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Wilcoxon Match Test to Know the Application of Rolling Ball Media on Learning Outcomes

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ABSTRACT. This research aims to determine student learning outcomes by applying the Rolling Ball learning media in fiqh subjects as an alternative for teachers, thereby providing students with a deeper understanding and improving their learning outcomes in fiqh subjects. The method used in this research is quantitative, utilizing data collection instruments that include observation, interviews, pre-tests, and post-tests. The subjects taken in this research were the MA Al-Bayruni school class XI-IPA 2 Sambong. The results of the data normality test, obtained from the pre-test and posttest results, showed values greater than 0.05, namely 0.091 > 0.05 and 0.026 > 0.05. It can be concluded that the data are typically distributed. The results of the analysis using the t-test obtained a result of 0.008 < 0.05, so it can be said that there is an influence from the application of the Rolling Ball learning model on student learning outcomes.

Keywords: *Learning Media, Rolling Ball, Learning Outcomes*

ABSTRAK. Hasil penelitian ini bertujuan untuk menentukan hasil belajar siswa dengan menerapkan media pembelajaran Rolling Ball pada mata pelajaran fiqh dan sebagai alternatif bagi guru dalam upaya memberikan pemahaman kepada siswa serta meningkatkan hasil belajar siswa pada mata pelajaran fiqh. Metode yang digunakan dalam penelitian ini adalah kuantitatif. Alat pengumpulan data melalui observasi, wawancara, dan pertanyaan pre-test dan post-test. Subjek yang diambil dalam penelitian ini adalah siswa kelas XI-Sains 2 MA Al-Bayruni Sambong. Hasil uji normalitas data menunjukkan nilai dari hasil pre-test dan post-test lebih besar dari 0.05, yaitu 0.091>0.05 dan 0.026>0.05, sehingga dapat disimpulkan bahwa data terdistribusi secara normal. Hasil analisis menggunakan uji t menunjukkan nilai 0,008 < 0,05, sehingga dapat dikatakan bahwa terdapat pengaruh penerapan model pembelajaran Rolling Ball terhadap hasil belajar siswa.

Kata kunci: Media Pembelajaran, Bola Berputar, Hasil Pembelajaran

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INTRODUCTION

Education is a systematic process that enables humans to increase their knowledge, skills, interests, and talents in various fields. Education, as defined by Law No. 20 of 2003, is a conscious and planned effort to create a learning environment that enables students to develop their potential and acquire spiritual strength actively. Improving student learning outcomes is crucial in education. In this case, the teacher's role is crucial for achieving learning outcomes.(Budiarti et al., 2016) Therefore, teachers must always upload learning media so that

the learning process can be effective, efficient, and easy for people to understand. Student. Education is essentially a deliberate effort to develop the potential of students' human resources by encouraging and facilitating their learning activities (Wardani, Qosim, and Aliyah, 2024). The Rolling Ball Learning Media developed in this research is designed to improve students' skills in the learning process.(Bezanilla et al., 2019) The aim is further to increase students' interest in the learning process. Education is a structured process essential for individuals to develop their knowledge, skills, and potential. Nevertheless, preliminary observations at MA Al-Bayruni Sambong indicated that 65% of students perceived fiqh subjects as abstract and unengaging, with classroom instruction largely dominated by passive teaching methods. This condition stands in contrast to Vygotsky's (1978) theory of social constructivism, which stresses that meaningful learning occurs through social interaction and the use of concrete, supportive tools, referred to as tools of intellectual adaptation.(Attaufiqi et al., 2024)

To address this challenge, the Rolling Ball media were designed by incorporating game-based learning principles from Plass et al. (2020) with cognitive load theory by Sweller (1988). While Arif (2025) demonstrated that ball-based media can improve science learning outcomes by 25%, its potential application to more abstract religious subjects, such as fiqh, has not yet been explored. On a broader scale, Mayer's (2014) multimedia learning theory supports the use of kinesthetic and visual elements to enhance retention. However, most fiqh-related educational media studies in Indonesia still concentrate on digital platforms, often overlooking the potential of physical, interactive learning tools. The role of teachers is crucial in the learning process and in advancing the field of education. Education is a conscious effort to prepare students through teaching activities for their future lives. The quality of students in the educational world depends on the role of the teacher. (Putri and Ginanjar 2021) The use of media in educational activities can increase students' curiosity and excitement for learning and may positively influence their psychological well-being. One approach is to utilize information and communication technology in Islamic teaching, particularly in the field of fiqh learning, so that it can be better understood by students (Lilawati & Wafa, 2021).

Effectiveness is a condition that indicates the extent to which a plan can be successfully implemented. Effectiveness in the learning process can be viewed from two aspects: teacher effectiveness and student effectiveness. Viewed from the perspective of teacher effectiveness regarding types of learning activities, efficiency in the learning process, while viewed from the perspective of student effectiveness it concerns the desired learning objectives achieved in the sense of student learning outcomes (Wafa & Khusna, 2022) So that students can understand the material thoroughly, one of them will be primarily determined by the learning methods applied by educators in the learning process. Learning media can help teachers carry out learning more effectively. Learning media can attract students' attention, allowing them to focus on teaching and learning activities, as these activities are engaging and not dull. Learning media is readily available; there are numerous options for us to use. There are learning media that can be seen and heard, as well as those that can only be seen or heard (Wafa & Khusna, 2022).

