Innovative STEAM Learning: Creating Engaging Colloid Material Videos for High School Students Using CapCut

Boy Pinandhita[1], Fuldiaratman[1,*], Aulia Sanova[1]
[1]Chemistry Education Study Program, Universitas Jambi, Jambi, Indonesia

Article Info

Article history:

Received Sep 12, 2024
Revised Oct 27, 2024
Accepted Nov 30, 2024
OnlineFirst Dec 12, 2024

Keywords:

CapCut
Colloid
Learning Videos
STEM

ABSTRACT

Purpose of the study: The purpose of this study was to develop STEAM-based learning videos using the CapCut application on Colloid material at the high school level.

Methodology: This study is a development research using the Lee & Owens development model. The research instruments used were interview guidelines and questionnaires. The development products were validated by media experts and material experts, practitioner assessments were carried out by teachers and then tested in small groups. The data analysis techniques used were qualitative data analysis (comments and suggestions) and quantitative data analysis (average score of answers and percentage of questionnaires).

Main Findings: The results of this study were obtained from material experts and media experts with an average score of 4.58 and 4.75 in the Very Eligible category. Furthermore, a practitioner's assessment by chemistry teachers was obtained with an average score of 4.8 (very feasible), and received a very good response from students with a percentage of 93.5%.

Novelty/Originality of this study: This study introduces a novel approach by integrating STEAM principles into the development of learning videos on colloid materials, leveraging the CapCut application to enhance creativity and interactivity in high school education. Unlike traditional teaching methods, this research combines technology-driven video editing with STEAM-based learning to foster critical thinking, collaboration, and practical application of scientific concepts in an engaging multimedia format.

Corresponding Author:
Fuldiaratman,
Chemistry Education Study Program, Universitas Jambi
Jl. Jambi – Muara Bulian No.KM. 15, Mendalo Darat, Kec. Jambi Luar Kota, Kabupaten Muaro Jambi, Jambi, Indonesia
Email: fuldia12@gmail.com

1. INTRODUCTION

In life, education has a very important role, which in education can also distinguish humans from other living things [1]-[3]. Generally, the view of education is said to be an institution in carrying out several functions, first education is used to prepare the nation's generation to play a role which will later be used for the future [4]-[6]. Second, education to transfer knowledge according to the expected role [7]-[9]. Third, education plays a role in transferring the values of unity in maintaining the integrity of society and the state [10],[11]. There are points two and three which mean that education provides meaning not only in providing knowledge but also in providing life values [12]-[14]. Thus, education can be a helper for humans. Education is a series of learning knowledge, skills, and habits from one group of humans to the next through teaching, training, and research methods [15]-[17]. The learning needed is not only in the form of activities to share knowledge or insights but also students are asked to be able to interpret what they learn and be able to connect ideas with everyday life. 21st century skills are needed to improve the quality of education because the quality of education has a very important role in supporting the progress and development of a country[18]-[20].

The skills needed in the 21st century include critical thinking and problem solving skills, creativity and innovation, communication, and collaboration [21], [22]. Therefore, chemistry educators need to develop these skills so that learning objectives can be achieved effectively and efficiently. Permendikbud number 22 of 2016 concerning standards for elementary and secondary education processes related to the implementation of learning in educational units and secondary education to achieve graduation competencies is a response to the revision of the 2013 curriculum by the government to identify 21st century competencies and skills. To clarify the characteristics of today's education when the 2013 curriculum is changed, teachers must develop learning by internalizing the 21st century 4C skills in each basic competency taught [23], [24]. The internalization process such as learning models and materials must also be changed.

The curriculum plays a significant role in implementing the education system. As a guide, the curriculum guides the implementation of the learning process [25], [26]. In the implementation of the 2013 Curriculum, the learning process plays a significant role in improving the quality of education. The 2013 Curriculum has been implemented at the junior high school level, accompanied by various improvements. In fact, the 2013 Curriculum has taken into account 21st century skills through content standards, process standards, and assessment standards [27], [28]. In the 2013 High School Curriculum, there is a Chemistry lesson. Chemistry is part of Natural Science that focuses on the study of the structure, composition, properties, and changes in matter, along with the energy involved in these changes [29], [30]. Colloid material in grade XII of high school is considered a difficult topic and is less popular with students. According to Pratiwi et al [31] Colloid learning generally does not involve mathematical calculations like other topics in chemistry, such as stoichiometry, chemical equilibrium, solution chemistry, and thermochemistry. Colloid material focuses more on memorizing certain concepts, which can make students less interested in chemistry lessons [32], [33].

Students' understanding of colloid material plays a significant role in attracting their attention. This is because understanding colloid material is an important prerequisite for understanding subsequent chemical material. In addition, colloid material has high relevance in everyday life. For example, the application of colloids in the soap industry is very important, because colloids play an effective role in making soap or detergent. Likewise in the food industry, colloids have a crucial role in making products such as soy sauce, milk, mayonnaise, butter, and sauce. In addition, in the health sector, colloids can be used for DNA identification and in the dialysis process. To master chemical concepts more deeply, an accurate understanding of the prerequisite material is needed so that related concepts can be understood correctly. Students often have difficulty understanding chemistry because they have difficulty connecting previously learned concepts with new concepts [34], [35]. Visual representations are needed to describe the properties and systems of colloids in more detail in the context of their chemical characteristics. So that the right learning media is needed, namely effective media to convey learning materials.

