage of Practicality Criteria

Percentage	Criteria
0 – 20	Very Bad
21 – 40	Not Good
41 – 60	Good Enough
61 – 80	Good
81 – 100	Very Good

(Riduwan, 2015)

Furthermore, the way to analyze the outcomes of the response questionnaire from student is based on the results of the mode score with a Likert scale as follows.

Table 3. Response Questionnaire Likert Scale Score

Score	Description
4	Strongly Disagree
3	Disagree
2	Agree
1	Strongly Agree

(Sugiyono, 2019)

Table 3. Interest Questionnaire Guttman Scale Score

Answer	Score
Yes	1
No	0

(Sugiyono, 2019)

Learning media is said to be practical if the percentage of activity observations is $\geq 61\%$ and the outcomes of the response questionnaire mode score meet the criteria with a score of each question ≥ 3. Then, learning interest questionnaire and pretest-posttest sheet to measure the

effectiveness of Chem-USG media. The following is how to analyze the questionnaire of students' learning interest. After obtaining the overall score of each statement, it can be computed using the following formula below.

$$\text{Percentage} = \frac{\text{sum of data collection scores}}{\text{sum of criteria scores}} \text{ x } 100\%$$

Then the calculation results are analyzed using the criteria table as follows.

Table 4. Interpretation Criteria for Interest Questionnaire

Percentage	Criteria
0 – 20	Very Bad
21 – 40	Not Good
41 – 60	Good Enough
61 – 80	Good
81 – 100	Very Good

(Riduwan, 2015)

Learning media is said to be effective if the percentage of interest in learning is ≥ 61% and improved learning outcomes.

Furthermore, the way to analyze student learning outcomes is with the Paired Sample t-Test test to determine the increase in learning outcomes. Before that, a normality test must be done first. The Kolmogorov-Smirnov Normality Test uses the SPSS Statistic version 16 application with provisions including: (1) If the probability value is greater than 0.05, then the data is considered normally distributed, and (2) If the probability value is less than 0.05, then the data is deemed not normally distributed. Then the Paired Sample t-Test test uses the SPSS Statistic version 16 application with hypotheses including: (1) if the significant value is greater than 0.05, then Ho is accepted or Ha is rejected which is shown in the significant increase in test results; and (2) if the significant value is smaller (<) than 0.05 then Ho is rejected or Ha is accepted which is shown in the significant increase in learning outcomes.

RESULTS AND DISCUSSION

The results of the research and discussion in this study are based on the 4D development model, which include define, design and develop. Below is an explanation of the research result and discussion.

Define

The research began with the Define stage, researchers obtained identification results including the beginning-end, student, task, concept and learning objectives analysis. In the beginning-end analysis, information was obtained about the learning process, the availability of teaching materials, teaching media, and chemistry learning methods from chemistry teacher interviews. At the learner analysis stage, information is obtained about learning methods, learning interests and characteristics of learning media that students are interested in through chemistry teacher interviews and student questionnaires. In the task analysis stage, concepts and learning objectives are carried out to determine the material that must be mastered by students in accordance with the Flow of Learning Objectives made by chemistry teachers. The material used is chemical equilibrium material on the subchapter of chemical equilibrium shift.

The learning media used by chemistry teachers at SMA Negeri 1 Krian Sidoarjo are speakers and mics to convey material, so that it can make students bored and lack of interest in participating in learning. This is supported by the theory which states that through fun game facilities, it's expected to assist the learning process. So that students do not feel bored and can

generate interest in participating in learning (Kumala, Sumarni, & Widiyatun, 2020). Based on previous research by Najibah, A. (2023), states that games as learning media can increase learning interest and can have an effect on improving learning outcomes of student (Najibah, 2023). At this stage, it is determined to develop game media as learning media to increase students' learning interest chemical equilibrium material.