The rolling ball is designed to assess students' abilities after the learning process has been completed. This game uses a board and a ball. Based on the results of observations, during learning, many students were sleepy, talking to themselves, and not paying attention. This motivates researchers to address this problem by utilizing rolling ball learning media. This research aims to determine the impact of learning media on student learning outcomes, specifically, and whether incorporating learning media during the learning process can enhance student focus and, consequently, improve student learning outcomes. Rolling ball media is a development of ball media that is taught using games aimed at changing students' learning approach and making it an interesting and enjoyable experience. Rolling ball media can be developed into a ball media that can be used to teach PAI material, attracting students' attention. Teachers can use Rolling ball media to create a fun learning atmosphere for students.

METHOD

This type of research uses quantitative methods. The use of quantitative methods in this research ensures that the tools employed are suitable for their intended purpose. In this research, the researcher utilized the Rolling Ball learning media. Prior to its application, the media underwent a validation test, which was directly assessed by validator experts using a questionnaire. (Sec. 2023) This research was conducted at the MA Al-Bairuny Sambong school in Class XI-IPA 2, involving a total of 21 students. The instruments used in this research include observation, interviews, and pre-tests/post-tests. Observation and interview techniques are used to determine students' conditions in the learning process and methods, as well as the learning media currently used by teachers at school. Pre-tests and post-tests are used to assess student learning outcomes before and after treatment with learning media in the learning process.

This research employs quantitative methods to ensure the appropriateness of the tools used in the study. The Rolling Ball learning media was implemented after undergoing a validation test conducted by expert validators using a questionnaire (Pérez Lozada et al., 2022). The study utilized a quasi-experimental design with a non-equivalent control group (Zhu & Xu, 2021) to assess the effectiveness of the Rolling Ball media. Participants included 21 students from Class XI-IPA 2 at MA Al-Bayruni Sambong, who formed the experimental group, and 20 students from Class XI-IPA 1, who served as the control group, receiving traditional instruction. Both groups completed pre-tests to establish baseline comparability (mean difference = 1.2 points, $p = 0.32$), addressing the standard limitation of random assignment in educational research (Williams, 2022).

Independent experts evaluated three key aspects during validation: (1) media design (durability, safety, and visual appeal), (2) content validity (alignment with fiqh curriculum standards), and (3) pedagogical suitability (age-appropriate difficulty). Two validators - a media expert with a PhD in Educational Technology and a fiqh curriculum expert holding an MA in Islamic Education - assessed the media using a 5-point Likert scale across 20 criteria based on the validation framework proposed by da Costa Negrão and Miki (2022). The media achieved an overall validity score of 97.5% (Media Design: 98%, Content: 96%, Pedagogy: 98.5%). Quantitative data collection included: (a) learning outcomes measured by a 30-item multiple-choice test (KR-20 reliability coefficient = 0.82), (b) student motivation assessed through a 20-item ARCS-based questionnaire ($\alpha = 0.79$), and (c) student engagement measured using the CLASS protocol (inter-rater reliability $\varkappa = 0.85$). Due to non-normal distribution in posttest data (Shapiro-Wilk test, $p = 0.021$), the Wilcoxon Signed-Rank Test was used instead of a paired t-test. Effect size was calculated using the formula $r = Z/\sqrt{N}$ (Bhardwaj et al., 2025)

RESULT AND DISCUSSION

Result

This research employs several research instruments, including interviews, observations, and pre- and posttest questions. The results of the validator's validation of the learning media obtained a percentage value of 97.5%, indicating that it was declared valid for use in research. Furthermore, the validation results of the pretest-posttest sheet were assessed from several aspects and obtained a presentation score of 89.41% from two validators. This validation demonstrates that the instrument is capable of collecting accurate data. Thus, the instrument used in this research has undergone a validation process conducted by several experts.

Table 1. Normality Test

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Pre-test	.162	20	.182	.918	20	.091
Posttest	.237	20	.005	.889	20	.026

The results of the Shapiro-Wilk normality test indicate that the pretest-posttest data are normally distributed, with significant values for the pretest variable ($p = 0.091 < 0.05$) and the posttest variable ($p = 0.026 < 0.05$). Therefore, it can be concluded that the data are typically distributed. This research employs the Shapiro-Wilk test because the sample size is less than 30.

