
FUN_COLLOID: An Interactive Multimedia Learning Platform for Understanding Colloids

Rabiah Afifah Daulay^{1*}, Mutiara Agustina Nasution¹, Kezia Merry Ivanya Devita Purba¹, Mella Amilasti Naila¹, Mutiara Ardi¹, Nurul Aliyyah¹, Sarah Agnesia Sinaga¹, Desy Rahmayanti Hasibuan²

¹⁾ Department of Chemistry Education, Universitas Negeri Medan, Indonesia

²⁾ Department of Chemistry Education, Universitas Islam Negeri Syahada Padangsidimpuan, Indonesia

*E-mail Corresponding Author: rabiahdaulay@unimed.ac.id

Abstract

This research aims to develop an engaging and effective learning tool that motivates students to learn more effectively and understand scientific concepts more deeply. This article introduces FUN_COLLOID, an interactive multimedia learning platform designed to enhance students' understanding of colloids, a crucial topic in chemistry. The methods used in this study include the development of interactive multimedia content, such as educational videos, virtual laboratories, and quizzes, as well as the evaluation of their impact on students' interest and understanding. The results showed that the use of FUN_COLLOID significantly improved students' understanding of colloid concepts, as well as increased their involvement in the learning process. The conclusion of this study emphasizes the importance of innovation in learning media to improve the quality of education in Indonesia, and provides recommendations for the further development of this platform so that it can be used in various other learning contexts.

Keywords: colloids; education; fun_colloid; multimedia learning; innovation

Abstrak

Penelitian ini bertujuan untuk mengembangkan perangkat pembelajaran yang menarik dan efektif yang memotivasi siswa untuk belajar lebih efektif dan memahami konsep-konsep ilmiah lebih mendalam. Artikel ini memperkenalkan FUN_COLLOID, sebuah platform pembelajaran multimedia interaktif yang dirancang untuk meningkatkan pemahaman siswa tentang koloid, topik penting dalam kimia. Metode yang digunakan dalam penelitian ini meliputi pengembangan konten multimedia interaktif, seperti video edukasi, laboratorium virtual, dan kuis, serta evaluasi dampaknya terhadap minat dan pemahaman siswa. Hasil penelitian menunjukkan bahwa penggunaan FUN_COLLOID secara signifikan meningkatkan pemahaman siswa tentang konsep koloid, serta meningkatkan keterlibatan mereka dalam proses pembelajaran. Kesimpulan penelitian ini menekankan pentingnya inovasi media pembelajaran untuk meningkatkan kualitas pendidikan di Indonesia, dan memberikan rekomendasi untuk pengembangan platform ini lebih lanjut agar dapat digunakan dalam berbagai konteks pembelajaran lainnya.

Keywords: fun_colloid; koloid; pendidikan; inovasi; pembelajaran multimedia

Introduction

Education needs to be developed to produce the next generation of qualified citizens who can compete internationally (Hapsari & Fahmi, 2021). However, the current level of education in Indonesia is a cause for concern. Education in Indonesia is of low quality due to several problems in the system. For example, poor education management, a lack of facilities and infrastructure, outdated thinking, inadequate teaching resources, and weak learning assessment standards. Some of these contribute to the low quality of education in Indonesia. In addition to the factors mentioned above, another cause of the decline in education quality in Indonesia is the issue of learning success (Tambunan & Siagian, 2022).

In addition, teachers should strive for renewal of learning media so that students do not feel bored with existing learning media. The media plays a crucial role in enhancing student learning outcomes. In this case, teacher creativity is expected to motivate students to learn (Agustini et al, 2023). The use of media can help students learn because it provides them with the opportunity to engage their senses, which makes them more interested in the learning process. In addition, the more students use their senses, the easier the lesson will be received and remembered.

