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# The Effect of Using Kaubi Media Based on Team Games Tournament (TGT) on Students' Communication Skills and Learning Outcomes in Biology Learning

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**Abstract:** Communication skills and learning outcomes are two important aspects that need to be developed in biology learning. Facts in the field show that active students still experience difficulties in communicating effectively and understanding biological concepts, especially in the human reproductive system material. This condition is caused by the dominance of conventional methods and the lack of learning media that can actively engage students. This study aims to determine the effect of using Biology Uno Cards (Kaubi) media based on Team Games Tournament (TGT) on communication skills and student learning outcomes. The research method used a one-group pretest-posttest on 34 grade XI high school students. The instruments used included observation of communication skills, learning outcome tests, and response questionnaires. The results showed an increase in students' communication skills from the first to the third meeting with a good category. In addition, the average value of learning outcomes increased from 54.85 in the pretest to 85.29 in the posttest with a Normalized Gain (N-Gain) value of 0.669 (moderate category). These findings demonstrate that the use of TGT-based Kaubi media has a positive impact on student communication skills and learning outcomes. Therefore, it can be used as an innovative alternative medium in biology learning to increase student engagement and understanding.

## INTRODUCTION

Education in the 21st century requires a fundamental transformation in the way learning is designed, delivered, and experienced. The focus of education is no longer restricted to the transmission of knowledge and the acquisition of cognitive skills alone, but it extends to fostering a set of higher-order competencies that prepare students to thrive in an increasingly complex, interconnected, and rapidly changing world. These competencies, widely known as the *"4Cs"* of *21st* century skills communication, collaboration, critical thinking, and creativity have become

central benchmarks for effective teaching and learning (Rismorlita et al., 2021). Within these competencies, communication has been recognized as a pivotal skill, serving as the bridge that connects knowledge, collaboration, and critical reasoning, thereby influencing not only how students learn but also how they demonstrate their learning outcomes in social and academic contexts (Kivunja, 2015).

In the context of biology education, communication skills, particularly oral communication, occupy a vital role in enhancing the quality of learning processes. Biology is a discipline that often involves abstract, complex, and interconnected concepts, such as molecular interactions, physiological processes, and ecological systems, which cannot be fully understood through rote memorization or passive reception of information. Effective communication allows students to articulate their ideas, engage in discussions, ask meaningful questions, and clarify misconceptions, which in turn contributes to deeper conceptual understanding. Previous research has established a close relationship between communication skills and learning achievement. For instance, Sari (2017) found that low oral communication skills in science classes often correlated with students' inability to grasp abstract concepts.

Despite its importance, communication skills among Indonesian students remain relatively low, especially in science subjects. *The Programme for International Student Assessment* (PISA) report by the OECD (2019) positioned Indonesia among the lower-ranked countries in science literacy. One of the reasons frequently cited for this outcome is the teacher-centered approach that still dominates classroom practices, which tends to limit students' opportunities to interact, communicate, and collaboratively construct knowledge. This challenge is particularly evident in biology classes, where teacher lectures remain the dominant method, while student participation is minimal and largely passive. Observational studies and teacher interviews in various senior high schools in Indonesia SMAN 1 Kademangan, SMAN 1 Talun, and SMAN 4 Blitar further reveal that only a small

number of students actively ask or respond during lessons, while the majority remain silent due to fear of making mistakes or lack of confidence. Such conditions indicate that teacher-centered pedagogies hinder not only student engagement but also their ability to practice and develop essential communication skills.

Moreover, the nature of biology as a subject poses additional challenges. Topics such as the human reproductive system involve complex processes (e.g., gametogenesis, hormonal regulation, fertilization, pregnancy) that require integrative understanding. These topics also often contain sensitive or taboo elements in the local cultural context, which makes students reluctant to discuss them openly. When students are not given appropriate scaffolding to communicate and explore these ideas collaboratively, misconceptions easily arise, leading to shallow comprehension and reduced motivation. Research by Rohani and Ibrohim (2020) has demonstrated that active verbal communication not only improves conceptual mastery but also enhances students' confidence and reflective thinking, while passive learning environments reinforce dependency on teacher explanations. Hence, an urgent need arises for innovative instructional strategies and media that can simultaneously foster communication, engagement, and understanding in biology education.

