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EFEKTIVITAS *BLENDED LEARNING* BERBASIS APLIKASI *MOBILE* TERHADAP KEMAMPUAN KOGNITIF DAN AFEKTIF SISWA DALAM PENDIDIKAN JASMANI

THE EFFECTIVENESS OF MOBILE APP-BASED BLENDED LEARNING ON STUDENTS' COGNITIVE AND AFFECTIVE COMPETENCIES IN PHYSICAL EDUCATION

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Abstrak

Perkembangan teknologi informasi dan komunikasi telah memberikan dampak yang signifikan terhadap dunia pendidikan, termasuk dalam proses pembelajaran pendidikan jasmani. Pembelajaran yang sebelumnya hanya dilakukan secara konvensional kini beralih ke arah digitalisasi dan penggunaan teknologi berbasis aplikasi. Penelitian ini bertujuan untuk menguji efektivitas pembelajaran campuran berbasis aplikasi seluler dalam meningkatkan kompetensi kognitif dan afektif siswa dalam pendidikan jasmani. Metode yang digunakan adalah quasi-eksperimen dengan desain kelompok kontrol pra-tes dan pasca-tes. Subjek penelitian terdiri dari 60 siswa SMA yang dibagi menjadi dua kelompok, yaitu kelompok eksperimen (n=30) yang menggunakan pembelajaran campuran berbasis aplikasi seluler dan kelompok kontrol (n=30) yang menggunakan pembelajaran konvensional. Hasil penelitian menunjukkan bahwa kelompok eksperimen mengalami peningkatan skor kognitif dari 56,4 menjadi 82,7 dan skor afektif dari 60,1 menjadi 85,3. Sementara itu, kelompok kontrol mengalami peningkatan skor kognitif dari 55,8 menjadi 69,4 dan skor afektif dari 59,7 menjadi 70,2. Hasil uji t menunjukkan perbedaan yang signifikan antara kedua kelompok ($p < 0,05$). Penelitian ini menyimpulkan bahwa pembelajaran campuran berbasis aplikasi seluler efektif dalam meningkatkan kompetensi kognitif dan afektif siswa.

Kata kunci: *blended learning*, aplikasi *mobile*, kognitif, afektif, siswa, pendidikan jasmani

Abstract

The development of information and communication technology has had a significant impact on the world of education, including in the process of physical education learning. Learning, which was previously only done conventionally, has now shifted towards digitization and the use of application-based technology. This study aims to examine the effectiveness of mobile application-based blended learning in improving students' cognitive and affective competencies in physical education. The method used is a quasi-experiment with a pre-test and post-test control group design. The research subjects consisted of 60 high school students divided into two groups, namely the experimental group (n=30) who used mobile application-based blended learning and the control group (n=30) who used conventional learning. The results showed that the experimental group experienced an increase in cognitive scores from 56.4 to 82.7 and affective scores from 60.1 to 85.3. Meanwhile, the control group experienced an increase in cognitive scores from 55.8 to 69.4 and affective scores from 59.7 to 70.2. The t-test results showed a significant difference between the two groups ($p < 0.05$). This study concluded that mobile application-based blended learning is effective in improving students' cognitive and affective competencies.

***Keywords**: blended learning, mobile app, cognitive, affective, students, physical education*

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INTRODUCTION

The development of information and communication technology has had a significant impact on the world of education, including the physical education learning process. Previously conducted solely through conventional methods, learning has now shifted towards digitalization and the use of application-based technology (Guillén Gámez & Perrino Peña, 2020; Sospedra Harding et al., 2021; Syafruddin, 2023; Volcu & Volcu, 2024; Yildiz et al., 2019). Physical education, known as physical activity in this field, is also required to follow this trend to improve learning effectiveness and respond to 21st-century challenges, particularly in developing students' comprehensive competencies (Fanany et al., 2024; Raibowo et al., 2023).

The blended learning model is an approach that combines face-to-face and online learning. This model provides flexibility, broad access to information, and a more personalized learning experience (Niyomves et al., 2024; Siddiqui et al., 2024; C. Wang et al., 2023). In the context of physical education, blended learning allows teachers to deliver theoretical material online, while practical activities continue in person. However, many physical education teachers have not optimally utilized this approach due to limited resources or lack of training in the use of educational technology.

Previous studies have examined the effectiveness of blended learning in improving cognitive learning outcomes in various subjects, such as mathematics, science, and language (Pratama & Roesdiyanto, 2022; Zhang et al., 2018). However, very little research has specifically examined the implementation of mobile app-based blended learning in physical education, particularly in terms of developing students' cognitive and affective competencies. In fact, physical education is not only about motor skills, but also about shaping attitudes, values, and a comprehensive understanding of physical fitness concepts.

Studies show that students are more actively engaged when the learning process uses interactive digital media (Peng, 2024). Meanwhile, other research shows that mobile learning in physical education can increase students' interest and understanding of the material (Lim, 2017). However, neither study fully integrated blended learning models nor quantitatively measured students' affective competencies, a key indicator in physical education.

On the other hand, the use of mobile applications in learning is increasingly relevant amidst the lifestyles of the digital generation. Mobile-based applications have the advantage of being easily accessible anytime and anywhere, and can present material in the form of text, audio, video, and interactive quizzes (Husnita et al., 2023; Zhang et al., 2018). Therefore, the integration of blended learning and mobile applications has great potential to create a more meaningful and enjoyable learning experience for students, particularly in physical education.