Design

Furthermore, at the design stage, the researcher designs the Chem-USG learning media to be developed through the first, namely the test preparation stage in the form of Pretest-Posttest items and questions on learning media. Furthermore, at the media selection stage, researchers determined the media developed, namely Chem-USG learning media on chemical equilibrium material. At the format selection stage, researchers designed Chem-USG learning media containing Uno Stacko blocks, question cards, game guides and material books as a reference for students and clue questions on learning media. At the initial design stage, researchers produced a draft in the form of Chem-USG learning media on the submaterial of chemical equilibrium shift which had not been validated by the validator. The image of Chem-USG learning media can be seen in Figure 2.

Figure 2. Chem-USG Learning Media

In Figure 2, the initial draft of Chem-USG learning media is obtained, which consists of uno stacko blocks and their packaging, guidebooks, question cards, and to make it more practical to carry, a totebag is provided to accommodate all the media. Chem-USG which is a learning media in the form of physical games can increase interest in learning because there are students can learn while playing by completing challenges for students to get rewards by answering questions correctly.

Develop

Validity

The validity test was carried out to assess the level of validity of the Chem-USG developed. The validity of a product is seen based on 2 criteria, namely content validity and construct validity. Content validity pertains to the appropriateness between game development and the content of the material used. While construct validity is connected to the internal appropriatenes of the learning media products developed (Lutfi, Aftinia, & Permani, 2023). According to Sugiyono (in Ariski, 2018), before the development trial is carried out, the validity stage must first be carried out (Ariski & Prasetya, 2018). The following are the results of the Chem-USG learning media validity test.

Table 5. Media Validation Results

Content Validity		
Aspect	**Modus Score**	**Criteria**
Correctness of knowledge concepts	3	Valid
Suitability of the material with the objectives	4	Valid
Construct Validity		
Aspect	**Modus Score**	**Criteria**
Chemical characteristics	3	Valid
Compatibility with learner characteristics	4	Valid
Has rules	4	Valid
There is an element of guidance	3	Valid
There is competition, requirements, and strategy in play	3	Valid
Challenging and actively engages learners	3	Valid
Provides feedback	3	Valid
Display as learning media	4	Valid
Use of good and correct language	3	Valid

Validation was carried out by 3 expert validators. Based on the validation research data in Table 5, on content validity, which means that the suitability between the Uno Stacko games as learning media with the content of the material used can be said to be valid. It can be seen that there is validity in the truth of the knowledge concept and the alignment of the material with the objectives. Likewise, on construct validity which shows that each statement obtained a mode score ≥ 3, namely on construct validity which means that the internal suitability of the Chem-USG learning media products developed such as chemical characteristics, characteristics of students, game rules, guiding elements, competition, game requirements and strategies, feedback, media display and language use can be said to be valid.

This is supported by the theory put forward by Asyhar (in Ariski & Prasetya, 2018) which states that the validation of media products is carried out to ensure the accuracy of curriculum material and learning objectives, as well as the suitability of the language with students (Ariski & Prasetya, 2018). Shown in previous research by Vinanda, A. M., et al (2022) that indicates the Uno Stacko Chemistry media developed gets a very valid category and gets a good response from validators in terms of media, material, and language aspects (Vinanda, Enawaty, & Melati, 2021). Then in previous research by Kumala, S. A., et al (2020) stated that the validation test result of media and material experts were in the good category (Kumala, Sumarni, & Widiyatun, 2020). From the description of the discussion of the validity test data by 3 expert validators, it can be seen that the validation results are in accordance with the good to very good criteria. This is because the Chem-USG learning media developed by researchers get valid to very valid results and do not get comments, suggestions, or revisions from expert validators.

Furthermore, at the stage of testing the practicality and effectiveness of Chem-USG learning media on chemical equilibrium material, chemical equilibrium shift. The research was conducted for 2 meetings. In the first meeting, introductions, pretests, pre-learning interest questionnaire, and learning simulations using Chem-USG learning media were conducted. In the second meeting, learning was carried out using Chem-USG learning media, the game was carried out as many as 2 rounds to determine the winner in the game. One class is divided into 2 large groups, then in the large group is divided into 3 small groups that will be competed, namely groups A, B, and C. The game starts with one group taking blocks, then the next group takes blocks according to the same number, color, or symbol as the previous group's blocks. The game begins with one group taking a block, then the next group takes a block according to the same number, color, or symbol as the previous group's block. If you successfully pick

up the block and answer the question, you get a point. If you successfully take the block but answer incorrectly, then you are given a clue and answer one more time, if it is still wrong then you get a point deduction. Meanwhile, if you knock down the uno stacko tower then immediately get a point deduction. The winner in group 1 is group B with a score of 55 points, while in group 2, group C with a score of 59 points. Furthermore, the posttest, post-interest questionnaire, and the students' response questionnaire to learning using Chem-USG learning media were filled in. After obtaining data from the outcome of the Chem-USG learning media development trial. The following is documentation of learning activities using the Chem-USG learning media developed.

