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Development of KAUBI Uno-Based Biology Card Game on Human Reproductive System Material

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Abstract

*The lack of interactive and engaging learning media often makes Biology lessons especially those involving sensitive topics like the Human Reproductive System, monotonous and less effective. This study aims to develop a learning medium called *Kartu Uno Biologi* (KAUBI), adapted from the UNO card game, to enhance student engagement, communication skills, and learning outcomes. The research used the ADDIE development model, which includes five stages: Analyze, Design, Develop, Implement, and Evaluate. The media was validated by six experts (three material and language experts, and three media experts) and tested on 34 Grade XI students at SMA Negeri 1 Kademangan. Validation results showed that KAUBI was rated valid (68% by material and language experts) and very valid (86% by media experts). The practicality test indicated that the media was easy to use with a score of 82.22%, while the effectiveness test showed improvement in students' understanding and oral communication, with a normalized gain score of 0.669 (medium category). Overall, KAUBI is considered a valid, practical, and effective alternative learning medium in Biology. However, the limited number of test subjects and focus on one topic restrict generalizability, suggesting the need for broader future applications.*

Kata Kunci: *Reproductive System; Educational Card Game; Biology Learning Media*

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INTRODUCTION

Education plays a vital role in shaping high-quality and adaptive human resources in response to the demands of the 21st century. The 4Cs communication, collaboration, critical thinking, and creativity form the foundation of modern education systems. Among these, communication is crucial as it bridges thinking, collaboration, and meaningful learning (Kivunja, 2014). However, classroom practices remain dominated by lecture-based methods, leading to one-way communication and passive student participation. In Biology learning, instructional media play a significant role in delivering material in engaging and interactive ways (Wahyudi, 2024), thereby promoting learning motivation and improving communication skills.

Observations and interviews at SMA Negeri 1 Kademangan showed that Biology learning still relies heavily on PowerPoint and YouTube videos. Questionnaire results from eleventh-grade students revealed that 95.4% desired interactive and enjoyable learning media to better understand complex Biology concepts. The lack of such media results in low learning motivation, weak communication skills, and unsatisfactory academic performance. These findings indicate that the core issue in Biology learning lies not only in instructional methods but in the limited use of innovative media that stimulate student interaction and communication.

Educational game-based media offer a promising solution to this issue, as they can create enjoyable learning experiences while developing students' communication and collaboration skills (Eka Rosita Sari et al., 2022). Game-based media, such as the Uno card game, are practical, visually appealing, and adaptable for contextual learning (Kurniawan et al., 2023). By adapting the Uno concept to Biology learning, students can explore scientific material while practicing communication, discussion, and problem-solving in groups (Hamsina et al., 2023). The Teams Games Tournament (TGT) learning model supports this approach by combining competition, teamwork, and play, fostering student engagement and interaction. Studies have shown that TGT effectively enhances learning outcomes and motivation by involving all students in cooperative learning (Erviani et al., 2022).

Considering these challenges, this study integrates the Uno card game with the TGT model to develop innovative Biology learning media titled Kartu Uno Biologi (KAUBI), focusing on the Human Reproductive System topic. This integration is relatively

unexplored in previous research, particularly regarding its potential to improve communication skills and learning outcomes among high school students. The KAUBI media aims to provide an engaging, student-centered, and effective learning experience that aligns with the demands of 21st-century education, emphasizing collaboration, communication, and creativity in the learning process.

RESEARCH METHOD

This study uses a Research and Development (R&D) approach aimed at developing the Uno Biology Card (KAUBI) as an innovative learning medium for the Human Reproductive System material in Biology. This study follows the ADDIE (Analyze, Design, Develop, Implement, Evaluate) development model proposed by (Branch, 2010). The research subjects consisted of eleventh grade students of SMA Negeri 1 Kademangan, who were selected by purposive sampling based on curriculum relevance and their readiness to participate and were conducted in February-March 2025. The learning materials used included the concept of the human reproductive system that was aligned with the national curriculum, while the instruments included KAUBI cards, observation sheets, questionnaires, and pretest-posttest instruments.

