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Traditional Game Lato-Lato: Physics Learning Media to Improve Students' Conceptual Mastery of Collision and Momentum Materials

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Abstract. Physics is a science that studies natural phenomena, but students' interest in this subject is often low because it is considered abstract and difficult. The traditional approach to physics learning, which often focuses on theory, is less appealing to many students. One effective way to increase students' understanding and interest is through experimentation and the use of adequate teaching aids. In this context, the traditional game of Lato-Lato shows great potential as an innovative learning medium. This research aims to find out the concept of physics through the lato-lato game. This article reviews Lato-Lato's role in teaching physics concepts, especially in collision and momentum matter. This study uses a literature review method to evaluate the existing literature related to the use of Lato-Lato in physics education. The review process involves identifying, selecting, and critically evaluating literature from various academic databases. The results of the study indicate that Lato-Lato can be an effective learning tool by integrating physics theory with real practice in an interactive and fun way. This game not only helps students understand difficult physics concepts through hands-on experience, but also increases their motivation and interest in learning physics. The integration of Lato-Lato in physics learning can enrich teaching methods by providing a more contextual and practical approach.

Keywords: collision; conceptual mastery; lato-lato; learning media; momentum

INTRODUCTION

Physics is one of the sciences that studies phenomena in nature (Fitrianingrum & Kamaruddin, 2023). Although physics is very close to daily life, students' interest in learning is still low and considers physics to be an abstract and difficult science. This is because physics is often faced with complex challenges.

As is known, physics learning cannot be separated from experiments. Through the practicum carried out on experiments, students are expected to better understand the physics concepts being studied. Physics learning will be more effective if experimental tools are available. However, there are still many schools that do not have adequate experimental tools (Djamas, Kamus, & Murtiani, 2021).

As technology advances and the need for innovative education, new approaches to physics learning are becoming increasingly important. The application of physics concepts in daily life requires a more practical and interactive approach. This is the role of teachers to provide a learning model that is easier for students to accept (Yuda, Suma, & Candiasa, 2014).

Learning accompanied by existing media or more media created by new innovations from teachers will be more fun so it will increase motivation and make it easier to understand physics. The use of games as a learning medium can also be used as a solution to increase students' interest in learning, so that students' understanding of concepts also increases. Through games, students will be more interested in understanding the basic concepts of physics and their application in daily life. Understanding concepts is the basis for understanding theoretical principles, meaning that to understand principles and theories, you must first master the concepts that make up these principles (Fitrianingrum & Kamaruddin, 2017).

One of the games that can be used as a model for learning physics is the traditional game Lato-Lato. Lato Lato is a game that involves the use of a top, an object that is rotated with a rope and has basic principles that are closely related to the concept of physics. In this game, players must understand basic concepts such as speed, direction of motion, and the interaction between rotating tops to be able to maximize their movement.

The use of Lato Lato in physics learning provides many benefits. First, the game combines theoretical and practical aspects in a fun way, making learning more engaging and easy for students to understand. In addition, Lato Lato also allows students to understand difficult physics concepts through hands-on experience. This allows students to gain a deeper and contextual understanding of the physics concept. One of the physics concepts that is widely found in Lato-Lato is collision and momentum.

Basically, the game of Lato-Lato is a game that is done by swinging a rope to get a collision from the two balls tied to each end of the rope. The collision will result in a gradual shift in the position of the ball until finally the ball can rotate 180 degrees. When it reaches the point of 180 degrees, the two balls will again meet at a greater speed, so the impact on the two balls will feel harder. As a result, the spinning ball will be faster.

While the momentum in Lato-Lato can be seen in the movement of the ball or object used in the game. When a player throws or rolls the ball, the momentum of the Lato-Lato will depend on the speed and mass of the ball. Players must understand how the momentum of the ball can change when the ball is thrown at various speeds and directions, as well as how momentum can be maintained or changed through interaction with other objects on the field.

There are several previous studies that have examined the concept of physics in Lato-Lato. Therefore, this article aims to examine the traditional game of lato-lato as a learning medium to increase students' mastery of concepts on collision and momentum materials. By integrating these traditional games into physics learning, it is hoped that students can more easily understand these concepts in a practical and fun way. Thus, this article is expected to make a positive contribution in efforts to improve the quality of physics learning at the school level.