Figure 3. Learning activities using Chem-USG learning media

Practicality

Observation of Student Activity

The student activity observation sheet aims to determine student participation, following procedures, knowing student interactions, and answering questions. Chem-USG learning media is said to meet the criteria if the percentage of student activity observation results reaches ≥ 61% based on Riduwan's (2015) measurement scale with good to very good criteria.

Table 6. Average Percentage Results of Activity Observation Results

Aspect	Observer Group 1		Average Percentage of Group 1	Observer Group 2		Average Percentage of Group 2
	1	2		1	2	
Learner Participation	80	80	80	96	80	88
Following the Procedure	100	100	100	100	100	100
Learner Interaction	97	89	93	91	97	94
Answering Questions	100	90	95	90	100	95

According to the data in Table 6, the overall average obtained in all aspects observed from the four observers is greater than 61% in the good category. The aspect of learner participation, the activity of learners in discussing with groups obtained an average percentage of group 1 and group 2 including in the good category. The aspect of answering questions, the activity of students in trying to answer questions obtained an average percentage including in the good category. These both aspects, it is observed that learning media can make students actively participate in answering questions and cooperating in groups during learning activities. This aligns with the Riduwan scale (2015) which states that the practicality score that fits the criteria is good to very good, namely ≥61%. It was shown in previous research by Ariski, D. (2018)

which stated that in the activity of students, 75.625% practicality was obtained which was classified in the good category, which encouraged students to be active during the learning process with the game media developed (Ariski & Prasetya, 2018).

In the aspect of following procedures, students' activities in following the rules in the learning media received an average percentage in the good category. In the aspect of learner interaction, the activity of students in interacting with learning media received an average percentage of group 1 and group 2 in the good category. This is in accordance with Riduwan's scale (2015) which states that the practicality score that fits the good to very good criteria is ≥61%. From the two statements on the observation sheet, it is also corroborated by Arikunto (in Handini & Asmarani, 2024) which states that the practicality of learning media can be assessed from the media is accepted and can be utilized effectively by teachers and students in the learning process (Handini & Asmarani, 2024).

Response Questionnaire

The learner response questionnaire aims to assess the feedback from students after testing the Chem-USG learning media. Aspects of the learner response questionnaire include game design, game instructions, and game display. Chem-USG learning media is considered practical if the results of the feedback from students regarding Chem-USG learning media obtain good to very good criteria.

Table 7. Data on the Outcome of the Student Response Questionnaire

Aspect	Score			
	1	2	3	4
Game Design	0	5	16	12
Game Instructions	0	3	19	11
Game Display	0	0	22	11

According to the data in Table 7, the mode score of each statement in the questionnaire of students' responses to the Chem-USG learning media is obtained which obtained a mode score ≥ 3 so that it can be said to be good. In the first aspect regarding the design of the game obtained a percentage of 84.84% of students who agreed that the Chem-USG game design was attractive. The second aspect, the availability of instructions for using the game obtained a percentage of 90.9% of students who agreed that there were instructions for using the game that were straightforward and easy to comprehend. In the third aspect regarding the appearance of Chem-USG learning media obtained a percentage of 100% of students who agreed that the writing, colors, and language on Chem-USG learning media were easy to read and easy to understand. From these three aspects, it is known that the Chem-USG learning media used can make students easy to understand chemical equilibrium material.

