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ANALYSIS OF LEARNING MEDIA NEEDS FOR CHEMISTRY ON HYDROCARBON MATERIAL

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ABSTRACT

The rapid development of chemistry requires an effective learning strategy, especially for hydrocarbon material, which is often a challenge for students. This study aims to analyze the needs of chemistry learning media on hydrocarbon material in the form of educational game cards integrated with elaborative thinking. The main focus of the research is to explore the views of chemistry teachers regarding the use of educational game cards and the application of elaborative thinking in learning. This study used an exploratory survey method with a qualitative approach involving 5 chemistry teachers at various schools in Yogyakarta. Data were collected using a semi-open questionnaire consisting of 16 questions covering aspects of understanding, application, constraints, and participants' responses to the development of educational game cards integrated with elaborative thinking. The results showed that the participants gave positive responses to the educational game cards to be developed. Based on the results of the study, it can be concluded that participants agreed to the development of chemistry learning media in the form of educational game cards and gave suggestions that the cards be made comprehensively using relaxed and simple language.

ABSTRAK

Perkembangan ilmu kimia yang pesat memerlukan strategi pembelajaran yang efektif, terutama pada materi hidrokarbon yang kerap menjadi tantangan bagi peserta didik. Penelitian ini bertujuan untuk menganalisis kebutuhan media pembelajaran kimia pada materi hidrokarbon berupa kartu permainan edukatif terintegrasi elaborative thinking. Fokus utama penelitian adalah menggali pandangan guru kimia mengenai penggunaan kartu permainan edukatif dan penerapan elaborative thinking dalam pembelajaran. Penelitian ini menggunakan metode survei eksploratif dengan pendekatan kualitatif yang melibatkan 5 guru kimia pada berbagai sekolah di Yogyakarta. Data dikumpulkan menggunakan angket semi-terbuka yang terdiri dari 16 pertanyaan yang mencakup aspek pemahaman, penerapan, kendala, serta tanggapan partisipan terhadap pengembangan kartu permainan edukatif terintegrasi elaborative thinking. Hasil penelitian menunjukkan bahwa partisipan memberikan tanggapan positif terhadap kartu permainan edukatif yang akan dikembangkan. Berdasarkan hasil penelitian dapat disimpulkan bahwa partisipan setuju terhadap adanya pengembangan media pembelajaran kimia materi hidrokarbon berupa kartu permainan edukatif dan memberikan saran agar kartu dibuat secara komprehensif dengan menggunakan bahasa yang santai dan sederhana.

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INTRODUCTION

Chemistry is developing rapidly along with technological advancements and its application in everyday life. Some chemistry subjects are abstract and require high-level reasoning to understand (Donasari & Silaban, 2021). Unfortunately, students struggle to connect chemical concepts to solve problems presented in class. This contributes to low student learning outcomes (Priliyanti et al., 2021).

Low student learning outcomes are influenced by learning difficulties experienced by students. Learning difficulties are caused by internal and external factors. Internal factors include low interest in learning, low motivation to learn, low conceptual understanding of the material, and poor arithmetic skills. External factors include the teacher's teaching methods, how they manage learning, peer interaction, and ineffective chemistry learning time (Priliyanti et al., 2021).

Teachers generally use the lecture method, which makes students more passive during learning (Asmi et al., 2024). This method is considered boring, thus affecting students' enthusiasm for learning (Bau et al., 2022). The use of learning media can be an alternative for improving learning (Putri et al., 2024).

Learning media is used to facilitate students' understanding of the material (Zahwa & Syafi'i, 2022). The use of appropriate learning media will have a positive impact. The Directorate of Higher Education, Ministry of National Education, identifies eight benefits of media in implementing the learning and teaching process, namely: (1) The delivery of lesson material can be standardized, (2) The learning process becomes clearer and more engaging, (3) The learning process becomes more interactive, (4) Efficiency in time and energy, (5) Improving the quality of student learning outcomes, (6) Media allows the learning process to take place anywhere and at any time, (7) Media can foster positive student attitudes towards the material and the learning and teaching process, (8) Changing the role of teachers to a more positive and productive direction (Wulandari et al., 2023). Learning media is one tool that can enhance learning.