According to Hamzah & Lamatenggo (2011), learning media refers to any form of communication tool that can be used to convey information from sources to students in a planned manner, thereby creating a conducive learning environment where the recipient can carry out the learning process efficiently and effectively. According to Masykur, Nofrizal, and Syazali (2017), learning media are used in schools as a means of learning to improve the quality of education (Rosiyana, 2021). The use of learning media offers various benefits, including the ability to streamline learning. By utilising the media, the material conveyed by the teacher will be more explicit, students' attention will be more focused, and they will be better equipped to understand

and deepen the material, ultimately achieving the learning objectives (Setianingsih & Siswono, 2024).

Web-based learning media (Google Sites) is one type of learning media made using technology and has the advantage of being able to store lesson information in various formats, including text, images, video, audio, and audiovisual media. Google Sites is a product from Google that is used to create websites. Google Sites has features to make content fun, entertaining, and easy to learn. Google Sites is also an effective site to assist teachers in delivering abstract content material effectively. Images, videos or animations uploaded on Google Sites can help students visualize these concepts more accurately, thus preventing students from forming misconceptions (Marini et al, 2023).

On Google Sites, teachers can design learning materials, assignments, and include a syllabus, and so on. In addition, the learning materials provided are not only in the form of text but also in the form of images, videos, and even practical simulations, allowing educators to vary their approach. The advantages of Google Sites are also straightforward to access; with only a gadget/laptop connected to the internet, students can use it (Islanda & Darmawan, 2023).

Web-based instructional materials offer a number of benefits, including: a) flexibility, which allows students to learn at any time and from any location; b) the ability for students to adapt their learning styles because the materials can be used independently; c) the ability to link materials so that students can access information from multiple sources; d) the potential to serve as a study aid for students who have limited study time; and e) an increase in the independence and activity of student learning.

Weaknesses of Web-based teaching media are a) the independence and motivation of students is the key to the success of web-based learning activities; b) there are obstacles in accessing learning using the web; c) if the equipment and bandwidth have limitations, then can lead to boredom and boredom if participants

students cannot access information; d) need guidelines for learners to find appropriate information amidst the diversity of information There is; e) learners who do not have devices sometimes will feel isolated (Yanto et al., 2023).

In addition, Google-based websites are free of charge or free and easy to access. It is hoped that learning media based on Google Site colloid material can make it easier for teachers to explain multilevel chemical representations and facilitate students' understanding of the learning materials provided by the teacher (Danin & Kamaludin, 2023).

The formulation of the research problem is the limited use of innovative and interactive learning media, which contributes to low student understanding and interest in learning colloid concepts in Indonesian schools. The purpose of this research is to develop an engaging and effective learning tool that motivates students to learn more effectively and understand scientific concepts more deeply.

Method

The research uses research and development methods. According to Sugiono (2016), the research and development method, also known as Research and Development (R&D), is a research approach used to produce a product and test its feasibility through evaluation and testing. The type of product developed in this research is web-based learning media for chemistry education, which can facilitate students and teachers with new, innovative, and engaging content. Learning media takes the form of a website that brings various learning activities and information together in one place.

This research is a method used to develop or validate products that will be used, especially in education and learning. In this research, the 4-D development model, created by Thiagarajan, Dorothy S. Semmel, and Melvyn I. Semmel, was used. This model consists of four stages: defining, designing, developing, and disseminating (Mulyatiningsih, 2011). However, in this

research, the focus of development is limited to the development stage and does not involve the dissemination stage. This study does not employ a conventional population or sample, as its focus is on product validation by experts. Therefore, the data source in this research consists of expert respondents, namely material experts and media experts. These experts are university lecturers with relevant competencies in their respective fields. The data were collected through a 5-point Likert scale questionnaire used to assess the quality of the developed product.

Results and Discussion

This research employs a descriptive, quantitative approach. The study was conducted from May to June 2024 at SMAN 2 Payakumbuh, one of the schools in West Sumatra. The samples used in this study consisted of 31 students from grade XI F9, selected using a purposive sampling technique.

The Fun_Colloid media, designed for high school science students and teachers, aims to enhance the understanding of colloidal systems through engaging multimedia content. This innovative platform has been validated by experts in the field, further emphasizing its suitability for educational purposes. The Fun_Colloid website can be accessed through the following link: [Fun_Colloid Website](http://Fun_Colloid_Website).