This is in accordance with Al Hibra's research (in Renatha & Rosdiana, 2020) which states that game media must be attractive to students allowing them to easily grasp the material and preventing from feel bored during the learning process (Renatha & Rosdiana, 2020). Shown in previous research by Camelia, B., et al (2024) stated that Uno Stacko learning media can help students grasp the material more easily (Camelia, Khairunnisa, & Sauqina, 2024). And the finding of earlier research by Ariski, D. (2018) which states that the students' response to the Uno Stacko game design is included in the good category so that it can make students interested because they can learn while playing (Ariski & Prasetya, 2018).

These three aspects are in accordance with the theory stated by Haviz (in Aldi, et al, 2022) that the practicality of development products refers to the extent to which users like and find it easy when using the media under normal conditions (Aldi, Adnan, Ismail, & Dzulqarnain, 2022). According to the analysis of the discussion regarding the results from the student activity observation sheet and the student response questionnaire to the Chem-USG learning media, it

can be said that the media developed by researchers meet the criteria as learning media needed by students to increase students' learning interest. Chem-USG learning media meets the criteria due to the use of media that is easy for educators and students, make it easier for students to understand chemical equilibrium material and does not make students feel bored during learning activities.

Effectiveness

Learning Interest

The results of the effectiveness of Chem-USG learning media are based on the results of student interest questionnaires and corroborated by student learning outcomes. The learning interest questionnaire is intended to determine the increase in students' interest in learning before and after implementing learning using Chem-USG learning media.

Table 8. Percentage of Student Learning Interest Questionnaire

Aspect	Percentage Score	
	Pre	Post
Happy Feeling	76	100
Student Engagement	27	85
Interest in Learning	64	97
Attention in Learning	70	100

Based on the data from the Pre and Post learning interest questionnaire results in Table 8, it is known that there is an increase in percentage in all aspects assessed. In the first aspect, namely happy feelings, an increase in percentage was obtained after implementing learning by using Chem-USG learning media. This is supported by the theory by Slameto (in Rusmiati, 2017) that feelings of pleasure can arise when students have an interest in an object and there is no compulsion to learn (Rusmiati, 2017). Also shown in previous research by Lestari, D., and Purwandari (2018), there were 100% of students who answered "happy" about learning with Uno Stacko media (Lestari & Purwandari, 2018).

In the second aspect, namely the student engagement, there is an increase in percentage after implementing learning by using Chem-USG learning media which makes students become more active in asking questions and expressing opinions. This is supported by the theory that a person's interest in learning can be shown through activities that encourage the active role of students in certain activities, in this case in the learning process. According to Slameto (in Rusmiati, 2017), this is related to the feelings of pleasure and interest of students in learning, if students are happy and interested, they will participate in these activities (Rusmiati, 2017). Supported by the results of observations of learner activities on aspects of learner participation that make learners actively discuss in learning in the good category.

In the third aspect, namely interest in learning, there is an increase in percentage after implementing learning by using Chem-USG learning media, which means that students are interested and carry out tasks seriously in learning activities supported by learning media. Interest is related to feelings of pleasure, if someone feels happy then someone will be interested in that. This is supported by the theory by Slameto (in Rusmiati, 2017) that interest in something is related to the driving force of students, namely the affective experience stimulated by the activity, in this case, namely the feeling of pleasure in playing (Rusmiati, 2017). Supported by the results of observations of student activities in the aspects of student interaction with learning media and aspects of answering questions in learning media with good categories.

In the fourth aspect, namely attention in learning, there is an increase in percentage after implementing learning by using Chem-USG learning media, which means that students are

focused and diligent in paying attention to the learning provided by the teacher. This is supported by the theory by Slameto (in Rusmiati, 2017) that the attention of students can be seen from the concentration of students on observing an object by putting aside other things (Rusmiati, 2017). Supported by the findings from observing of the student activities who focus on following the rules in the game with a good category.

Of these four aspects, in accordance with Slameto's theory (in Rusmiati, 2017) which reveals that a person's interest can be shown through activities related to his interests so that it can make individuals active in an activity. As well as the theory that interest is shown as a high sense of preference and interest, along with self-awareness in something that is considered to provide benefits and satisfaction in oneself, so that individuals are encouraged to be actively involved in participating in these activities without coercion or prompting (Falah, 2019). It is shown in previous research by Supriyono (2022) which shows that the use of media in the learning process can arouse students' interest in learning (Supriyono, 2022). As well as previous research by Lalita, C. D., et al (2023) which states that Uno Stacko media can increase students' learning interest Physics that has already been implemented (Lalita, Haryadi, & Oktarisa, 2023).