The design of the study was a one-group pretest–posttest, enabling comparison of students' performance before and after the intervention. Data collection employed several techniques: observation and questionnaires were used to measure student practicality and responsiveness, while pretest–posttest assessments measured learning outcomes, and a communication skills rubric evaluated performance. The communication skills variables measured included: (1) ability to convey understanding of concepts verbally, (2) use of proper grammar, (3) ability to respect the interlocutor, and (4) ability to provide clear and easily understood explanations.

The development process involved validation by six expert validators, each with specific expertise: three material and language experts (lecturers in biology education), three media experts (educational technology specialists). These validators assessed the KAUBI prototype in terms of content accuracy, linguistic clarity, visual design, and functional feasibility. Validation results were analyzed using the mean score categorization based on a 5-point Likert scale. The interpretation of the average score followed these validity criteria in table 1.

Table 1. Validation Test Result Criteria

No	Interval	Criterion
1	81% - 100%	Very V alid
2	61% - 80%	Valid
3	41%- 60%	Quite Valid
4	21% - 40%	Less Valid
5	0% - 20%	Unvalid

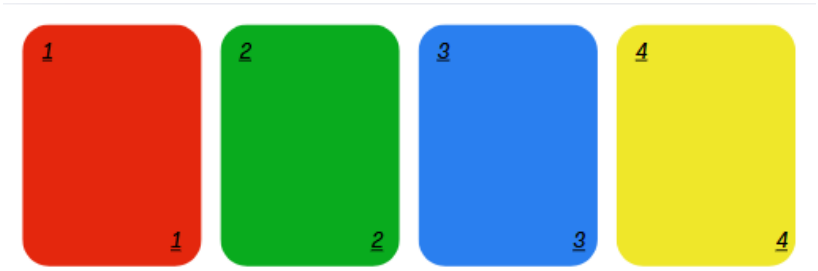
(Source: Riduwan, 2020)

Data analysis combined qualitative descriptive methods for validation and response data with quantitative statistical analysis using N-Gain scores to determine the level of learning improvement. Expert validation results were summarized as percentages and categorized according to the criteria above, while practicality and effectiveness scores were interpreted based on percentage ranges, where ≥81% was categorized as "very practical" and "very effective." Overall, this methodological framework ensured that the development and testing of KAUBI were conducted systematically to determine its validity, practicality, and effectiveness in improving students' communication skills and learning outcomes in biology education.

RESULT AND DISCUSSION

The Biology Uno Card Game (Kaubi) developed in this study has several advantages, including its ability to present reproductive system material in an engaging and enjoyable way. This media allows students to learn while playing, which can increase their active involvement in learning as well as their communication skills with peers. In addition, the use of Kaubi provides students with the opportunity to review and reinforce their understanding of concepts through direct interaction in the game.

The development process of Kaubi began with designing the product, including the card content, game rules, and visual design. The initial design was adapted from the general format of Uno cards and was developed based on the results of the student needs analysis. The product was then created using graphic design applications to produce an attractive card appearance. The cards were designed in various types, such as illustrated question cards and non-illustrated question cards, with a front display in four different colors and a back design in three colors, all intended to enhance students' interest in using the cards during learning activities.



(a)

(b)

(c)

Figure 1. (a) front view of the card; (b) display of question cards with pictures and questions without pictures; (c) back view of the card

The Biology Uno Card Game (Kaubi) developed in this study is considered to have very good quality based on the results of expert validation. The validation process was carried out by three validators, namely a lecturer in Biology Education from the Islamic University of Balitar, Blitar. Based on the media validation results, Kaubi was declared to be highly valid, with an overall average validation percentage of 88%, indicating that this media is suitable for use in the Biology learning process. The media validation results can be seen in Table 2.

Table 2. Uno Card Game Media Validation Results

No.	Assesment Aspects	Validator 1	Validator 2	Validator 3	Average	Criterion
1.	Grahics	71%	93%	96%	87%	Very Valid
2.	Media	92%	100%	75%	89%	Very Valid
3.	Benefits	71%	81%	100%	84%	Very Valid
	Overall Average				88%	Very Valid

The Biology Uno Card (Kaubi) learning media was validated by media experts through three main aspects: graphics, media, and usefulness. The results indicate that Kaubi is a highly valid and feasible educational tool for Biology learning. In the graphic aspect, the evaluation focused on the card's visual design, including color composition, image clarity, typography, and layout. This aspect achieved an average score of 87%, categorized as very valid. According to (Kusumawati & Yuliani, 2021), good visual design enhances learners' attention and comprehension through clear and consistent visual representation. Similarly, (Mayer, 2024) explains that appropriate colors, icons, and layouts support cognitive information processing and reduce learners' cognitive load. Hence, Kaubi's visuals are not merely aesthetic but functionally designed to optimize understanding and engagement in Biology learning.