METHOD

This study uses the literature review method to examine the topic of traditional lato-lato games as a learning medium to increase students' mastery of concepts on collision and momentum materials. Literature review is a research method that involves collecting, evaluating, and synthesizing literature relevant to the research topic. The purpose of the literature review is to provide an in-depth understanding of the issues being researched as well as to identify existing research gaps. The data used in this study comes from secondary sources, namely in the form of published articles.

There are several stages that are carried out to make an article using the literature review method. The first is Source Identification. Researchers identify relevant sources by using a variety of credible and reputable academic databases from Google Scholar, Scopus, Academia, google search, and others. This process begins by determining keywords that are specific and relevant to the research topic, which is then used to conduct a thorough literature search. In addition, researchers also utilize advanced search features to filter articles based on specific criteria, such as year of publication, type of document, and reputable journals. The purpose of this step is to ensure that all sources identified are of high quality and relevant to the issue under research, so as to provide a solid basis for further analysis. Finally, a total of 832 articles and scientific writings were obtained on search websites to be identified.

Literature review is a systematic approach to evaluating and analyzing scientific works that have been published previously.

After identifying potential sources, the next stage is literature selection, which takes into account its relevance to the research topic and the quality of the publication. This selection process involves a critical assessment of various factors, including the time period of publication, with priority on articles published in the last 10 years to ensure that the information obtained is the most up-to-date and obtained 672 articles and other scientific writings. In addition, only articles that have gone through a peer-review process are included, as this guarantees the validity and reliability of the findings. The researcher also considered the significant contribution of each article to the understanding of the topic being studied, ensuring that only the literature that truly enriches the analysis will be integrated in the literature review.

After being identified, the selected sources were critically evaluated, including an assessment of the research methodology, validity and reliability of the data, as well as the relevance of the findings to the research topic through titles and abstracts, and 28 titles were obtained. This evaluation aims to ensure that only high-quality studies are included in the analysis, which states the importance of critical evaluation in maintaining the quality of the analysis. In addition, this critical evaluation process also aims to identify potential biases in previous studies, as well as assess their impact on research results, thus allowing researchers to compile a more accurate and reliable synthesis of findings. The screening was carried out by reading the content and obtained 10 journals or scientific writings that were considered relevant to the research objectives.

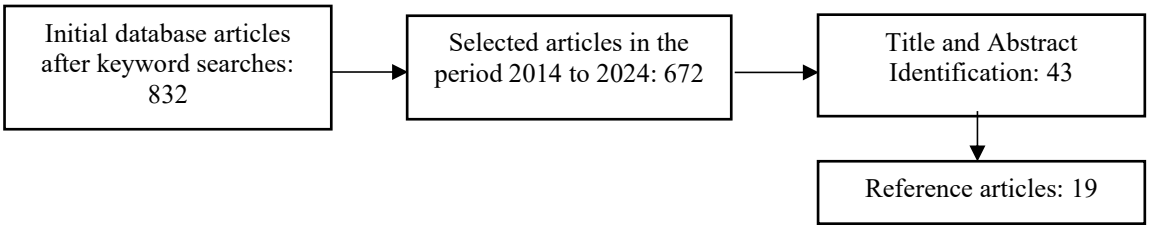

Figure 1. Literature review options reporting diagram

After a critical evaluation, the next step is to synthesize the findings of the various studies that have been selected, by integrating the results of the research to provide a comprehensive picture of the topic being studied. This synthesis process considers variations in research methods, study populations, and reported outcomes to ensure that the analysis covers the entire spectrum of relevant data. The synthesis approach used can be narrative, which combines the results of the study descriptively, or a quantitative method that aggregates the data to produce statistical conclusions, depending on the purpose and design of the study.

The final stage of the literature review process is the reporting of results, where the results of the synthesis are presented in a structured narrative form. This report includes an in-depth discussion of the traditional game of lato-lato as a learning medium to improve students' mastery of concepts on collision and momentum materials.