Website and App Icons

The Fun_Colloid media is represented by distinctive icons for both its website and app, making it easily recognizable among educational resources.

Website Home Page

The home page of the Fun_Colloid website provides a user-friendly interface that introduces visitors to the available resources on colloids.

Website Home Page Menu

The menu on the home page allows users to navigate easily to different sections,

ensuring that students and teachers can find relevant content efficiently.

App Home Page

The app's home page mirrors the website's design and functionality, offering a seamless transition for users who prefer mobile learning.

App Home Page Menu

Similar to the website, the app features a menu that facilitates easy access to various learning modules related to colloids.

Content Discussed in Fun_Colloid

Fun_Colloid covers a comprehensive curriculum on colloids, including the following topics:

1. Definition and Characteristics of Colloids: This section introduces colloids, their defining characteristics, and their significance in science.
2. Types of Colloids: Users explore various types of colloids, categorised by the dispersed phase and dispersing medium, including sols, emulsions, foams, and others.
3. Properties of Colloids: Key properties of colloids are discussed, including the Tyndall effect, Brownian motion, electrophoresis, and coagulation.
4. Preparation of Colloids: This section covers methods of creating colloids through condensation and dispersion techniques.
5. Colloids in Everyday Life: Examples of colloids commonly encountered in daily life are highlighted, ranging from food products and cosmetics to industrial applications.

Interactive Features of Fun_Colloid

To enhance engagement and learning, Fun_Colloid includes several interactive features:

1. Educational Videos: Access engaging educational videos that explain colloid material with clear visualizations for better understanding.
2. Virtual Lab: A virtual laboratory allows users to simulate colloid experiments without the need for physical equipment.

3. Practice Questions (Wordwall): Users can test their understanding with interactive questions presented in a fun quiz format on Wordwall.

4. Educational Games: The platform features games designed to deepen users' knowledge about colloids while allowing them to play and learn simultaneously.

Validation Results

To ensure the quality and effectiveness of Fun_Colloid, validation was conducted with both media and material experts. Their feedback focused on design, content, and usability, using the scoring systems defined previously.

The validation conducted by media experts yielded an average score of 3.63, categorized as High quality. This result indicates that the Fun_Colloid media demonstrates strong design quality, usability, and multimedia integration. Elements such as visual appeal, alignment with user needs, and background color consistency received high scores, confirming a generally positive user experience. However, medium scores on button consistency and font size suggest a need for refinement in interface uniformity and readability.

According to Islanda and Darmawan (2023), effective media design plays a crucial role in enhancing student performance by providing interactive and visually engaging content that appeals to learners. Likewise, Halim and Halim (2024) emphasise the importance of intuitive navigation and multimedia features in digital learning tools, affirming that a coherent design can enhance cognitive processing and usability.

The support for multi-device compatibility and ease of use further reflects its adaptability across different learning environments. This aligns with findings by Aulia, Kaspul, and Riefani (2021), who reported high student satisfaction with Google Sites-based media due to its accessibility, clarity, and well-integrated multimedia elements. Additionally, Laros et al. (2023) emphasize that multimedia features—when well-integrated—can

significantly boost learner motivation, efficiency, and engagement, especially in post-pandemic educational settings. The

validation results from media experts are presented in Table 1 below.