One of the promising approaches to address these challenges is the integration of cooperative learning models with game-based educational media. Cooperative learning emphasizes structured interaction among students, enabling them to learn from one another through shared goals, peer tutoring, and group accountability. Among the various cooperative learning models, Teams Games Tournament (TGT), developed by Slavin (2015), stands out as particularly effective. TGT integrates group learning with academic games and tournaments, where students work in heterogeneous teams to master content, then compete in friendly competitions to earn points for their teams. This model combines academic rigor with motivational elements such as competition, recognition, and collaboration, making it suitable for fostering both communication skills and

conceptual understanding. Prior studies have reported that TGT improves student motivation, enhances peer interaction, and cultivates healthy competition, ultimately resulting in higher academic achievement (Hairunnisa, 2024, Seran, 2019).

Complementing cooperative models, game-based learning media has gained increasing attention in recent years as an engaging and innovative strategy to improve science education. Games are inherently interactive, rule-based, and motivational, providing students with authentic contexts in which they can apply knowledge and practice skills. Huang and Hew (2018) highlight that game-based learning can stimulate students' intrinsic motivation, sustain attention, and create memorable learning experiences. Similarly, Wijayanti et al. (2022) showed that integrating games into biology lessons significantly enhanced students' communication, participation, and learning outcomes. In particular, the use of familiar games adapted for educational purposes is considered advantageous, as students already understand the basic mechanics and can focus on the content embedded in the game.

One of the most popular games among adolescents is UNO cards, which are widely recognized for their simple rules, engaging play, and social interaction elements. By modifying UNO into an educational medium, teachers can contextualize the game mechanics into a meaningful learning tool. Several studies have demonstrated the feasibility of such adaptations, where UNO cards were redesigned with subject-specific questions to create engaging learning media in physics (Sari et al., 2022), economics (Kurniawan et al., 2023), and mathematics (Fransiska, 2023). These studies reported positive results in terms of validity, practicality, and student engagement. However, the integration of UNO cards into biology learning, particularly in the sensitive and abstract topic of the human reproductive system, remains underexplored. This gap provides an opportunity for innovation by designing *Kartu Uno Biologi* (Kaubi), a set of UNO cards adapted to

contain contextual questions and illustrations related to the reproductive system, aligned with the national curriculum.

The novelty of this study lies in the integration of Kaubi with the TGT cooperative model, which combines the motivational aspects of popular game media with the structured pedagogy of cooperative learning. This dual approach is expected to overcome students' reluctance to communicate, create an enjoyable learning atmosphere, and improve academic achievement in biology. Unlike traditional media such as PowerPoint slides or videos, Kaubi requires active student participation, as players must not only follow the game mechanics but also answer questions, explain their reasoning, and engage in team discussions. The design of KAUBI includes both illustrated and non-illustrated questions, catering to different learning styles and reinforcing conceptual visualization. By embedding biology content into a game that is already familiar to students, the cognitive load of learning new rules is minimized, allowing students to focus on the subject matter.

The theoretical foundation of this study is anchored in Vygotsky's constructivist theory, which posits that learning is a social process facilitated by interaction and mediated tools. Kaubi serves as a mediational tool that structures student interactions in a way that scaffolds communication, peer learning, and collaborative problem solving. Furthermore, cooperative learning theory underlines the principle of positive interdependence, individual accountability, and group processing, all of which are inherent in the TGT model. Through this integration, it is expected that students will experience meaningful learning that enhances not only cognitive outcomes but also essential skills such as communication, collaboration, and self-confidence.