In the media aspect, which assessed the completeness of learning components, clarity of rules, and relevance to learning objectives, Kaubi obtained a score of 89% (very valid). This finding aligns with the instructional design framework by (Branch, 2010), which emphasizes the importance of alignment between learning objectives, content, activities, and evaluation. The structure and rules of Kaubi are developed to match Biology learning outcomes, particularly to enhance students' communication, collaboration, and critical thinking. The clarity of instructions and systematic scoring ensures that gameplay remains meaningful and educational rather than purely recreational (Paramita et al., 2019).

The usefulness aspect, which measures the media's ability to improve motivation, interaction, and conceptual understanding, received an average of 84%, also very valid. Game-Based Learning theory supports that games promote intrinsic motivation by providing active engagement and immediate feedback (Dewi & Kustiarini, 2022). Furthermore, Social Constructivism (Arifin & Lestari, 2020) highlights that social interaction during play enhances communication and collaboration through idea sharing and negotiation. Through interactive gameplay, Kaubi enables students to practice scientific communication while reinforcing conceptual mastery.

Overall, the combined validation results across the three aspects produced an average validity score of 88%, placing Kaubi in the very valid category. These findings confirm that Kaubi fulfills essential content, visual, and pedagogical validity standards. Therefore, the Biology Uno Card media can be considered a valid and innovative learning tool that effectively supports active, collaborative, and communicative learning environments in Biology classrooms.

In addition to the media validity test, material and language validation was also conducted to determine the feasibility of the content used in the Kaubi media. The average result of material validation from validator 1 was 63%, and from validator 2 was 65%, resulting in an overall average of 68%, which falls under the valid category. This indicates that the content in the Kaubi card game media has met the learning indicators and the accuracy of concept delivery in the reproductive system material. The results of the material validation can be seen in Table 3.

Table 3. Uno Card Game Material and Language Validation Results

No.	Assesment Aspects	Validator 1	Validator 2	Validator 3	Average	Criterion
1.	Material	63%	68%	56%	63%	Valid
2.	Construction	63%	64%	69%	65%	Valid
3.	Language	75%	79%	75%	76%	Valid
	Overall Average				68%	Valid

The material validation assessment includes three aspects: content, construction, and language. The average score obtained from the three validators is 68%, which falls into the valid category. This validation indicates that the material content and language use are in accordance with the learning outcomes and objectives for the topic of the human reproductive system. These findings are in line with the study conducted by (Sultani et al., 2023), which stated that game-based learning media with well-structured content can significantly improve students' understanding.

To determine the effectiveness level of the Uno Biology Card media on the topic of the Human Reproductive System, an effectiveness test was conducted in one experimental class, namely Class XI-3 of SMAN 1 Kademangan. At this stage, observations were made on students' communication skills, and a multiple-choice test was administered to assess student learning outcomes. Based on the observation results of students' verbal communication skills over three meetings, a significant improvement was seen in each indicator. In general, the average results indicate an improvement from the first to the third meeting, there was an increase from 79% in the first meeting to 88% in the third

meeting. This indicates that the use of the Kaubi media encourages students to be more active in expressing their understanding of the material studied. The results of the observation on students' communication skills can be seen in Table 4.

Table 4. Observation on Students' Communication Skills Results

No.	Oral Communication Skill Indicators	Average Percentage of Each Meeting		
		Meeting 1	Meeting 2	Meeting 3
1.	Ability to convey understanding of concepts verbally	80%	85%	90%
2.	Uses proper grammar	78%	83%	90%
3.	Is able to respect the interlocutor	82%	80%	85%
4.	Is able to provide clear and easily understood exsplanations	75%	80%	85%
	Overall Average	79%	82%	88%

The analysis of communication skills in Table 3 shows a consistent improvement across three learning sessions using Kaubi media. This indicates that educational game-based learning fosters an active and meaningful communication environment. Students began expressing ideas and opinions more confidently and in an organized manner, while group-based play encouraged them to discuss, explain, and respond to peers' ideas, enhancing cooperative interaction.