Based on an interview conducted with a chemistry teacher at State Senior High School 15 Muaro Jambi, it was found that the school was still implementing the revised 2013 curriculum for grade XII. According to the information obtained, students have difficulty in understanding colloid material, which is one of the challenging topics in chemistry lessons. This difficulty is caused by many students having difficulty memorizing the material. In addition, many students feel that chemistry is a difficult subject, so they are not very interested in participating in the learning process. Based on a preliminary study at State Senior High School 15 Muaro Jambi, it was found that most students had difficulty in understanding colloid material, reaching a difficulty level of around 60%. The learning process at this school uses printed books and Student Worksheets. However, the Student Worksheets used are general, only presenting a summary of the material and limited practice questions. This is in accordance with a preliminary study of students at State Senior High School 15 Muaro Jambi, who wanted learning media in the form of videos with titles, material content, and example questions to facilitate understanding of colloid material. Learning videos are included as additional learning media for students to understand colloid material.

Based on the evaluation of these needs, an interesting and varied learning approach is needed to increase students' interest and understanding in chemistry lessons, especially on the topic of colloids. Colloid material requires a deeper understanding of concepts because it involves a lot of memorization that must be mastered by students. Students also stated that colloid material is a fairly difficult topic. In addition, the current learning process tends to use the lecture method only, so there needs to be variation in the explanation and teaching of this material. Therefore, variation is needed in learning colloid material in order to provide more significant meaning and impression to students. With the aim of helping students to understand and master colloid material, so that the learning process can be stored in the long term and easily remembered when needed.

By considering several conditions, researchers can find optimal and appropriate solutions to overcome the problems faced by students in understanding colloid material. Where these problems require students to understand colloid material. With a tiered chemical concept, which develops from the simplest to the most complex. So in understanding a concept, it is necessary to follow the sequence from the simplest concept to the most complex concept. So, researchers decided to overcome the problems that have been described by creating interesting and fun learning media in chemistry subjects, especially colloid material. The purpose of this development is to stimulate creative thinking skills, increase the spirit of activeness, and motivate and attract students' attention during the learning process.

The use of learning media in the classroom has positive impacts, such as reducing time, increasing student engagement, and strengthening student memory. The development of learning media is adjusted to the challenges faced by teachers and students during the learning process. For example, there is the application of STEAM- based learning videos using the CapCut application. According to Ridwan et al, the use of learning video media as an aid aims to present audio and visual elements that contain concepts, studies, and main points of teaching in the learning process [36]. Through learning videos, students can feel motivated and show interest in understanding the material taught by the teacher. The use of learning videos can not only increase students' knowledge, but also train logical and analytical thinking skills, encourage students' creativity, guide them to learn more effectively, stimulate imagination, and provide a fun learning experience.

According to Nasrah, in the field of education, STEAM is an integrated approach method that combines Science, Technology, Engineering, Arts, and Mathematics subjects as a means of developing students' inquiry, communication, and critical thinking during learning [37]. According to Wandraini et al, Learning with the STEAM approach is a form of learning that focuses on context, where students are invited to interpret the phenomena around them [38]. This STEAM approach aims to develop students' skills, such as problem-solving skills, critical thinking, and collaboration skills. According to Rahayu, the CapCut application is a video editing application on Android/iOS smartphones that is popular among novice editors [27]. In addition, the CapCut application also provides features that are easy to understand and comprehend by many people. According to Aprilliana & Efendi, the benefits of using the CapCut application in the learning process are its ability to develop students' critical thinking skills, create an efficient learning environment, be a source of interesting learning materials, and avoid boredom [39]. Thus, it is hoped that the use of this application can improve students' writing skills.

The gap analysis between previous research conducted by Pahmi & Syafwin, current research can be seen from the focus and innovation in the use of the CapCut application as a learning medium [39]. Previous research tends to be more general, focusing on the use of CapCut to create videos in the context of STEAM learning without delving into specific topics or deeper pedagogical approaches. Meanwhile, current research focuses more on specific materials, namely colloids, and how the CapCut application can be used to create interesting and educational videos that are able to convey complex scientific concepts to high school students. This gap lies in the application of more concentrated technology and the relevance of content that is adjusted to the needs of the higher education curriculum, as well as innovation in delivering material through more dynamic and interactive visuals.

The novelty of this research lies in the development of STEAM-based learning videos that utilize the CapCut application as the main tool in compiling colloid learning materials for grade XII high school students. The integration of the STEAM approach into colloid materials not only provides a new dimension in how content is delivered through interactive and visual elements, but also combines elements of art effectively in the context of science learning, which is rarely applied in traditional learning videos. In addition, the use of CapCut, a video editing application commonly used in non- educational contexts, shows innovation in utilizing easily accessible technology to improve the quality and appeal of learning materials. The urgency of this research is based on the need for innovation in learning methods that can increase student engagement and understanding in complex materials, such as colloids. In this digital era, the integration of technology in education, especially through STEAM-based video media, is becoming increasingly important to stimulate students' critical thinking skills, creativity, and conceptual understanding. However, there are still shortcomings in the development of learning media that effectively combine STEAM elements, especially at the high school level. Therefore, the purpose of this study is to develop STEAM-based learning videos using the CapCut application that are not only interesting and interactive, but also relevant and effective in improving students' understanding of colloid material. This study also aims to evaluate the feasibility and effectiveness of the developed learning media through validation by experts, practitioner assessments, and student responses, to ensure that this media can be widely applied in educational contexts.

2. RESEARCH METHOD

The research was conducted using the Lee & Owens development model with five stages adapted from the ADDIE framework, namely Analysis, Design, Develop, Implementation, and Evaluation [40]-[42]. The first stage, Analysis, aims to identify the needs and problems that exist in learning [43]. In the Design stage, solutions are designed that are in accordance with these needs, including determining the learning objectives and strategies to be used [44]. The Development stage involves the creation of planned learning materials or products.

Implementation is carried out by applying the materials or products in a real learning context [45]. Finally, the Evaluation stage serves to assess the effectiveness and impact of the products that have been implemented, in order to make improvements or revisions that are needed to improve the quality of learning.