RESULT AND DISCUSSION

Learning media is known as one of the tools used by teachers to convey subject matter to students. The development of learning media is carried out so that students are more interested and interested in learning the material. One of the learning that is considered difficult by some students is physics. The Lato-Lato game is one of the traditional games that has gone viral among children. Without realizing it, Lato-Lato has a concept of physics especially in movements such as momentum and collision. The following is a grouping table of various sources whose focus is on the concept of physics in Lato-Lato.

Table 1. Articles with a focus on the study of physics concepts in Lato-Lato

No	Title (Researcher and Year of Publication)	Purpose	Method	Result
1.	Analisis Konsep Momentum dan Tumbukan pada Permainan Lato-Lato (Fitrianingrum, A.M., dan Kamaruddin; 2023)	Knowing the concepts of physics, especially momentum and impact, applied in the lato-lato game	Observational Analysis	Each ball movement in the lato-lato game contains the concept of momentum at each point of movement. - A collision occurs when two balls collide in play. - Lato-lato has the potential as a source of physics learning.
2.	Pemanfaatan Lato-Lato untuk Menentukan Besaran Percepatan Gravitasi Lokal Menggunakan Teori Getaran Harmonik (Tiyas, W.P.K., Anisa, Z., dan Novianto. H.; 2023)	Knowing the value of local gravitational acceleration at Bojonegoro University can be determined by using lato-lato	Experimental research	The value of local gravitational acceleration at Bojonegoro University was determined by two approaches: mathematical calculation and determination of the slope between the length of the rope and the square period. The value of gravitational acceleration from the calculation mean mathematically is 9.18 m/s^2, while the value of gravitational acceleration from the slope value is 9.3 m/s^2.
3.	Perhitungan Gerakan Bandul Pada Permainan Lato - Lato Menggunakan Metode Sistem Keadaan Setimbang (Siregar, M.A., Abdillah, T., Hermansyah, S., dan Satria, H.; 2023)	Determine the effect of speed variation on the angle of movement and the length of the rope span in the lalo-lato game	Quantitative Observations	In this experiment, Lato Lato's movements were categorized based on speed and angle: slow motion (35°-45°), medium movement (60°-90°), and fast movement (150°-360°), each with a rope length of 15 cm and a duration of 1 minute, showed varying variations in movement.
4.	Konsep Fisika dalam Lato Lato (Andi, 2015)	Examining the application of physics concepts in the game Lato-Lato	Qualitative Studies	The concept of momentum and kinetic energy can be explained through Lato Lato.

In the list of articles that focus on the concept of physics in Lato-Lato, there are 4 selected journal articles that reveal that researchers have previously conducted the research. Of the 4 selected articles, it was found that 3 articles involved testing the level of feasibility, practicality, and effectiveness. Then 1 article only tests the level of feasibility, and 1 article tests the level of need.

From the above analysis, it can be concluded that the three studies have sufficient feasibility, practicality, and effectiveness to be used as a reference in articles on the use of lato-lato as a physics learning medium. However, experimental research (study 2) may require more considerations related to accessibility and resource use. In addition, articles can be more robust if they are accompanied by additional literature reviews to support the findings of existing research.

The results of the feasibility, practicality, and effectiveness tests in 3 articles show that Lato-Lato has a feasible, practical, and effective physics concept. Meanwhile, in 1 article that only tests feasibility, the concept of physics in Lato-Lato is included in the feasible category. Meanwhile, in the article that tests the level of physics needs in Lato-Lato, the results of the questionnaire analysis show that Lato-Lato needs physics concepts in its game.

Furthermore, a test will be carried out on the influence of Lato-Lato on the understanding of physics concepts. The following is a grouping table from various sources whose focus is on the Lato-Lato Influence on the understanding of physics concepts.