(Maesharoh et al., 2024) found that game-based learning improves interpersonal communication through enjoyable, participatory environments, and emphasized its role in promoting effective social interaction. Kaubi's design balances competition and cooperation, creating promotive interaction within teams—an essential element in cooperative learning theory (Slavin et al., 2015). Therefore, Kaubi not only deepens understanding of Biology concepts but also cultivates communication as a vital 21st-century skill.

The analysis of students' learning outcomes was carried out by calculating the average pretest scores obtained before the use of Kaubi media, while the posttest scores were obtained after the use of Kaubi media in a class of 34 students. Students' learning outcomes showed an improvement after the use of Kaubi media. The analysis of students' scores can be seen in Table 5.

Table 5. Analysis of Students' Scores Results

Explanation	Score
Pretest Average	54.85
Posttest Average	85.29
N-Gain	0.660
Conclusion	Medium

The N-gain analysis shows that Kaubi media effectively enhances students' cognitive achievement by integrating interactive and game-based elements that promote active engagement and intrinsic motivation. According to Mayer's Cognitive Theory of Multimedia Learning (Mayer, 2024), combining visual and verbal representations helps optimize cognitive processing and knowledge retention. This aligns with findings by (Akbar et al., 2023), who reported that game-based media can significantly improve conceptual understanding through experiential learning. Therefore, Kaubi effectively supports deeper cognitive processing, increasing both motivation and comprehension in biology learning.

To observe the response after using the Biology Uno Card media on the Human Reproductive System material, a response test was conducted. This response test on the use of the Biology Uno Card media for the Human Reproductive System material was given to the 34 students of class XI-3 at SMAN Kademangan and one Teacher of biology subject class XI SMAN 1 Kademangan. The response data from both the teacher and students are presented in Table 6.

Table 6. Response Data From Both the Teacher and Students Results

Respondents	Percentage (%)	Category
Teacher of biology class XI	98%	Very Good
Student class XI-3	98%	Very Good

Based on the response data from the Biology subject teacher, the acceptance level of the Kaubi media is very high. The assessment score reached 98%, which falls into the Excellent category. This result indicates that the teacher considers Kaubi to be a feasible and supportive medium in the learning process, particularly for the topic of the human reproductive system. The evaluation includes aspects such as content accuracy, clarity of instructions, visual appeal, alignment with the curriculum, and the potential to achieve learning objectives. In line with these findings, a study by (Illahi et al., 2021) revealed that the use of appropriate and interactive learning media can improve the quality of instruction and facilitate more effective achievement of learning goals.

Meanwhile, the students' response results also showed the same high score, which is 98%, also categorized as Excellent. This figure indicates that students demonstrated a very high level of interest and satisfaction with the media used. These positive responses reflect that Kaubi successfully created an enjoyable learning experience and encouraged active student engagement in the learning process. The media was considered effective in

facilitating concept comprehension through an innovative and interactive approach, while also increasing students' motivation to learn. This aligns with the research by (Handayanti et al., 2020), which stated that interactive media in education can enhance student engagement and stimulate their motivation to learn better. Additionally, research by (Arifin & Lestari, 2020) also showed that the use of attractive learning media can encourage students to be more active in class and improve their understanding of the material taught.

CONCLUSION

The development of the Biology Uno Card Game (Kaubi) demonstrates that the media is highly valid, practical, and effective in supporting Biology learning, particularly in the topic of the Human Reproductive System. Kaubi successfully engages students in active learning, enhances oral communication skills, and improves cognitive understanding through interactive and enjoyable gameplay. Its implementation fosters collaboration and motivation, making learning more student-centered. Therefore, Kaubi can serve as an innovative model for integrating game-based learning in science education. For future research, it is recommended to apply Kaubi to other Biology topics, test its long-term impact on learning outcomes, and explore digital or hybrid adaptations to expand accessibility. Teachers are also encouraged to use Kaubi as a classroom strategy to strengthen communication, teamwork, and critical thinking core competencies of 21st-century education.

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