The urgency of this study is twofold. First, it responds to the persistent problem of low communication skills and passive participation among Indonesian students in biology classes. Second, it offers an innovative instructional alternative that integrates widely familiar games with cooperative learning pedagogy, an approach that has not been widely developed in the context of biology education in

Indonesia. The state of the art of this research lies in addressing a critical gap in the literature: while UNO cards have been adapted in other subjects, their use in biology particularly in complex and sensitive topics such as reproduction remains novel. Moreover, this study does not stop at the design stage but goes further to empirically validate Kaubi in terms of its validity, practicality, and effectiveness through expert evaluation, student trials, and pretest-posttest analysis.

Based on the background and rationale above, the research problem can be formulated as follows, *How is the development process of Kaubi learning media based on the TGT model, and to what extent is it valid, practical, and effective in improving students' communication skills and biology learning outcomes in the topic of the human reproductive system at the grade XI senior high school level?*

## RESEARCH METHODS

This study employed a research and development (R&D) approach combined with a pre-experimental design to examine the effect of Biology Uno Card (Kaubi) media based on the Teams Games Tournament (TGT) model on students' communication skills and learning outcomes in biology learning. The development of the learning media followed the ADDIE model, which consists of five stages: Analyze, Design, Develop, Implement, and Evaluate (Branch, 2009). The research subjects were 34 Grade XI senior high school students at SMA Negeri 1 Kademangan. The sampling technique used was purposive sampling, based on curriculum relevance and students' participation in the reproductive system learning topic. The learning material focused on the human reproductive system, aligned with the senior high school biology curriculum.

The Analyze stage involved a needs analysis through classroom observations, interviews with biology teachers, and student questionnaires. This stage aimed to identify learning problems, student characteristics, learning objectives, and the suitability of learning media. The results indicated that biology learning was still teacher-centered and required interactive media to support

communication skills and conceptual understanding, particularly on the human reproductive system topic. In the Design stage, the structure and components of Kaubi media were planned, including learning objectives, game rules, card types, question indicators, and assessment instruments. The design was aligned with the biology curriculum and the cooperative principles of the TGT model. Learning instruments such as communication skill observation sheets, pretest–posttest questions, and response questionnaires were also prepared at this stage.

The Develop stage focused on producing the initial Kaubi prototype. The media and research instruments were validated by material experts and media experts to ensure content accuracy, language clarity, and visual feasibility. Apart from that, at this stage, tests were conducted on class XII who had already received reproductive system material through three stages, namely, limited trials, including individual trials, small group trials, and field testing. Revisions were made based on expert suggestions before proceeding to implementation. The Implement was carried out in the research class, namely class XI, with three meetings. Kaubi was applied in classroom learning using the one-group pretest–posttest design to examine its effect on students' communication skills and learning outcomes. The Evaluate stage was conducted through formative and summative evaluation. Data were collected using observation, tests, and questionnaires. Learning outcomes were analyzed using N-Gain analysis, while communication skills and response data were analyzed descriptively using percentage categories. This systematic ADDIE-based approach ensured that KaubI media was valid, practical, and effective for biology learning.

## RESULTS AND DISCUSSION

The implementation of *Kartu Uno Biologi* (Kaubi) in the teaching of the human reproductive system yielded significant improvements in both students' cognitive achievement and their communication skills. The analysis of pretest and posttest results provides clear evidence of this improvement. The average pretest score of students was 54.85, which rose substantially to 85.29 in the posttest. The

normalized gain (N-Gain) value of 0.669, equivalent to 66.9%, falls into the medium category, indicating that although learning gains were not maximal, students nevertheless experienced meaningful conceptual progress. These results confirm the hypothesis that cooperative learning supported by educational games facilitates mastery of abstract concepts by providing scaffolding through discussion, peer support, and interactive play. They also align with previous studies by Wijayanti et al. (2022) and Huang and Hew (2018), who reported that game-based strategies enhance both motivation and long-term conceptual retention in science learning.

As shown in Table 1, students' average pretest score was 54.85, while the posttest average increased markedly to 85.29. The normalized gain (N-Gain) value was 0.669 (66.9%), which is classified as a medium category of improvement. These findings indicate that KAUBI facilitated meaningful conceptual progress, confirming that cooperative learning supported by educational games provides scaffolding for abstract topics.