The learning resources developed are learning resources in the form of learning videos. At this stage, the researcher used the CapCut and Animaker applications. The learning resource products that will be produced are in the form of STEAM-based learning videos for colloidal material, The resulting learning videos are in the form of links that can be accessed via smartphones or laptops/computers, The material in the STEAM-based learning videos is presented through a combination of text, images, and videos, STEAM-based learning videos are designed using the CapCut application and assisted by Google forms in answering questions in the learning videos.

In the implementation stage, a trial trial of a group consisting of 11 students was conducted. The types of data used were qualitative data in the form of comments and suggestions from media experts, material experts, and teachers. Quantitative data in the form of scores from questionnaires given to media experts, material experts, teacher assessments, and responses from students. The data analysis of this study was conducted using qualitative and quantitative approaches to evaluate the feasibility and effectiveness of the developed STEAM-based learning videos. Qualitative data were obtained through comments and suggestions from experts who provided input on the quality of content, presentation, and technical aspects of the learning videos [46]. Meanwhile, quantitative data were analyzed based on the average score given by experts and practitioners through a questionnaire designed to measure aspects of the feasibility of materials and media [47]. To calculate the needs questionnaire instrument distributed to 11 students of class XII science at State Senior High School 15 Muaro Jambi. Therefore, the following rating scale formula is used.

$$\%Score = \frac{Number\ of\ scores\ obtained}{The\ maximum\ total\ of\ all\ scores}\ x\ 100\% \qquad \ldots (1)$$

To calculate the validation instrument of media experts, material experts, and teacher assessments based on the average answer score using the formula:

$$Average\ Score = \frac{Total\ Score}{Number\ of\ Grains}\ \text{x}\ 100\% \qquad \ldots (2)$$

This study uses a Likert scale, namely a five-point scale. Here are the criteria for the five-point scale. With reference to the criteria as in table 1 below.

Table 1. Instrument Assessment Criteria using the Likert Scale

Average Answer Score	Validation Criteria
>4.2 – 5.0	Very Eligible
>3.4 – 4.2	Eligible
>2.6 – 3.4	Less Eligible
>1.8 – 2.6	Not Eligible
1.0 – 1.8	Very Uneligible

And to calculate the percentage of student responses, the formula used is:

$$\text{K} = \frac{F}{N\ x\ I\ x\ R}\ \text{x}\ 100\% \qquad \ldots (3)$$

The results of student responses can be categorized into criteria as shown in table 2 below.

Table 2. Assessment Criteria for Percentage of Student Responses

Value Scale (%)	Criteria
81 – 100	Very Eligible
61 – 80	Eligible
41 – 60	Less Eligible
21 – 40	Not Eligible
0 – 20	Very Uneligible

The overall research procedure begins with an in-depth analysis of the needs and problems that exist in the learning context that is to be improved. After that, a design stage is carried out to formulate appropriate solutions, including setting learning objectives and strategies to be used. In the next stage, learning materials or products are developed according to the plan that has been prepared. The finished product is then applied in a real learning context to test the effectiveness and suitability of the product to user needs. Finally, the evaluation stage is carried out to assess the impact and effectiveness of the implemented product, as well as provide feedback for further improvement if necessary. The development procedure in this research can be seen in the following figure 1.

Figure 1. Research Procedure

3. RESULTS AND DICUSSION

In this study, the data collected were data from questionnaires and data from questionnaires on students' religious moderation attitudes. Furthermore, to achieve the research objectives, the data obtained were analyzed using simple regression analysis techniques. The data collected in this study also came from the value of the questionnaire filling assignment regarding the PBL model as the independent variable (X) and the questionnaire for students' religious moderation attitudes as the dependent variable (Y). Data on the learning outcomes of the subject of aqidah akhlak and data from the student behavior questionnaire.

The results of this study were obtained through five stages of the development model, namely:

1. ***Analysis Stage***

In the analysis stage, the researcher conducted the needs analysis stage, student characteristics analysis, learning objectives analysis, material analysis, and educational technology analysis. The analysis stage was carried out through interviews with one of the chemistry teachers of class XII and the distribution of questionnaires to students in class XII science State Senior High School 15 Muaro Jambi.

Based on initial observations conducted at State Senior High School 15 Muaro Jambi, it can be concluded that students understand colloid material well enough. However, students are less able to understand colloid material as a whole. Therefore, students need teaching materials that can help students understand colloid material further.

The results of the student needs questionnaire can be seen in the following table:

Table 1. Results of The Student Needs Questionnaire

o.	Questions	Results (%)	Description
.	Is colloid material a good material?	63.6%	Most students stated that colloid material is good material.
.	Have you ever used media and teaching materials to explain the material?	54.5%	Almost half of students have used learning media quite well.
.	Do students need additional teaching materials other than printed books?	100%	Based on interviews and questionnaires, students need additional learning materials other than printed books.
.	Can students use smartphones as learning tools?	100%	Students can use smartphones as learning aids.
.	Proposed solutions (additional teaching materials in the form of learning videos)	-	Providing learning videos as an additional solution.

Based on the results of the student needs questionnaire filled out by 11 students, 63.6% of students stated that colloid material is good material. The percentage obtained from students regarding having used media and teaching materials in explaining the material reached 54.5%, from which the presentation students stated that they had used learning media well enough. Based on the results of the interviews and questionnaires, it can be concluded that students at State Senior High School 15 Muaro Jambi need additional teaching materials to accompany printed books and can utilize smartphones as learning tools [48], [49]. Therefore, the solution that can be provided is to add teaching materials such as learning videos.