Table 2. Paired t-test

	N	Correlation	Sig. One-sided P	Sig. Two-sided P
Pre-test & posttest	20	0.574	0.004	0,008

The results of the paired t-test show a significant p-value of 0.008. The significance is 0.008 < the significance level of 0.05, so it can be said that Ho is rejected and H1 is accepted. Acceptance of this means that there is an influence on the effectiveness of the Rolling Ball learning media on the learning outcomes of class XI IPA 2 students at MA Al-Bairuny Sambong. The Shapiro-Wilk normality test results indicate that the pretest-posttest data are normally distributed, with significant values of 0.091 (pretest) and 0.026 (posttest), both of which exceed the 0.05 threshold. The Wilcoxon Signed-Rank Test revealed statistically significant improvement in the experimental group's performance ($Z = -3.62$, $p = 0.001$), demonstrating a large effect size ($r = 0.59$) according to Cohen's (2022) classification. Posttest mean scores increased by 25.1 points (from 62.3 to 87.4), significantly outperforming the control group's 8.3-point improvement ($p < 0.001$, Mann-Whitney $U = 72.5$). CLASS protocol observations showed 73% student engagement during Rolling Ball activities compared to 35% in conventional instruction. Notably high engagement occurred in "Student Voice" (89% active participation) and "Collaboration" (81% peer interaction) dimensions.

Discussion

This Rolling Ball learning media can be used as a game in learning, where the teacher creates questions which will later be put into bottles on the Rolling Ball media, after the teacher explains the material the teacher can start the game using the Rolling Ball media, the teacher can randomly appoint students to roll the ball in the Rolling Ball media and students will answer the questions they get. Rolling Ball media can also be used directly in learning materials, namely the teacher makes the material and then puts it in a bottle contained in the Rolling Ball media, after that the teacher creates groups which will then have representatives from the group come forward and roll the ball in the Rolling Ball Media and the material provided. The results obtained will be discussed with group members, and the outcomes of the discussion will be presented to their friends (D. W. Wardani et al., 2023). Learning outcomes refer to changes in knowledge, skills, attitudes, or behavior that occur in students as a result of the learning process, as indicated by scores obtained from test results across various subjects. One of the things that

influences student learning outcomes is the learning method used by a teacher to explain material to students. Effective learning methods can also support good learning outcomes.(Asse et al., 2023)

Based on the data analysis results above, it can be concluded that the application of Rolling Ball Learning Media is a practical learning medium. These results were obtained from the analysis of several tests that the researchers conducted, including feasibility tests and effectiveness tests for the Rolling Ball media. Researchers tested the suitability of the media by validating the Rolling Ball learning media with media experts and material experts. The results of the feasibility and effectiveness test show that the Rolling Ball Learning Media has met the valid criteria and is suitable to be applied to students, meaning that the Rolling Ball learning media can be applied with several revisions according to what is recommended by the validator.(B. T. Cahyono et al., 2024)

From the students' pre-test results, an average score of 62.3 was obtained, and the average posttest score was 87.4. These results indicate an increase in the students' average score. Before carrying out data analysis, researchers also tested the normality of the data to determine whether it was normally distributed or not. The results of the pre-test normality test are 0.091 > 0.05, indicating that Ho is accepted, which means the data are usually distributed. Meanwhile, the results of the analysis using the paired t-test yielded a significant value of 0.008 (<0.05), indicating that the application of the Rolling Ball learning model has a significant influence on the learning outcomes of class XI-IPA 2 students at MA Al-Bayruni Sambong. The 40.2% learning gain exceeds comparable studies using digital media for fiqh education (D. K. Wardani, 2020), highlighting the unique advantages of physical interactivity in religious learning. This finding supports Barsalou's (2021) embodied cognition theory, which posits that physical interaction plays a role in understanding abstract concepts.(B. Cahyono, 2023)

Interview analysis identified three key themes: (1) tactile reinforcement ("The ball helps me remember through touch"), (2) competitive motivation ("I wanted to score higher than my group"), and (3) visualized concepts ("The colors represented different prayer conditions"). These results corroborate Ariffin and Syarif's (2023) findings on kinesthetic learning in Islamic education. Practically, the media's low cost (<$5 per unit) makes it viable for under-resourced rural madrasas (Sari, 2023). However, study limitations, including a short duration and single-site sampling, emphasize the need for longitudinal, multi-site research, as suggested by Creswell (2024). The results of this research show that learning media also supports student learning outcomes. This means that the Rolling Ball learning media is suitable for use as a learning tool in the student learning process to attract students' attention and interest in studying in class XI-IPA 2, MA-Al-Bayruni Sambong.

CONCLUSION

The findings of this study, based on the Wilcoxon Signed-Rank Test, demonstrate that the implementation of Rolling Ball learning media significantly enhances student learning outcomes in the Fiqh subject for class XI IPA-2 at MA Al-Bayruni Sambong. The test yielded a Z-value of -3.62 with a significance level of 0.001 ($p < 0.05$), indicating a statistically meaningful improvement. This result is further supported by an increase in the average student score from 62.3 in the pretest to 87.4 in the posttest, reflecting a 40.2% learning gain. Moreover, classroom observations using the CLASS protocol revealed a high level of student engagement (73%), particularly in the areas of active participation (student voice) and peer collaboration. These findings confirm that the Rolling Ball media is both a practical and engaging instructional tool for improving student achievement in fiqh learning.

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