Playing cards are one learning medium that can increase student engagement and motivation. Playing cards have attractive and diverse designs and can be used as a medium for conveying material in a creative and engaging manner (Sari & Yuliani, 2020). The developed playing cards will involve elaborative thinking, such as mnemonics and concept maps. These cards possess the characteristics of visual, graphic, and verbal media, which are considered the most effective and principal media in educational communication (Yuniastuti et al., 2021). Therefore, this study aims to analyze the need for learning media in the form of educational playing cards integrated with elaborative thinking in chemistry subjects, specifically hydrocarbons.

METHODS

Types and Design of Research

This research employed an exploratory survey method with a qualitative approach. No intervention was provided to any of the participants. This study focused on gathering information from chemistry teachers regarding the need for learning media for hydrocarbon chemistry in the form of educational cards that involve elaborative thinking. Therefore, this study describes the development of educational game cards and the advantages and disadvantages of educational game cards in chemistry learning in high school, as recognized by high school teachers.

Participants and Research Content

The participants in this study consisted of five teachers with experience using chemistry learning media. The participants were selected from diverse teaching backgrounds and teaching locations. They were selected using a convenience sampling technique. Three public high school teachers and two private high

school teachers in Yogyakarta participated in this study.

This study explored chemistry teachers' experiences in teaching using educational card games. This research focused on the strengths and weaknesses of using card games as a learning medium for chemistry, specifically for hydrocarbons in grade 11. The application of elaborative thinking to create the card games differentiates the educational card games developed from existing ones.

Data Analysis Instruments and Techniques

Data were collected through a semi-structured questionnaire comprising 16 items. The questions given through the semi-open questionnaire covered 4 aspects, namely understanding, application, obstacles, and responses related to the development of chemistry learning media in the form of educational game cards for grade 11 hydrocarbon material. The results of filling out the questionnaire will later be analyzed using descriptive statistical analysis. The grid for the needs analysis questionnaire is as in Table 1.

Table 1. Grid of the questionnaire instrument for analyzing the needs of learning media for chemistry on hydrocarbon material

No.	Aspect	Indicators	Number of items	Item Numbers
1.	Understanding	Merdeka Curriculum in Schools	1	4
		Elaborative thinking	2	10, 11
2.	Implementation	Merdeka Curriculum in Schools	3	1, 2, 3
		Instructional Media	2	5, 6
		Educational game cards in learning	2	7, 8, 9
3.	Constraint	Hydrocarbon learning in phase F of grade 11	2	12, 13,
4.	Response	Development of educational game cards	3	14, 15,16

Data Analysis

The collected data were analyzed using descriptive statistical analysis. Descriptive statistical analysis is a statistical analysis used to describe the collected data as it is, without the intention of drawing general conclusions or generalizations. The analytical technique used is presenting the data in tabular form or using frequency distributions. The results of this analysis will reveal the trends in the research findings.

RESULT AND DISCUSSION

The development of chemistry learning media for hydrocarbons is intended to improve the quality of learning, facilitate student understanding, and add educational card-based learning media. A needs analysis is a preliminary step in developing the media. The results of the needs analysis questionnaire are presented in Table 2.

Table 2. Results of the questionnaire on the analysis of the needs for learning media for chemistry on hydrocarbon material related to the implementation of the curriculum in schools

No.	Questions	Respondent Answer
1.	Does the school where you teach implement the Merdeka curriculum?	**100% of teachers answered yes.**
2.	If yes, how is the Merdeka curriculum implemented in schools?	40% of teachers responded that the Merdeka curriculum had been implemented in grade 10. 20% of teachers reported that the Merdeka curriculum had been implemented in grade 10 and that Teaching Modules were used as a learning tool. 40% of teachers reported that the Merdeka curriculum had been implemented in grade 10, that Teaching Modules were used as a learning tool, and that subjects were grouped into Mathematics and Natural Sciences, and Social Sciences.

No.	Questions	Respondent Answer
3.	If not, please state the reasons why the school has not implemented the Merdeka curriculum?	There is no answer because all the schools surveyed have implemented the Merdeka curriculum.
4.	In your opinion, what are the minimum learning outcomes for chemistry for grade XI students?	40% of teachers stated that the minimum chemistry achievement for eleventh-grade chemistry students is the complete understanding of the concepts covered in Phase F. 20% of teachers stated that the minimum chemistry achievement for eleventh-grade chemistry students is the complete understanding of the concepts covered in Phase F, excluding the concept of solutions. 20% of teachers stated that the minimum chemistry achievement for eleventh-grade chemistry students is the complete understanding of the concepts covered in Phase F, excluding the properties, structure, and interactions of particles in compounds. 20% of teachers stated that the minimum chemistry achievement for eleventh-grade chemistry students is chemical calculations, the properties, structure, and interactions of particles in compounds, and organic chemistry, including its applications, with the caveat that organic chemistry focuses more on hydrocarbons.