Analysis of student characteristics needs to be carried out with reference to national education standards. This standard emphasizes that student development must pay attention to several aspects, such as the needs of talents, interests, needs and interests of students. In carrying out teaching and learning activities in schools, the approach must be adjusted to the characteristics.

Analysis of student characteristics was carried out through interview questionnaires to class XII chemistry teachers and also through distributing questionnaires to students. Information obtained from interviews and distributing questionnaires to class XII science students of State Senior High School 15 Muaro Jambi showed that teachers use a contextual approach in learning related to everyday life. However, teachers tend to provide explanations verbally without using other learning methods or strategies.

Therefore, researchers provide a solution by creating teaching materials that are more interesting for students using STEAM-based learning video media. By using this media, researchers can help students gain a better understanding of the subject so that they can maintain it in the long term. With teaching materials in the form of STEAM- based learning video media, researchers hope that students in learning will not only memorize but understand the material taught, especially colloid material. Through video media, students can be given an overview of colloid material.

In making this teaching material product, it has a target so that it can be used by class XII students of State Senior High School 15 Muaro Jambi. From the results of the student characteristics questionnaire, it was found that the percentage that students need learning videos to help the learning process reached 72.7%. For suggestions from students regarding the learning video products needed by students, namely learning videos that contain titles, core competencies and basic competencies, learning indicators, provide brief but clear explanations and are also equipped with examples of images or animations that can be easily understood. Based on this, learning videos need to be developed as a solution to overcome existing problems and it is hoped that these products can help students learn independently.

2. *Design Stage*

In the design stage, the learning video is planned and structured to meet the needs identified in the analysis stage. This involves several key steps: determining the project team, setting a research schedule, specifying media requirements, structuring the material, creating flowcharts and storyboards, and conducting evaluations with the supervising lecturer. The design of the learning video is guided by cognitive learning theory and constructivist learning theory, ensuring that the video is both informative and engaging for students [50], [51].

- Cognitive learning theory focuses on how students process and understand information, ensuring the video content is designed to align with the mental processes of acquiring and organizing knowledge.
- Constructivist learning theory emphasizes learning as an active process where students construct new knowledge based on their experiences. This theory encourages interactive and learner-centered design elements.

In the Design stage, several key steps are followed to ensure the development of an effective learning video. The first step is team determination, where the project team is selected based on their expertise and roles in the project. Next, a research schedule is established to set clear timelines and deadlines for each phase of the design process. Media specifications are then outlined to define the technical requirements for the video, including format, resolution, and other relevant aspects. Following that, the material structure is planned, which involves organizing the content in a logical sequence that aligns with the learning objectives. This is followed by the creation of flowcharts and storyboards to visually map out the sequence of scenes and key elements in the video. Finally, an evaluation with the supervising lecturer is conducted to review the design and ensure that it meets the educational goals and expectations before moving forward with the development stage. The entire design process is guided by cognitive learning theory and constructivist learning theory, ensuring that the video content is both cognitively stimulating and actively engaging for students.

Here is a diagram for the Design Stage that illustrates the process of planning an educat ional video:

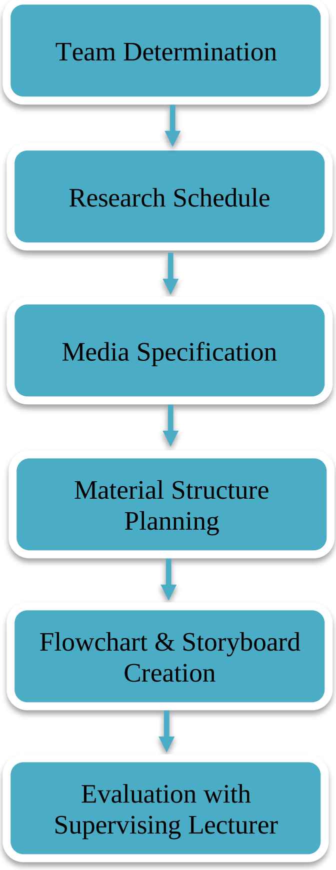

Figure 2. Design Stage

3. ***Development Stage***

At the development stage, the product will be made according to the storyboard that has been designed and integrated into the CapCut and Animaker applications. At this stage, validation by media experts and material experts is also carried out twice. The results of validation by experts can be seen in the following table:

Table 3. Validation Results by Media Experts and Material Experts

Aspect	Total Score	ean	Category	Interval
Media Expert Validation	76	.75	Worthy	> 3.4 – 4.2
Material Expert Validation	55	.58	Very Worthy	> 4.2 – 5.0

Table 3 presents the validation results conducted by media experts and material experts on the developed product. Validation from media experts obtained a total score of 76 with an average value of 4.75, which is included in the worthy category with an interval of > 3.4 - 4.2. Meanwhile, validation from material experts obtained a total score of 55 with an average value of 4.58, which is included in the very worthy category with an interval of > 4.2 - 5.0. These results indicate that the validated product is considered to have good quality, both in terms of media and material, with a score that is in the very worthy category. This happened because the product developed had met high quality standards in terms of both media design and material substance, thus obtaining a positive assessment from experts with a score indicating compliance with the established eligibility criteria [52].