From these four aspects, it is concluded that learning by using Chem-USG learning media is one of the external factors that foster students' learning interest. This is supported by the theory that learning media is an external factor that can affect the growth of students' learning interest (Korompot, Rahim, & Pakaya, 2020). Furthermore, the discussion of student learning outcomes as a supporter of increasing the learning interest questionnaire results.

Learning Outcomes

Students' learning outcomes are obtained from student test sheets consisting of Pretest and Posttest sheets on chemical equilibrium material. The Pretest sheet aims to assess the students' prior knowledge before carrying out the lesson by using Chem-USG learning media. While the Posttest sheet aims to evaluate the students' knowledge at the end of the lesson by using Chem-USG learning media.

According to the data on student learning outcomes, it is evident that there is an improvement in student learning outcomes after getting learning treatment using Chem-USG learning media on chemical equilibrium material. Learning outcomes are important things that are used to determine the level of students in mastering the material achieved. Learning media is said to be effective if there is a significant difference when measured using the Paired Sample t-Test test. Before conducting the Paired Sample t-Test, a Kolmogorov-Smirnov normality test must be performed on the Pretest and Posttest data using SPSS. If the significant value is greater than 0.05, the data is considered normally distributed. Meanwhile, if the significant value is less than 0.05, the data is deemed not normally distributed (Sugiyono, 2019).

Table 9. SPSS Normality Test of Learning Outcomes

	class	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
result	pretest	.147	33	.070	.944	33	.090
	posttest	.140	33	.099	.936	33	.051

According to the Kolmogorov-Smirnov normality test using SPSS in Table 9, indicate that the significant value is more than 0.05, thus it can be concluded that the test data from 33 students of class XI-1 SMA Negeri 1 Krian Sidoarjo are normally distributed. Overall, students get lower scores during the Pretest because before being given Chem-USG learning media and the value of each student increases during the Posttest because after being given Chem-USG learning media. Furthermore, the Paired Sample t-Test test was performed.

Table 10. Paired Sample t-Test Results

		t	df	Sig. (2-tailed)
Pair 1	Pretest - Posttest	-22.472	32	.000

According to the data in Table 10, the results showed a significant value smaller than 0.05, indicating that Ho is rejected and Ha is accepted, which is shown in the significant difference in learning outcomes. And reinforced by the results of the increase in the average learning outcomes, on the Pretest of 33.33 then increased to 74.55 on the Posttest. Also shown in previous research by Larasati, M. S., and Prihatnani, E. (2018) which states that the SPSS test results from the student' Pretest and Posttest sheets on the use of Uno Stacko media in learning are normally distributed data and there are significant differences (Larasati & Prihatnani, 2018). It can be concluded that the results of the SPSS test, the results obtained are appropriate, namely the Chem-USG learning media on chemical equilibrium material can increase students' interest in learning because the results of a significant increase in value are supporters of increasing students' interest in learning.

Based on the discussion of learning interest according to Slameto (in Rusmiati, 2017) and previous research on uno stacko can increase students' learning interest. Then the discussion of the significant difference in learning outcomes. It is concluded that the connection between learning interest and student learning outcomes is supported by the theory that effective is a certain influence or benefit obtained from a change made. It is known from the learning outcomes of students who have increased, meaning that Chem-USG learning media provides influence and benefits to improving student learning outcomes (Fakhrurrazi, 2018). As well as the theory that high learning interest often leads to better learning outcomes, while lack of learning interest often results in lower learning outcomes (Falah, 2019).