Based on Table 2 and questions 1-3, all participants have implemented the Merdeka curriculum in their schools, with varying degrees of implementation. Question 4 addresses the minimum learning outcomes in chemistry for 11th-grade students. This needs to be reviewed to enable researchers to determine the material limits in developing learning media. Because the material of this study was hydrocarbons, the researchers focused on participant responses related to hydrocarbons. All participants stated that the minimum achievement for 11th-grade students in hydrocarbons is the ability to understand organic chemistry and its applications. 80% of participants added that students also need to understand the properties, structure, and interactions of particles in forming a compound. 20% of participants also added that the organic chemistry taught focuses more on hydrocarbons.

Table 3. Results of the questionnaire on the analysis of the needs for learning media for chemistry on hydrocarbon material related to teaching experience using learning media

No.	Questions	Respondent Answer
5.	What learning media have you used in learning?	Learning media used by teachers include Student Worksheet, Learning Videos, Practicals, PowerPoint, Cards, Books, Interactive learning websites, e-modules, MolView, PhET, and Molymod.
6.	In your opinion, how does the learning process using learning media in the classroom compare to the learning process without using learning media?	All teachers responded positively. The use of learning media increased student enthusiasm, making classes more active and engaging. Furthermore, the use of learning media was deemed to facilitate learning when it aligned with students' learning styles.
7.	Have you ever used educational game cards in the learning process?	60% of teachers answered yes. 40% of teachers answered no.
8.	If yes, what was your experience when using educational game cards in the learning process?	According to teachers who have experience in using educational game cards in the learning process, it will make students active and easier to understand the material, but the learning atmosphere becomes less conducive, and

No.	Questions	Respondent Answer
		sometimes students focus more on the fun than the material.
9.	In your opinion, are educational game cards capable of supporting the learning outcomes in the Merdeka curriculum?	80% of teachers answered yes. 20% of teachers did not answer.

Table 3, questions 5 and 6, explore participants' experiences using learning media. Based on the data obtained, the media used by participants included Student Worksheets, learning videos, practical exercises, PowerPoint, cards, books, interactive learning websites, e-modules, Molview, PhET, and Molymod. Participants reported that the use of learning media in the classroom increased student enthusiasm, making classes more active and engaging. Furthermore, the use of learning media was considered to facilitate learning when the media matched students' learning styles. This aligns with previous research indicating that learning media can be an alternative for improving child development and learning quality (Putri et al., 2024).

In questions 7-9, the researchers narrowed down the learning media to educational game cards. Based on the data obtained, 60% of participants reported using educational game cards during the learning process. Participants' experiences using educational card games in the learning process made students more active and easier to understand the material. However, the learning environment became less conducive, and at times, students focused more on enjoyment than on the material. Eighty percent of participants reported that educational cards supported learning outcomes in the independent curriculum. Previous research also suggests that using card games can increase student motivation. This is because fun and challenging activities can improve students' intrinsic motivation (Supriyatno & Wardani, 2021). Furthermore, other research has shown that card games create a competitive yet supportive learning environment, thus motivating students to actively participate in learning activities (Putra & Fadillah, 2020).

Table 4. Results of the questionnaire on the analysis of the needs for learning media for chemistry on hydrocarbon material related to elaborative thinking

No.	Questions	Respondent Answer
10.	Do you know the term "elaborative thinking"?	100% of respondents answered yes.
11.	If yes, what do you think is meant by "elaborative thinking"?	40% of teachers responded that they use a creative thinking system that connects ideas, concepts, and experiences to create meaning. 20% of teachers reported learning that involves coding, such as images, shapes, and explanations. 20% of teachers responded with a creative thinking system that connects ideas, concepts, and experiences to create meaning, learning that involves coding in the form of images, shapes, and explanations. 20% of teachers responded with a creative thinking system that connects ideas, concepts, and experiences to create meaning; this learning involves coding in the form of images, shapes, and explanations, as well as mnemonics.