4. ***Implementation Stage***

In the implementation stage, before being tested on students, an assessment was first carried out by the teacher. The results of the teacher's assessment and Student Response Assessment (Small Group Trial) can be seen in the following table:

Table 4. The results of the teacher's assessment and Student Response Assessment (Small Group Trial)

Assessment Aspect	otal	Average	Interval	Category

	Score				
Teacher Assessment	2	.8	4	> 4.2 – 5.0	Very Good
Student Response Assessment (Small Group Trial)			-	81% - 100%	Very Good

Based on the results of the teacher assessment instrument, a total score of 72 was obtained with an average of 4.8 which is in the interval > 4.2-5.0 in the Very Eligible criteria. The assessment instrument in the form of a questionnaire containing responses and comments regarding the STEAM-based learning media developed, shows that the media is interesting and easily accessible in general. This media can be used independently by students via smartphones or computers and is expected to increase student interest in learning. Educators also gave a positive response to the media developed by the researcher, which can later be used as an independent learning tool, especially for colloid material. Based on the positive response from the teacher, the researcher can proceed to the next stage, namely the implementation stage or direct application of the media to students. After the assessment is carried out by the teacher, the next step is to conduct a small group trial with 10 test subjects. Based on the results of the student response instrument, the percentage of overall respondents' answers was 93.5%, which was in the range of 81-100% with the Very Good criteria. This happened because the STEAM-based learning media that was developed was proven to be interesting, easy to access, and supported independent learning, so that it received a very good response from teachers and students in terms of usability and effectiveness [53].

5. *Evaluation Stage*

This evaluation stage is a stage to review whether the product developed is in accordance with initial expectations or not. Evaluation in this development research is formative, namely analysis is carried out at each stage, both at the design stage, development stage, and implementation stage. This evaluation stage is carried out as a need for product revision so that it is suitable for use.

Based on the student respondent questionnaire regarding STEAM-based learning video products, students feel interested when learning so that it makes it easier for students to understand colloid material. Evaluation at the implementation stage is carried out based on teacher assessments and student response questionnaires [54], [55]. Based on the assessment of the chemistry teacher of class XII science State Senior High School 15 Muaro Jambi, the results obtained were that the learning video product that had been developed was very suitable for testing. Then, a trial was carried out on a small group consisting of 10 students or respondents in class XII science State Senior High School 15 Muaro Jambi. After students accessed the learning video, students filled out an instrument in the form of a student response questionnaire to the learning video. The results obtained were that students gave a very good response, namely 93% to the learning video that had been evaluated, called the final product.

This study provides novelty in an interactive and technology-based learning approach. Through the integration of digital creativity, this study combines aspects of art, science, and technology to create engaging educational content for high school students. This approach not only enhances students' understanding of the concept of colloids but also trains 21st-century skills such as critical thinking, collaboration, and digital literacy. In addition, the use of CapCut as an easily accessible video editing tool provides a practical solution for teachers to present more engaging and relevant materials in the digital era [56]-[58].

The implications of this study are very significant for the development of learning practices at the high school level, especially in chemistry subjects. The use of STEAM- based learning videos developed through the CapCut application not only enriches more interactive and interesting teaching methods, but also shows that easily accessible technology can be adapted effectively for educational purposes [59]. The validation results showing high feasibility and positive responses from students indicate that this media can increase learning motivation, understanding of the material, and critical and creative thinking skills. Further implications are the potential for adapting this development model to various other subjects, expanding the use of the STEAM approach in a wider educational environment. In addition, these findings can also be the basis for the development of educational policies that support the integration of technology into the curriculum, encourage broader pedagogical innovation and have a positive impact on the quality of learning in Indonesia.

This study has several limitations that need to be considered. First, the trial of the developed STEAM-based learning videos was only carried out in small groups, so the results may not represent a wider student population. Second, this study only focuses on one subject matter, namely colloids, so the generalization of the results to other materials or subjects is still limited. In addition, the use of the CapCut application as the main tool in developing learning videos also has limitations in terms of features and functionality compared to more professional video editing software. Recommendations for future research are to expand the trial to a larger and more diverse group, and explore similar or more sophisticated applications to develop STEAM-based learning videos on other subject matter. Further research can also examine the long-term impact of using this learning media on improving student learning outcomes, as well as the adaptation of this approach in various other educational contexts.

4. CONCLUSION

This study concludes that the development of STEAM-based learning video media using the CapCut application on colloid material for class XII senior high school students was successfully carried out through a systematic process. This process included material and learning objective selection, STEAM-based learning design, content development, technology integration, testing and evaluation, and publication. The developed media was deemed highly feasible based on theoretical evaluations by media and material expert validators, teacher assessments, and practical evaluations from student responses, all of which indicated its effectiveness and applicability in the classroom.

The findings suggest that integrating STEAM-based learning video media using tools like CapCut in teaching colloid material significantly enhances its feasibility and effectiveness. Schools and educators are encouraged to adopt and further develop similar media to make learning engaging and relevant for students. By combining STEAM principles with accessible technology, such as CapCut, teachers can provide interactive and innovative learning experiences, particularly in science subjects. Future research should focus on expanding the application of this approach to other topics and grade levels to assess its broader applicability and effectiveness. Additionally, further studies could explore the impact of this media on students' critical thinking, creativity, and problem-solving skills. Investigating ways to refine and scale up technology-driven teaching materials can support the ongoing integration of digital tools into education, fostering students' technological proficiency and preparing them for the demands of the modern, interdisciplinary workforce.

ACKNOWLEDGEMENTS

The researcher would like to express his gratitude to all parties involved so that this research can be completed properly.

REFERENCES

[1] E. Khaidir and F. M. Suud, "Islamic education in forming students' characters at as-shofa islamic high school, Pekanbaru Riau," *International Journal of Islamic Educational Psychology*, vol. 1, no. 1, pp. 50-63, 2020. doi: 10.18196/ijiep.1105.

[2] I. B. A. A. Wiguna and N. S. Sunariyadi, "The role of parents in developing early childhood character education," *WIDYALAYA: Jurnal Ilmu Pendidikan*, vol. 1, no. 3, pp. 328-341, 2021.