This is also explained in Piaget's learning theory, which argues about cognitive theory that play can make children's brains active, balance the functions of the right and left brain and the formation of neural structures, and can develop neural understanding that is useful for the future. As for Vygotsky's learning theory, it is suggested that play is one of the ways children think in solving problems with the discovery of knowledge in the social world of the child, namely from playmates who can make their cognitive develop (Lutfi, Aftinia, & Permani, 2023). It was also shown in previous research by Najibah, A., et al (2023) that there is an impact of learning interest on student achievement (Najibah, 2023). And supported by the findings of research conducted by Byusa, et al (2022) which states that educational games can make conceptual understanding and student motivation increases, allowing them to learn and enjoy while understanding the material being studied (Nadila, Enawaty, Erlina, & Masriani, 2024).

CONCLUSION

Based on the findings of the research and the discussion that has been conducted regarding the development of Chem-USG learning media to increase students' learning interest in high school chemical equilibrium material can be said to be feasible. Chem-USG learning media is declared valid with a mode score of 3 and 4. Chem-USG learning media is said to be practical because it achieves an average percentage on the results of observation of student activities obtained 80%-100% in the good category and the student response questionnaire results showed mode scores are 3 and 4 in the good category, allowing Chem-USG learning media can be declared practical. Chem-USG learning media obtained a rise in the percentage of post-students' learning interest reached more than 80% in the good category and was supported with an improvement in the average learning outcomes of students so that Chem-USG learning media

could be declared effective. It is concluded that Chem-USG learning media meets the eligibility requirements, namely valid, practical and effective.

RECOMMENDATIONS

Based on the obstacles during the research and the limited time of the research, suggestions for further research are given, namely to adjust the allocation of learning time that has been determined in order to achieve maximum learning objectives. It is crucial to consider the time allocation because students ask to continue playing outside the predetermined time allocation.

ACKNOWLEDGEMENTS

BIBLIOGRAPHY

Aldi, S., Adnan, Ismail, & Dzulqarnain, A. F. (2022). Uji Kepraktisan Lembar Kerja Peserta Didik Elektronik Berbasis Keterampilan Proses Sains pada Materi SMA/MA Kelas XI Semester I . *Bioedusiana Vol. 7 No.1*, 135.

Ariski, D., & Prasetya, S. P. (2018). Pengembangan Permainan Uno Stacko Geography (USG) sebagai Media Pembelajaran Geografi pada Materi Mitigasi Bencana Alam Kelas XI IPS SMA Negeri 16 Surabaya. *Swara Bhumi Vol. 5 No. 8*, 4.

Camelia, B., Khairunnisa, Y., & Sauqina. (2024). Pengembangan Media Pembelajaran Uno Stacko pada Sub Materi Mengenal Matahari Lebih Dekat untuk Meningkatkan Motivasi Belajar Peserta Didik. *Eduproxima: Jurnal Ilmiah Pendidikan IPA*, 185-194.

Fakhrurrazi. (2018). Hakikat Pembelajaran yang Efektif. *Jurnal At-Tafkir Vol.XI, No.1*, 86-90.

Falah, B. N. (2019). Pengaruh Gaya Belajar Siswa dan Minat Belajar Matematika Siswa Terhadap Hasil Belajar Matematika Siswa. *Jurnal Euclid, Vol.6, No.1*, 25-27.

Friantini, R. N., & Winata, R. (2019). Analisis Minat Belajar pada Pembelajaran Matematika. *Jurnal Pendidikan Matematika Indonesia Vol.4, No.1*, 6-11.

Handini, W. P., & Asmarani, D. (2024). Pengembangan Media Uno Stacko yang Valid dan Praktis dalam Pembelajaran Matematika. *Jurnal Pendidikan Matematika Vol.11 No.1*, 56.

Korompot, S., Rahim, M., & Pakaya, R. (2020). Persepsi Siswa Tentang Faktor yang Mempengaruhi Minat Belajar. *Jambura Guidance and Counseling Journal Vol. 1, No.1*, 41-42.

Kumala, S. A., Sumarni, R. A., & Widiyatun, F. (2020). Pengembangan Media Pembelajaran Menggunakan Uno Stacko pada Materi Fisika Kelas X. *Navigation Physics 2(1)*, 14-20.