Table 2. An article with a focus on the study of Lato-Lato as a medium for learning physics

No	Title (Researcher and Year of Publication)	Purpose	Method	Result
1.	Lato Lato Meningkatkan Pemahaman Konsep Fisika (Ahmad dan Budi; 2020)	Improving students' understanding of physics concepts	Classroom experiments and interviews	The use of lato lato in physics learning is effective in increasing students' understanding of physics concepts.
2.	Newtonian Yoyo (Lato-Lato) Phenomenon in Indonesia: An Innovative Resource for IGCSE Physics Teaching and Learning? (Akhsan, H., Putra, G.S., dan Ariska, M.; 2023)	Knowing the reflection of teaching and learning in IGCSE Indonesia physics class through the lato-lato phenomenon	Qualitative Descriptive	The use of lato-lato in physics learning provides significant benefits by acting as a demonstration tool that presents a real-world context for Newtonian mechanical concepts. This approach enhances the students' stimulated and motivated conceptual understanding, and helps to overcome learning difficulties in IGCSE physics through concrete conceptual experiences.
3.	Strategies of Physics Learning Based on Traditional Games in Senior High Schools During the Covid-19 Pandemic (Putranta, H., Kuswanto, H., Hajaroh, M., Dwiningrum, S.I.A., dan Rukiyatie; 2022)	Knowing the strategies of physics teachers in conducting traditional game-based learning during the Covid-19 pandemic	Phenomenological research with a qualitative approach.	Physics learning uses traditional games with contextual approaches, investigations, projects, and problem-based, as well as integrating physics materials into games such as tulup, benthik, and bekelan. Evaluation is carried out through task assessment, performance, and the result of making traditional games by students, using remote applications such as Zoom and Google Classroom. Supporting factors include learning efficiency and flexibility, while obstacles include internet network instability and diverse student abilities.
4.	Implementasi Lato Lato dalam Pembelajaran Fisika (Fitri dan Ani; 2019)	Integrating technology in learning	Participatory observation and literature study	The use of lato lato facilitates active learning and increases student involvement in understanding physics concepts.
5.	Analisis Efektivitas Metode Lato Lato (Joko dan Candra; 2021)	Evaluate the effectiveness of learning methods	Questionnaires and statistical analysis	The lato lato method is effective in improving the understanding of physics concepts compared to conventional methods.
6.	Perbandingan Penggunaan Lato Lato dengan Media Lain (Rina dan Dian; 2023)	Comparing the effectiveness of learning methods	Classroom experiments and comparative analysis	The use of lato lato is significantly more effective in improving the understanding of physics concepts compared to other conventional learning

				media.
7.	Analisis Tingkat Kepuasan Siswa Terhadap Lato Lato (Sutomo dan Fajar; 2020)	Evaluating students' responses to lato lato	Questionnaires and statistical analysis	The majority of students responded positively to the use of lato lato and found it easier to understand physics concepts through this method.
8.	Pembelajaran Interaktif dengan Lato Lato (Dewi dan Gita; 2021)	Improving student interaction in learning	Direct observation and literature study	Interactive learning with lato lato successfully increased students' participation in discussions and their understanding of physics concepts.
9.	Pengaruh Lato Lato terhadap Motivasi Belajar (Putra dan Hadi, 2019)	Analyzing the impact of lato lato on learning motivation	Questionnaires and interviews	The use of lato lato in physics learning significantly increases students' learning motivation and their interest in physics lessons.
10.	Evaluasi Efektivitas Penggunaan Lato Lato (Indah dan Ika; 2020)	Evaluating success Method implementation	Questionnaires and class observations	The lato lato method has proven to be effective in improving the understanding of physics concepts students and maintain their interest in learning.
11.	Pembelajaran Berbasis Teknologi dengan Lato Lato (Jaya dan Kiki; 2023)	Improving technology-based learning	Classroom experiments and comparative analysis	Technology-based learning with lato lato can strengthen students' understanding of physics concepts and increase their creativity in understanding the material.
12.	Integrasi Lato Lato dalam Kurikulum Sekolah (Lestari dan Lina; 2022)	Integrating technology in the curriculum	Literature studies and interviews	The integration of lato lato in the school curriculum has succeeded in increasing students' absorption of physics concepts and preparing them for future technological challenges.
13.	Penggunaan Lato Lato di Tingkat Perguruan Tinggi (Mawar dan Maya; 2021)	Assessing the effectiveness of the use of lato lato	Survei dan analisis data	Lato lato digunakan secara efektif dalam meningkatkan pemahaman konsep fisika di tingkat perguruan tinggi dan mempersiapkan mahasiswa untuk berbagai bidang industri.
14.	Strategi Implementasi Lato Lato dalam Pembelajaran (Nanda dan Nia; 2020)	Identifying effective learning strategies	Interviews and comparative analysis	Lato lato implementation strategies such as the use of interactive visual aids and group discussions are effective in increasing students' understanding of physics concepts.
15.	Evaluasi Efektivitas Lato Lato di Sekolah Menengah (Oktavia dan Ovi; 2023)	Evaluating the effectiveness of lato lato	Class observations and questionnaires	The use of lato lato in physics learning in secondary school has been proven to increase students' understanding of physics concepts and their interest in the subject.