[3] A. Afrida, F. Nwanya, and F. M. Omar, "Think Pair Share Type Cooperative Learning to Improve Chemistry Learning Outcomes on Atomic Structure Material," *Indonesian Journal of Education Research (IJoER)*, vol. 5, no. 3, pp. 92-99, 2024. doi: 10.37251/ijoer.v5i3.991.

[4] J. Shaturaev, "2045: Path to nation's golden age (Indonesia Policies and Management of Education)," *Science and Education*, vol. 2, no. 12, pp. 866-875, 2021.

[5] D. Himmawan, S. Sauri, and A. Khoirurrahman, "The role of educators in transforming education towards indonesia's golden generation," *Manajia: Journal of Education and Management*, vol. 1, no. 1, pp. 20-30, 2023. doi: 10.58355/manajia.v1i1.3.

[6] L. Amiqoh, S. Osman, and M. Yilmaz, "Comparison of motivation and geography learning outcomes of students in islamic boarding schools and outside," *Indonesian Journal of Education Research (IJoER)*, vol. 5, no. 1, pp. 19-27, 2024. doi: 10.37251/ijoer.v5i1.877.

[7] W. F. Rahman, "The role of civic education teachers in preventing juvenile delinquency in schools," *Didactica: Jurnal Kajian Pendidikan Dan Pembelajaran*, vol. 2, no. 1, pp. 17-24, 2022. doi: 10.56393/didactica.v2i1.1139.

[8] D. Stock and S. T. Liechty, "Tutors for transfer? Reconsidering the role of transfer in writing tutor education," *The Writing Center Journal*, vol. 40, no. 1, pp. 85-102, 2022.

[9] R. Juwita and P. Mateha, "Moving toward a healthy eating pattern: Exploring the interrelationship of knowledge, attitudes, and behavior in young adults," *Indonesian Journal of Education Research (IJoER)*, vol. 5, no. 2, pp. 69-75, 2024. doi: 10.37251/ijoer.v5i2.936.

[10] P. Setyosari and W. Kamdi, "Exploration of moral integrity education and superior cadre leadership at madrasah boarding school Indonesia," *International Journal of Instruction*, vol. 14, no. 4, pp. 753-774, 2021. doi: .10.29333/iji.2021.14443a

[11] F. Ramdani, M. N. Ulwan, L. A. Arief, M. F. Al-Farisi, R. Rochiman, A. Kogoya, and Y. F. Furnamasari, "The importance of pancasila education in building national identity awareness and patriotism among students," *Jurnal Nakula: Pusat Ilmu Pendidikan, Bahasa dan Ilmu Sosial*, vol. 2, no. 3, pp. 282-296, 2024. doi: 10.61132/nakula.v2i3.858.

[12] C. Wamsler, 'Education for sustainability: Fostering a more conscious society and transformation towards sustainability," *International Journal of Sustainability in Higher Education*, vol. 21, no. 1, pp. 112-130, 2020. doi: 10.1108/IJSHE-04-2019-0152.

[13] R. Rudiawan and A. P. Asmaroini, "The role of pancasila and citizenship education teachers in strengthening the profile of pancasila students in schools," *Edupedia*, vol. 6, no. 1, pp. 55-63, 2022. doi: 10.24269/ed.v6i1.1332.

[14] A. Abbas, "Utilization of the Library as a Learning Resource for Students of the Department of Islamic Religious Education," *Jurnal Pendidikan Agama Islam Indonesia (JPAII)*, vol. 4, no. 1, pp. 9-12, 2023. doi: 10.37251/jpaii.v4i1.646.

[15] S. Sebayang and T. Rajagukguk, "The influence of education, training, and work motivation on teacher performance in private elementary and junior high schools Budi Murni 3 Medan," *Jurnal Ilmu Manajemen METHONOMIX*, vol. 2, no. 2, pp. 105-114, 2019.

[16] R. Asyhar, "Strategies for consolidating character education through project-based learning in MIPA subjects," *Jurnal Review Pendidikan Dan Pengajaran (JRPP)*, vol. 6, no. 4, pp. 3228-3237, 2023. doi: 10.31004/jrpp.v6i4.22554.

[17] K. K. Ilyas, S. Beglerovic, and T. B. Atique, "Use of learning facilities on students' islamic religious education learning achievement in high school," *Jurnal Pendidikan Agama Islam Indonesia (JPAII)*, vol. 4, no. 4, pp. 89-94, 2023. doi: 10.37251/jpaii.v4i4.783.

[18] R. H. Mardhiyah, S. N. F. Aldriani, F. Chitta, and M. R. Zulfikar, "The importance of 21st century learning skills for human resource development," *Lectura: Jurnal Pendidikan*, vol. 12, no. 1, pp. 29-40, 2021. doi: 10.31849/lectura.v12i1.5813

[19] C. I. S. Puspa, D. N. O. Rahayu, and M. Parhan, "21st century education transformation in realizing superior human resources towards Indonesia Gold 2045," *Jurnal Basicedu*, vol. 7, no. 5, pp. 3309-3321, 2023. doi: 10.31004/basicedu.v7i5.5030.

[20] A. Y. M. Rismawan and A. I. Musaddad, "Description of student communication and attention patterns in islamic religious education learning," *Jurnal Pendidikan Agama Islam Indonesia (JPAII)*, vol. 4, no. 3, pp. 54-57, 2023. doi: 10.37251/jpaii.v4i3.717.

[21] A. A. Fikri, A. Nurona, L. Saadah, L. E. Nailufa, and V. Ismah, "Teacher skills in guiding discussions in 21st century learning," *Journal of Education and Teaching*, vol. 2, no. 1, pp. 1-7, 2021. doi: doi.org/10.35961/tanjak.v2i1.119.

[22] K. Ware and K. E. Bambut, "Literature review: Developing 21st century skills for students in chemistry learning," *Jurnal Biogenerasi*, vol. 9, no. 1, pp. 982-991, 2024. doi: 10.30605/biogenerasi.v9i1.3654.