Questions 10-11 discuss elaborative thinking. All participants were familiar with the term elaborative thinking. According to participants, elaborative thinking is a creative thinking system that connects ideas, concepts, and experiences to create meaning. This process includes learning that involves coding in the form of images, shapes, and explanations, such

as mind maps or concept maps, and knowing that requires coding, such as mnemonics. This question is necessary for the initial analysis of the development of learning media because the cards to be developed are based on elaborative thinking. In addition, the obstacles participants faced in teaching hydrocarbon materials to grade XI and the solutions they implemented to overcome these obstacles were discussed. This is necessary to obtain references, enabling the developed media to serve as an alternative to address the challenges encountered.

Table 5. Results of the questionnaire on the analysis of the needs for learning media for the chemistry material on hydrocarbons, related to obstacles during hydrocarbon learning

No.	Questions	Respondent Answer
12.	What obstacles did you encounter in teaching hydrocarbon materials to class XI?	Participants' responses included difficulties conditioning students to focus during instruction, low student interest and motivation in learning chemistry, limited learning media, and difficulty understanding the material.
13.	What solution do you apply when you experience the problem in point number 12?	Participants' responses included developing simple, engaging learning materials, implementing group learning, and employing more engaging learning methods, such as Team Games Tournament.

Challenges experienced by participants in teaching hydrocarbons included difficulty conditioning students to focus, low interest and motivation in chemistry, limited learning media, and difficulty understanding the material. The solutions participants chose to address these challenges included creating simple learning media, using engaging learning media, conducting group learning, and employing engaging learning methods such as Team Games Tournament (TGT).

These solutions also align with previous research findings. Research by Andiastutik and Luthfi (2017), who developed the Diamond Chemistry Adventure game for hydrocarbons, demonstrated improved student learning outcomes following its implementation. Selecting the right learning media can create a more lively and enjoyable learning environment, promote student proactivity, and enhance teacher performance (Kadaruddin, 2016).

Table 6. Results of the questionnaire on the analysis of learning media needs in chemistry for hydrocarbon materials, related to the educational game cards developed.

No.	Questions	Respondent Answer
14.	What would you think if an educational game card were developed for the hydrocarbon learning process in grade XI?	All participants responded positively to the development of educational game cards for hydrocarbon materials, as they added variety to learning, were highly innovative in increasing enthusiasm for learning, especially during daytime learning, and served as an alternative learning medium.
15.	If educational game cards are developed that employ advanced coding, such as concept maps and mnemonics, will they improve students' learning and make it easier for them to learn hydrocarbons?	100% of respondents answered yes
16.	Do you have any suggestions for developing educational game cards as a learning medium for students, particularly for hydrocarbon materials?	Participants suggested creating cards that are relaxed and simple. They should comprehensively cover hydrocarbons, specifically for grade 11, and incorporate phenomena to broaden students' knowledge. Participants also suggested creating a digital version for greater convenience and ease of use.

All participants responded positively to the development of educational game cards for hydrocarbons. Reasons given included adding variety to learning, being highly innovative for increasing enthusiasm for learning, especially during daytime sessions, and serving as an alternative learning medium. All participants agreed that educational game cards employing advanced coding strategies, such as concept maps and mnemonics, would enhance students' learning and facilitate understanding of hydrocarbons. Learning with mnemonics enhances learning, making it easier to remember over the long term (Firdaus & Hafidah, 2020). Other research supports this statement, showing that mnemonics can improve students' memory, as evidenced by their engagement, interest, and persistence in learning (Heryani et al., 2021). Meanwhile, the use of concept maps in learning can empower students to tackle problems with systematic problem-solving steps (Khasanah, 2019). Research by Simanullang (2022) suggests that implementing concept maps as a learning medium can improve students' cognitive outcomes.

Participants suggested creating simple, relaxed cards. They should comprehensively cover hydrocarbons, specifically for grade 11, and incorporate phenomena to broaden students' knowledge. Participants also recommended creating a digital version for greater convenience and ease of use.

CONCLUSION

The research found that participants responded positively to the development of chemistry learning media for hydrocarbon materials. The press developed is an educational game card that applies elaborative thinking, which is expected to improve the variety and quality of learning. Participants suggested creating a simple, relaxed card. The card was designed comprehensively using a hydrocarbon material, specifically for grade 11, and included phenomena to broaden students' insight. Participants also suggested creating a digital version for more practicality and ease of application. Suggestions for further research include testing the effectiveness of the educational game card by piloting the media in small groups.

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