**Table 1. Student Learning Outcomes**

| Assesment | Mean Score | Gain | Category |
|---|---|---|---|
| Pretest | 54.85 | - | - |
| Posttest | 85.29 | 0.669 (66.9%) | Medium Improvement |

These results are consistent with prior studies (Wijayanti et al., 2022; Huang & Hew, 2018) that found game-based learning improves both motivation and retention. Kaubi achieved similar outcomes by combining the fun of gameplay with academic rigor.

The practicality of Kaubi was examined in three stages: one-on-one pilot testing, small group trials, and full-class field implementation. During the individual trial with three students, the highest ratings were given to the clarity of instructions and the appeal of the game design, demonstrating that students found the medium accessible and engaging. However, some difficulties were noted in understanding certain questions, particularly those requiring more abstract reasoning. This suggests that while the media was generally user-friendly, revisions

were needed to simplify complex items. When the media was tested in a small group of nine students, ratings improved across almost all aspects. Concept comprehension, clarity of instructions, and learning motivation reached very high levels, showing that the collaborative element of the game strengthened students' ability to interact meaningfully with peers. The group dynamics encouraged discussion, argumentation, and peer support, which contributed to deeper learning. In the field test involving 28 students, practicality remained in the "good" category, although concept comprehension scores declined slightly compared to the small group trial. This reduction can be explained by the wider variation in academic abilities within a full-class setting, where stronger students tended to dominate the activity, while weaker students occasionally became passive. This finding underlines the importance of teacher facilitation in ensuring balanced participation and equitable learning outcomes in heterogeneous classrooms.

Besides improving cognitive outcomes, Kaubi also fostered significant growth in students' communication skills. Indicators of communication were evaluated through observation, and the results showed strong progress across dimensions. The highest achievement was found in the indicator of respecting interlocutors, followed by the ability to convey understanding and the use of proper language. These results suggest that the cooperative nature of the activity encouraged students to engage more respectfully with their peers, listen attentively, and use appropriate academic vocabulary. However, the lowest performance appeared in the indicator of providing clear and detailed explanations. While students became more confident in participating and respectful in discussion, some struggled to articulate complex biological concepts clearly. This indicates a need for additional scaffolding from teachers, such as modeling how to explain processes systematically or encouraging students to use diagrams when describing abstract phenomena. These observations are consistent with Vygotsky's sociocultural theory, which emphasizes that learning is most effective when mediated by social interaction and guided support (Sari, 2017).

Students' communication skills also showed strong development. **Table 2** summarizes the observed indicators. The highest achievement was in respecting interlocutors (92%), followed by the ability to convey understanding (88%) and the use of appropriate language (86%). The lowest score was in the ability to provide clear explanations (80%). These results suggest that while the cooperative structure encouraged participation and respect, additional scaffolding is needed to help students articulate detailed explanations of abstract processes.

**Table 2. Development of Students' Communication Skills**

| Indicator | Percentage (%) | Category |
|---|---|---|
| Respecting interlocutors | 92% | Very Good |
| Conveying understanding | 88% | Very Good |
| Using appropriate language | 86% | Very Good |
| Providing clear explanations | 80% | Good |

These findings align with Vygotsky's sociocultural theory, which emphasizes the role of interaction and scaffolding in developing higher-order skills (Sari, 2017). Kaubi created opportunities for students to listen, respond, and collaborate, though teachers still needed to guide students toward more structured communication.

Teacher and student responses provided further confirmation of the acceptability and practicality of Kaubi. The biology teacher rated the medium at 98%, categorizing it as "very good." The teacher particularly noted that Kaubi was enjoyable, supported the achievement of learning objectives, and introduced an innovative approach to teaching abstract and sensitive material such as reproduction. Students also expressed overwhelmingly positive responses, with an approval rate of 98% in the "positive" category. They highlighted that the media was not only fun but also helpful in understanding concepts and staying engaged throughout the lesson. These responses mirror earlier findings from Slavin (2015), Huang and Hew (2018), and Wijayanti et al. (2022), who emphasized that integrating games into cooperative learning enhances student enthusiasm, strengthens communication, and supports achievement.