Table 1.
Validation Results by Media Experts

Indicator	Score	Quality Category
A. Design		
The design presented aligns with the characteristics of the media users.	4	High
The design is appealing to the media users.	4	High
The background color of the media is appropriate.	4	High
The images in the media effectively represent the presented learning material.	4	High
The menu display facilitates user navigation.	3.5	High
The layout of the menu does not confuse users.	3.5	High
Buttons have consistent colors and icons.	2.5	Medium
The font color in the text is appropriate.	3.5	High
The font size is suitable for its intended use (titles, content, etc.).	2.5	Medium
The type of font used is not confusing for users to understand the information presented.	3.5	High
B. Video		
The illustrations in the video are relevant to the learning material.	3.5	High
C. Animation		
The animations used are not excessive.	4	High
The animations presented align with the users' characteristics.	4	High
D. Ease of Use		
The media is easy to use and simple to operate.	4	High
The media can be used for independent study.	4	High
The media can be used on various devices.	4	High
Average Score	3.63	High

Material experts rated the Fun_Colloid content with an average score of 4.59, categorized as Very High quality. This reflects excellent alignment with curriculum objectives, clear presentation, and strong support for learner understanding. The material was found to be engaging, easy to comprehend, and relevant to real-world contexts.

According to Halim and Halim (2024), educational content that incorporates real-life applications and encourages student reflection contributes significantly to deeper learning and skill

development. Islanda and Darmawan (2023) support this by showing that Google Sites-based instructional media enhanced physics students' achievement through structured modules, simulations, and interactive tasks. The use of accessible language and standardized terminology, as highlighted in this study, further reduces cognitive load and supports knowledge retention—echoing the findings of Aulia et al. (2021), who noted very positive learner responses due to the platform's simple yet effective design. The validation results from material experts are presented in Table 2 below.

Table 2.
Validation Results by Material Experts

Question	Score	Description
A. Format		
Is the multimedia presentation engaging in its presentation of colloid material?	5	Very High
Is the organization of the colloid material in the multimedia presentation appropriate?	4.5	Very High
B. Content		
Is the content in the multimedia aligned with the learning outcomes?	5	Very High
Is the content in the multimedia aligned with the learning objectives?	5	Very High
Is the colloid material in the multimedia easy to understand?	5	Very High
Does the presentation of colloid material in the multimedia enhance comprehension?	4.5	Very High
Is the organization of the colloid material in the multimedia clear?	4	High
Are the practice questions in the multimedia aligned with the material?	5	Very High
Can the presented material be applied in real life?	4.5	Very High
C. Language		
Is the language used in the multimedia standardized?	4	High
Are the terms and words used in the multimedia easy to understand?	4.5	Very High
Average Score	4.59	Very High

Moreover, the presence of practice questions and contextual learning reinforces active engagement and knowledge transfer. Laros et al. (2023) assert that multimedia-based instruction is especially effective in post-pandemic education by fostering accelerated learning and motivating students through varied digital formats.

Conclusion

This research addressed the problem of limited innovative learning media in Indonesian schools, which leads to low student interest and understanding of colloid concepts. The developed media, FUN COLLOID, met the research objective by providing an engaging and effective tool. It achieved a score of 3.63 (High quality) from media experts and 4.59 (Very High quality) from material experts, indicating strong design, usability, and content alignment with learning goals. Future research is recommended to proceed to the implementation stage of FUN COLLOID in real chemistry classrooms, particularly in

teaching colloid material. This will allow evaluation of its actual impact on student motivation, engagement, and learning outcomes.

Acknowledgment

We would like to express our sincere gratitude to our supervising lecturers for their invaluable guidance, support, and encouragement throughout the course of this research. Their expertise and insights have been instrumental in shaping the development of this platform.

We also extend our appreciation to the media and content experts who participated as validators in this study. Their feedback and evaluations have been crucial in ensuring the quality and effectiveness of the Fun_Colloid platform. Thank you for your contributions and for helping us achieve our research goals.

References

Agustini, D., Agustini, K., & Pascima, I. B. N. (2023). Pengembangan Media

Pembelajaran Interaktif Berbasis Discovery Learning pada Mata Pelajaran Bahasa Inggris materi Descriptive Text di SMP Negeri 4 Singaraja. *KARMAPATI (Kumpulan Artikel Mahasiswa Pendidikan Teknik Informatika)*, 12(1), 96–106.