Lalita, C. D., Haryadi, R., & Oktarisa, Y. (2023). Pengembangan Game Uno Stacko Physics untuk Meningkatkan Minat Belajar Fisika. *Cendekia: Jurnal Pendidikan dan Pengajaran Vol. 1, No.5*, 13-23.

Larasati, M. S., & Prihatnani, E. (2018). Pengembangan Media Pembelajaran USH (Uno Stacko Hitung). *EDU-MAT: Jurnal Pendidikan Matematika, Vol. 6, No. 2*, 150-161.

Lestari, D., & Purwandari. (2018). Pengembangan permainan Uno Staco sebagai media pembelajaran untuk meningkatkan kerja sama dan kemampuan berfikir kritis siswa pada materi kalor kelas XI TKR 1 SMKN 1 Jiwan. *Prosiding Seminar Nasional Quantum Pend. Fisika* (pp. 145-149). Yogyakarta: Universitas Ahmad Dahlan.

Lutfi, A., & Nugroho P, A. (2019). Minat Belajar dan Keberhasilan Belajar Partikel Penyusun Atom dengan Media Pembelajaran Permainan Chem Man. *Jurnal Pembelajaran Kimia Vol.4, No.1*, 39-50.

Lutfi, A., Aftinia, F., & Permani, B. E. (2023). Gamification: Game as a medium for learning chemistry to motivate and increase retention of students' learning outcomes. *Journal of Technology and Science Education, 13(1)*, 193-207.

Nadila, Enawaty, E., Erlina, & Masriani. (2024). Kartu Permainan Kimia sebagai Media Alternatif untuk Belajar: Tinjauan Literatur. *Hydrogen: Jurnal Kependidikan Kimia, 12(5)*, 1047-1066.

Najibah, A. (2023). Pengaruh Minat, Kepercayaan Diri, dan Kreativitas terhadap Prestasi Belajar Peserta Didik Kelas XI MIA di SMA Muhammadiyah 06 Paciran. *Postulat: Jurnal Inovasi Pendidikan Matematika Vol. 4, No.1*, 152-161.

Renatha, G. T., & Rosdiana, L. (2020). Validitas Permainan Kartu Truth and Dare Materi Pencemaran Lingkungan untuk Siswa SMP Kelas VII. *Pensa E-Jurnal: Pendidikan Sains Vol.8, No.2*, 145.

Riduwan. (2015). *Skala Pengukuran Variabel-Variabel Penelitian.* Bandung: Alfabeta.

Rusmiati. (2017). Pengaruh Minat Belajar terhadap Prestasi Belajar Bidang Studi Ekonomi Siswa MA Al Fattah Sumbermulyo. *UTILITY: Jurnal Ilmiah Pendidikan dan Ekonomi*, 21-36.

Sili, J. U., Kurniasih, Y., Nufida, B. A., & Khery, Y. (2024). Development of Nature-Based Practical Instructions to Improve Science Process Skills in Class XI MIA Acid-Base Material. *Jurnal Ilmu Sosial dan Pendidikan Vol. 8, No.3*, 2025-2033.

Simarmata, T., Selly, R., Sari, S. A., Jasmidi, & Zubir, M. (2024). Pengaruh Model Pembelajaran Learning Cycle 5E Berbantuan Media I-Spring terhadap Hasil dan Minat Belajar Siswa pada Materi Kesetimbangan Kimia. *Jurnal Pendidikan Kimia Universitas Riau, 9(2)*, 116-125.

Sugiyono. (2019). *Metode Penelitian Pendidikan.* Bandung: Alfabeta.

Supriyono. (2022). Pentingnya Media Pembelajaran untuk Meningkatkan Minat Belajar Siswa SD. *EduStream: Jurnal Pendidikan Dasar, 2(1)*, 43-48.

Tafonao, T. (2018). Peranan Media Pembelajaran dalam Meningkatkan Minat Belajar Mahasiswa. *Jurnal Komunikasi Pendidikan, Vol.2 No.2*, 103-105.

Vinanda, A. M., Enawaty, E., & Melati, H. A. (2021). Development of Uno Stacko Chemistry Media on Hydrocarbon Material. *Jurnal Education and Development, Vol. 10, No.1*, 51-59.