[23] M. S. Alnashr and L. Nuraini, "Strengthening computational thinking skills of madrasah ibtidaiyah teachers in thematic learning based on local wisdom," *Kifah: Jurnal Pengabdian Masyarakat*, vol. 1, no. 1, pp. 1-18, 2022. doi: 10.35878/kifah.v1i1.392.

[24] N. Maidah and N. Jannah, "Perception of akidah akhlak teachers on 21st century skills in madrasah aliyah," *Risalah, Jurnal Pendidikan dan Studi Islam*, vol. 10, no. 2, pp. 742-759, 2024. doi: 10.31943/jurnal_risalah.v10i2.1397

[25] H. A. Lastya and S. Wahyuni, "Implementation of the 2018 revised 2013 curriculum in vocational high schools in Aceh Province," *Circuit: Jurnal Ilmiah Pendidikan Teknik Elektro*, vol. 6, no. 1, pp. 87-96, 2022. doi: 10.22373/crc.v6i1.11192.

[26] D. N. Laili and I. Fardhani, "Teacher needs analysis for the development of integrated practical modules as a guide for IPA practicum," *Proceedings of Life and Applied Sciences*, vol. 1, 2023.

[27] I. D. Rahayu, "Application of capcut to improve speaking skills in english," *Jurnal Petisi (Pendidikan Teknologi Informasi)*, vol. 3, no. 2, pp. 44-50, 2022.

[28] T. R. H. Afif and M. F. R. Siregar, "Curriculum development analysis of SKL, CP, TP, and ATP suitability in the independent curriculum for high schools," *Jurnal Penelitian Pendidikan Indonesia (JPPI)*, vol. 1, no. 4, pp. 475-485, 2024.

[29] Y. Amakraw and N. Kartika, "Implementation Strategies for Natural Science Practical Learning for Elementary and Secondary Students," *SEARCH: Science Education Research Journal*, vol. 1, no. 1, pp. 34-41, 2022.

[30] V. Z. Putri, S. A. Rahmadea, A. S. Az-zahra, L. Kristiani, L. H. I. Fahzrial, and Y. Ratnasari, "Analysis of Conceptual Understanding of Phase Change Through Ice Cream Making Practicum," *Jurnal BELAINDIKA (Pembelajaran dan Inovasi Pendidikan)*, vol. 6, no. 2, pp. 145-155, 2024. doi: 10.52005/belaindika.v6i2.225.

[31] T. Pratiwi, D. Kurniasih, and R. A. Kurniawan, "Development of Inquiry-Based colloid practical guides for grade XI science students at SMA Negeri 1 Sungai Raya," *Ar-Razi Jurnal Ilmiah*, vol. 6, no. 1, 2018. doi: 10.29406/arz.v6i1.985.

[32] N. M. Rosa and F. P. Nursa'adah, "Descriptive analysis of learning difficulties in basic chemistry courses," *Formatif: Jurnal Ilmiah Pendidikan MIPA*, vol. 9, no. 4, 2019. doi: 10.30998/formatif.v9i4.3665

[33] S. N. Fitri, T. Junanto, R. Sasri, H. Hairida, and R. Rasmawan, "Creative thinking skills in colloidal material of 11th grade science students at SMAN 1 Mempawah Hilir," *Hydrogen: Jurnal Kependidikan Kimia*, vol. 12, no. 1, pp. 56-67, 2024. doi: 10.33394/hjkk.v12i1.10367

[34] E. W. Kainde and C. Y. Tahya, "The use of reflection journals as guidance for students in finding meaning in chemistry subjects," *Journal of Educational Chemistry*, vol. 2, no. 2, pp. 49-56, 2020. doi: 10.21580/jec.2020.2.2.6076.

[35] M. P. Sari, A. Andromeda, and A. Hardinata, "Study of learning difficulties among students in understanding periodic properties of elements," *Jurnal Eksakta Pendidikan (JEP)*, vol. 4, no. 1, pp. 18-26, 2020. doi: 10.24036/jep/vol4-iss1/379

[36] R. S. Ridwan, I. Al-Aqsha, and G. Rahmadini, "Utilization of Video-Based learning media in delivering learning content," *Inovasi Kurikulum*, vol. 18, no. 1, pp. 38-53, 2021. doi: 10.17509/jik.v18i1.37653.

[37] N. Nasrah, "Effectiveness of STEAM learning models for elementary students," *JKPD (Jurnal Kajian Pendidikan Dasar)*, vol. 6, no. 1, pp. 1-13, 2021. doi: 10.26618/jkpd.v6i1.4166.

[38] A. Wandraini, A. Wau, E. I. Putri, and R. Fitri, "Implementation of STEAM (Science, Technology, Engineering, Arts, and Mathematics) in biology learning," *Proceedings of the National Biology Seminar*, vol. 2, no. 2, pp. 938-946, 2022.

[39] Pahmi, L. D., & Syafwin, M., "Using the CapCut application as a learning media," *Journal International Inspire Education Technology*, vol. 1, no. 1, pp. 40-51, 2022.