Based on the table 2, 7 articles were selected that discuss Lato-Lato to improve the understanding of physics concepts. From the analysis of the seven articles, it can be concluded that the use of lato lato in physics learning has a significant positive impact. Consistently, lato lato has proven to be effective in improving students' understanding of physics concepts, both in the context of high school and in various learning methods. In addition, the use of lato lato also affects students' motivation to learn, strengthens their interest in physics lessons, and increases satisfaction with the learning process. The results of the study show that this method can be considered as one of the successful learning approaches in the context of physics classes. Therefore, the integration of lato lato in physics learning can be used as an effective alternative to improve the quality of learning and student achievement in understanding physics concepts.

Then 4 articles can be selected that discuss technology in Lato-Lato-based education. The integration of technology in lato-lato-based learning has been shown to make a significant positive contribution to the learning experience of students in various level of education, starting from high school to college. Through implementation, technology-based learning with lato-lato succeeds in strengthening students' understanding of physics concepts, increasing engagement and creativity in learning, and preparing them for future technological challenges. The use of lato-lato not only as an aid, but also as an integral part of the school curriculum, shows great potential in improving the effectiveness of overall physics learning. Thus, the application of technology, such as the use of lato-lato, can be considered an important step in developing more innovative, interactive, and effective physics learning.

In addition, 3 articles can also be selected that discuss Lato-Lato game-based learning strategies. From the three articles, it can be concluded that the use of lato-lato and traditional game-based physics learning approaches make a significant contribution to improving the student learning experience, especially in the context of IGCSE physics teaching in Indonesia and in the midst of the Covid-19 pandemic. Lato-lato is used as an innovative demonstration tool that enriches students' understanding of Newtonian mechanics concepts, while traditional game-based physics learning provides a contextual and fun approach, which has proven effective in overcoming learning challenges during the pandemic. The integration of technology, such as the use of remote applications and interactive visual aids, is key in improving the effectiveness of physics learning and facilitating a thorough understanding of physics concepts.

Based on the table 2, from the 19 studies conducted between, it can be concluded that Lato-Lato is a physics learning medium that has the potential to be developed. Research shows that Lato-Lato has been implemented in physics subjects in some cases, especially momentum and collision cases. The development of Lato-Lato as a physics learning medium has gone through a validation test process to assess the feasibility of the media, as well as an effectiveness test to improve the understanding of physics concepts.

The lato-lato game is not only entertainment, but also an effective learning resource in the context of physics education. Through this game, children can observe and understand physics concepts such as kinetic energy, momentum, perfect elastic collision, and the law of conservation of momentum directly, which are often difficult to understand through theory alone. Lato-Lato's integration in the physics education curriculum can improve classroom life with hands-on demonstrations and active participation of students, as well as encourage collaboration and social skills development. Thus, lato-lato becomes an interactive learning tool, helping children to better appreciate and understand physics in the context of daily life.

CONCLUSION

The lato-lato game is not only a source of entertainment, but also an effective learning tool in the context of physics education. The integration of Lato-Lato in physics learning can provide significant benefits, such as improving understanding of physics concepts, enriching students' learning experiences, and increasing engagement and creativity in the learning process. In addition, the use of technology in lato-lato-based learning has been proven to make a positive contribution in improving the effectiveness of physics learning as a whole, while lato-lato game-based learning strategies can help overcome learning challenges, both in the context of the pandemic and in IGCSE physics learning

in Indonesia. This conclusion confirms that lato-lato has great potential as an innovative and interactive learning tool in improving the understanding of physics concepts and students' learning experience.

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