Aulia, D., Kaspul, & Riefani, M. K. (2021). Google Site as a Learning Media in the 21st Century on the Protists Concept. *BIO-INOVED: Jurnal Biologi-Inovasi Pendidikan*, 3(3), 173–178. <https://doi.org/10.20527/bino.v3i3.10524>

Danin, V. J., & Kamaludin, A. (2023). Development of Google Sites Based Learning Media on Chemical Bonds with Multilevel Chemical Representation. *Jurnal Penelitian Pendidikan IPA*, 9(9), 6727–6733.

Halim, A. A., & Halim, N. D. A. (2024). Exploring the Integration and Impact of Google Sites in Teaching and Learning: A Structured Scoping Review. *Quantum Journal of Social Sciences and Humanities*, 5(SI1), 110–124. <https://doi.org/10.55197/qjssh.v5iS1.1569>

Hamzah, B. U., & Lamatenggo, N. (2011). *Teknologi Komunikasi dan Informasi Pembelajaran* (Ed. 1, Cet. 2). Jakarta: Bumi Aksara.

Hapsari, D. I. S., & Fahmi, S. (2021). Pengembangan Media Pembelajaran Interaktif Berbasis Android pada Operasi pada Matriks. *FIBONACCI: Jurnal Pendidikan Matematika dan Matematika*, 7(1), 51–60.

Islanda, E., & Darmawan, D. (2023). Pengembangan Google Sites sebagai Media Pembelajaran untuk Meningkatkan Prestasi Belajar Siswa. *Jurnal TeknodiK*, 27(1), 51–62.

Laros, T., Misnawati, D., Aslan, A., Taufiqoh, Z., & Imelda, I. (2023). The Effectiveness of Multimedia-Based Learning to Accelerate Learning after the Pandemic at the Basic Education Level. *Tafkir: Interdisciplinary Journal of Islamic Education*, 4(1), 128–146. <https://doi.org/10.31538/tijie.v4i1.311>

Masykur, R., Nofrizal, & Syazali, M. (2017). Pengembangan Media Pembelajaran Matematika dengan Macromedia Flash. *Al-Jabar: Jurnal Pendidikan Matematika*, 8(2), 177–186.

Marini, A., Safitri, D., Yarmi, G., & Dewiyani, L. (2023). Development of Web Using Google Sites to Increase Learning Interest in Social Science Education. *Eurasian Journal of Educational Research*, 106(106), 137–148.

Mulyatiningsih, E. (2011). *Metode Penelitian Terapan Bidang Pendidikan*. Bandung: Alfabeta / Yogyakarta: Universitas Negeri Yogyakarta.

Rosiyana, R. (2021). Pemanfaatan Media Pembelajaran Google Sites dalam Pembelajaran Bahasa Indonesia Jarak Jauh Siswa Kelas VII SMP Islam Asy-Syuhada Kota Bogor. *Jurnal Ilmiah KORPUS*, 5(2), 217–226.

Setianingsih, D., & Siswono, T. Y. E. (2024). Pengembangan Media Pembelajaran Berbasis Web (Google Sites) untuk Meningkatkan Keterampilan Berpikir Kritis dan Literasi Digital Siswa Kelas V Sekolah Dasar. *ELSE (Elementary School Education Journal): Jurnal Pendidikan dan Pembelajaran Sekolah Dasar*, 8(2).

Sugiono, & Kuntjojo. (2016). Pengembangan Model Permainan Pra-Calistung Anak Usia Dini. *Jurnal Pendidikan Usia Dini*, 10(2), 255–276.

Tambunan, M. A., & Siagian, P. (2022). Pengembangan Media Pembelajaran Informatika Subjects. *Journal of*

Vocational Education Studies, 6(1), 11–24.

White, H. (2007). Problem-Based Learning in Introductory Science Across Disciplines. available 27 Maret 2007 from <http://www.udel.edu/chem/white/finalrpt.html>

Yanto, R., Waskito, W., Effendi, H., & Purwanto, W. (2023). Development of Web-Based Learning Media Using Google Sites in Vocational High School. *Humantech: Jurnal Ilmiah Multidisiplin Indonesia*, 1(10), 1520–1533.