[40] G. Aprilliana and R. Efendi, "The use of the capcut application to improve advertisement text writing skills for grade viii students at SMPN 4 Jampangtengah, Sukabumi Regency," *Triangulasi: Jurnal Pendidikan Kebahasaan, Kesastraan, Dan Pembelajaran*, vol. 2, no. 2, pp. 48-53, 2022. doi: 10.55215/triangulasi.v2i2.6732.
[41] M. A. H. Patwary and H. D. Surjono, "Implementation of E-Learning with Team Builder at Vocational High Schools," *REID (Research and Evaluation in Education)*, vol. 1, no. 1, pp. 25-44, 2015. doi: 10.21831/reid.v1i1.4896
[42] I. R. Mega and R. Handayani, "Developing HOTS-Based english materials for the tenth grade students in Bangka Selatan," *Curricula: Journal of Teaching and Learning*, vol. 6, no. 2, pp. 88-98, 2021. doi: 10.22216/curricula.v6i2.223
[43] Ramly, S. N. F., Ahmad, N. J., & Said, H. M., "The development of innovation and chemical entrepreneurship module for pre-university students: An analysis phase of ADDIE model," *Journal of Natural Science and Integration*, vol. 5, no. 1, pp. 96-116, 2022. doi: 10.24014/jnsi.v5i1.16751.
[44] Tu, J. C., Zhang, X., & Zhang, X. Y., "Basic courses of design major based on the ADDIE model: Shed light on response to social trends and needs," *Sustainability*, vol. 13, no. 8, p. 4414, 2021. doi: 10.3390/su13084414.
[45] E. Barbazza, N. S. Klazinga, and D. S. Kringos, "Exploring the actionability of healthcare performance indicators for quality of care: a qualitative analysis of the literature, expert opinion and user experience," *BMJ Quality & Safety*, vol. 30, no. 12, pp. 1010-1020, 2021. doi: 10.1136/bmjqs-2020-011247.
[46] Alrawashdeh, H. M., Al-Tammemi, A. A. B., Alzawahreh, M. K., Al-Tamimi, A., Elkholy, M., Al Sarireh, F., ... & Ghoul, I., "Occupational burnout and job satisfaction among physicians in times of COVID-19 crisis: a convergent parallel mixed-method study," *BMC Public Health*, vol. 21, pp. 1-18, 2021.
[47] I. B. Maâ and A. B. Putri, "English e-book as supporting learning media for X grade students," *APPLICATION: Applied Science in Learning Research*, vol. 2, no. 1, pp. 35–42, 2022. doi: 10.32764/application.v2i1.2022.
[48] P. D. Iswara, J. Julia, T. Supriyadi, and E. Y. Ali, "Developing Android-based learning media to enhance early reading competence of elementary school students," *Pegem Journal of Education and Instruction*, vol. 13, no. 4, pp. 43–55, 2023. doi: 10.47750/pegegog.13.04.06.
[49] T. S. Desai and D. C. Kulkarni, "Assessment of interactive video to enhance learning experience: A case study," *Journal of Engineering Education Transformations*, vol. 35, no. 1, pp. 74–80, 2022.
[50] A. Marougkas, C. Troussas, A. Krouska, and C. Sgouropoulou, "Virtual reality in education: A review of learning theories, approaches and methodologies for the last decade," *Electronics*, vol. 12, no. 13, p. 2832, 2023. doi: 10.3390/e
[51] J. P. Widodo, L. Musyarofah, and J. Slamet, "Developing a Moodle-based learning management system (LMS) for slow learners," *Jurnal Inspirasi Pendidikan*, vol. 12, no. 1, pp. 1–10, 2022. doi: 10.21067/jip.v12i1.6346.
[52] F. Hardiansyah, "Improve science learning outcomes for elementary school students through the development of flipbook media," *Jurnal Penelitian Pendidikan IPA*, vol. 8, no. 6, pp. 3069–3077, 2022. doi: 10.29303/jppipa.v8i6.2413.
[53] A. Husna and D. M. D. M. Fajar, "Development of interactive learning media based on articulate storyline 3 on Newton's law material with a contextual approach at the junior high school level," *IJIS Edu: Indonesian Journal of Integrated Science Education*, vol. 4, no. 1, pp. 17–26, 2022. doi: 10.29300/ijisedu.v4i1.6487.
[54] M. Yahya, M. Maftuhati, A. H. Mustofa, and Z. Arifa, "Online-based Arabic learning management during the Covid-19 pandemic era: plan, implementation and evaluation," *Al-Ta'rib: Jurnal Ilmiah Program Studi Pendidikan Bahasa Arab IAIN Palangka Raya*, vol. 9, no. 1, pp. 85–98, 2021. doi: 10.23971/altarib.v9i1.2505.
[55] Y. K. Amri and N. Azizah, "The effect of using audio-visual media through the Capcut application on writing skills text of lectures for class XI high school students Budisatrya," *LingPoet: Journal of Linguistics and Literary Research*, vol. 5, no. 3, pp. 204–210, 2024.
[56] D. A. P. Sari, H. K. Wardani, and A. Alimin, "Developing instructional video in teaching writing for the tenth graders," *JEELL (Journal of English Education, Linguistics and Literature) English Department of STKIP PGRI Jombang*, vol. 10, no. 2, pp. 131–149, 2024. doi: 10.32682/jeell.v10i2.3496.
[57] E. G. Boelan, A. B. Baunsele, A. M. Kopon, M. B. Tukan, M. A. U. Leba, and F. Komisia, "Improving the pedagogic competence of Pandhega Jaya Christian High School teachers through making learning videos," *Abdimas: Jurnal Pengabdian Masyarakat Universitas Merdeka Malang*, vol. 7, no. 3, pp. 508–518, 2022.
[58] B. A. Lukas and M. M. Yunus, "ESL Teachers' Challenges in Implementing E-learning during COVID-19," *Int. J. Learn. Teach. Educ. Res.*, vol. 20, no. 2, pp. 330-348, 2021. doi: 10.26803/ijlter.20.2.18.
[59] A. Szymkowiak, B. Melović, M. Dabić, K. Jeganathan, and G. S. Kundi, "Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people," *Technol. Soc.*, vol. 65, p. 101565, 2021. doi: 10.1016/j.techsoc.2021.101565.