Acceptance of the media was very high, as presented in **Table 3**. The teacher provided a 98% rating in the "very good" category, highlighting that Kaubi was enjoyable, practical, and aligned with learning objectives. Students also gave a 98% approval rating, reflecting enthusiasm and recognition of the usefulness of the media in understanding complex topics.

**Table 3. Teacher and Student Responses**

| Respondent | Score (%) | Category |
|---|---|---|
| Teacher | 98% | Very Good |
| Students | 98% | Very Good |

These positive responses reinforce the practicality and acceptability of Kaubi. They also echo findings from Slavin (2015) and Huang and Hew (2018), who argued that educational games in cooperative contexts boost motivation, participation, and communication.

Taken together, these findings confirm that Kaubi is a valid, practical, and effective medium for biology education. The significant increase in test scores demonstrates that the integration of familiar games with cooperative structures can bridge the gap between entertainment and education, particularly in topics considered abstract or sensitive. The practicality tests show that the medium is well-received and user-friendly, though adjustments are necessary to accommodate the diverse abilities of a full class. The growth in communication skills underscores the potential of Kaubi not only to improve learning outcomes but also to foster essential 21st-century competencies, which are often neglected in traditional teacher-centered classrooms.

Nevertheless, some challenges were noted. The medium requires sufficient instructional time, as the TGT model combined with card-based gameplay involves multiple stages that cannot always be completed within standard lesson hours. Additionally, the diversity of student abilities in larger classes necessitates strong teacher facilitation to maintain balanced participation. Finally, while respect and participation improved, the ability to provide clear explanations requires further

reinforcement through additional instructional strategies. These limitations highlight opportunities for refining both the design of Kaubi and its classroom implementation.

In conclusion, the study demonstrates that Kaubi can be a valuable innovation in biology education, particularly for complex topics such as the reproductive system. By integrating cooperative learning and game-based media, Kaubi enhances cognitive achievement, strengthens communication skills, and creates a positive and engaging classroom atmosphere. These outcomes contribute to addressing the persistent challenges of low communication skills and passive learning in Indonesian classrooms. Moreover, the success of Kaubi suggests that adapting simple yet popular games into educational tools can be a practical and effective approach for improving the quality of biology education at the secondary school level.

## CONCLUSIONS AND RECOMMENDATIONS

This study concludes that *Kartu Uno Biologi* (Kaubi), a learning media developed by integrating UNO cards with the Teams Games Tournament (TGT) cooperative model, is valid, practical, and effective for secondary school biology learning. Validation results from experts confirmed the appropriateness of the content, design, and language, while trials at the individual, small group, and field levels demonstrated that Kaubi was engaging, easy to use, and supportive of learning objectives. The implementation of Kaubi significantly improved students' conceptual understanding of the human reproductive system, with an N-Gain score of 0.669 in the medium improvement category. These findings indicate that the use of cooperative learning supported by game-based strategies can effectively facilitate mastery of abstract concepts.

In addition to cognitive achievement, Kaubi also contributed to the enhancement of students' communication skills. Respecting interlocutors and expressing ideas were the most developed indicators, reflecting the cooperative and

interactive nature of the learning process. However, the ability to provide clear and detailed explanations was still relatively weaker, suggesting the need for additional scaffolding and teacher support to strengthen verbal articulation of scientific concepts. Teacher and student responses, both reaching 98%, further emphasized the high level of acceptance and the potential of Kaubi to be applied in classroom settings.

Based on these results, several recommendations can be proposed. Future research is encouraged to expand the application of Kaubi to other biology topics or broader science subjects to test its versatility. Refinements to question design and communication scaffolding are suggested to improve clarity in scientific explanations. Further studies may also include larger and more diverse samples across different educational levels and school contexts, in order to validate consistency and generalizability of the findings. Through these efforts, Kaubi can continue to contribute to the development of innovative, engaging, and effective science education practices.

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