The uniqueness of this study lies in the systematic development and implementation of a blended learning model based on mobile applications in the context of physical education. This study also focuses on two under-recognized learning outcomes: cognitive and affective competencies, which play a significant role in character development, conceptual understanding, and students' positive attitudes toward physical activity.

Based on this background, the purpose of this study is to test the effectiveness of mobile application-based dual learning in improving students' cognitive and affective competencies in physical education. This research is expected to provide alternative learning strategies that are adaptive to technological developments and encourage physical education teachers to be more creative and innovative in designing the learning process.

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The results of this study are expected to provide theoretical and practical contributions to the development of physical education learning models in the digital era. Theoretically, this research can enrich scientific studies on blended learning in the field of physical education. Practically, this research can serve as a reference for teachers, curriculum developers, and educational policymakers in designing learning that is relevant, effective, and centered on the needs of 21st-century students.

METHOD

This study used a quantitative approach with a quasi-experimental method and a pre-test and post-test control group design. This design was used to compare learning outcomes between two groups: one using mobile app-based blended learning and one using conventional learning.

Table 1. Pre-Test and Post-Test Control Group Research Design

Group	Initial Test	Intervention	Post-Intervention Test
Control	Cognitive and Affective Test	Mobile App-Based Blended Learning	Cognitive and Affective Test
Experimental	Cognitive and Affective Test	Conventional Learning	Cognitive and Affective Test

This research was conducted at State Vocational High School 14 Medan, North Sumatra Province. The study lasted for two months, from March to April 2025, covering the preparation stage, intervention implementation, and data collection and analysis. The population in this study were all 11th grade students taking physical education in the even semester of the 2024/2025 academic year. The sample consisted of 60 students selected using a purposive sampling method, with the criteria of having an Android smartphone and an adequate internet connection. The sample was then divided into two groups: 30 students as the experimental group and 30 students as the control group.

Table 2. Characteristics of the Research Sample

Group	n	Average Age	Gender	Smartphone Ownership
Experimental	30	16,2 ± 0,5	17/13	100%
Control	30	16,1 ± 0,4	16/14	100%

The experimental group participated in learning using a specially designed mobile app-based blended learning model. The app included theoretical learning materials, videos demonstrating physical activity, interactive quizzes, and a discussion forum. Meanwhile, the control group received learning through conventional lectures and physical exercises.

Data collection was conducted using two types of instruments: a multiple-choice test to measure cognitive competence and a Likert-scale questionnaire to measure students' affective competence. The cognitive test was developed based on indicators of students' understanding of the concepts and knowledge of the material being taught. Meanwhile, the affective questionnaire measured students' attitudes toward physical activity, cooperation, responsibility, and interest in participating in learning.

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Table 3. Cognitive Competence Measurement Indicators

No.	Cognitive Indicators	Question Format	Number of Questions
1	Understanding the concept of physical fitness	Multiple Choice	5
2	Explaining the benefits of physical activity	Multiple Choice	5
3	Identifying the principles of exercise	Multiple Choice	5
	Total		15

Table 4. Affective Competence Measurement Indicators

No.	Affective Indicators	Questionnaire Statements	Likert Scale
1	Responsibility	"I complete assignments on time"	1–5
2	Cooperation	"I am able to work in a team"	1–5
3	Interest in Physical Activity	"I enjoy physical education lessons"	1–5
4	Discipline	"I follow the teacher's instructions accurately"	1–5

Before use, the tools were tested for validity and reliability. Content validity was obtained through expert assessment by three lecturers who are experts in the fields of physical education and learning technology, as shown in Table 5.

Table 5. Results of Validity and Reliability Tests of Research Instruments

Instrument Type	n	Expert Score1	Expert Score2	Expert Score3	Average Validity Score	Cronbach's Alpha	Information
Cognitive Competency Test	15	4.6	4.4	4.8	4.6	0.812	Valid
Affective Competency Questionnaire	12	4.7	4.5	4.9	4.7	0.873	Valid

An average validity score of ≥ 4.5 indicates that all items are suitable for use according to experts. A Cronbach's Alpha value of > 0.70 indicates high reliability of the instrument.

Data analysis used descriptive and inferential statistics. Normality and homogeneity tests were conducted first to ensure the data met the requirements for parametric analysis. Next, a paired t-test was used to assess improvement in each group, while an independent t-test was used to compare scores between the experimental and control groups after treatment.

RESULTS

This study aims to determine the effectiveness of mobile application-based blended learning in improving students' cognitive and affective competencies. Analysis was conducted on the pretest and posttest results of each group, both the experimental and control groups.

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Table 6. Average Cognitive Competence Score of Students

Group	Pretest (Mean ± SD)	Posttest (Mean ± SD)	Difference
Experimental	56,4 ± 8,2	82,7 ± 6,5	26,3
Control	55,8 ± 7,9	69,4 ± 6,8	13,6

Table 6 shows that the experimental group experienced a 26.3-point increase in cognitive scores, while the control group only experienced a 13.6-point increase.

Similar results were also seen in the measurement of students' affective competencies, as shown in Table 7 below.

Table 7. Average Score of Students' Affective Competence

Group	Pretest (Mean ± SD)	Posttest (Mean ± SD)	Difference
Experimental	60,1 ± 7,5	85,3 ± 5,9	25,2
Control	59,7 ± 6,8	70,2 ± 6,3	10,5

Based on Table 7, it is known that the experimental group showed a higher increase in affective scores compared to the control group. A visualization of the comparison of the increase in cognitive and affective scores between the two groups is presented in Figure 1.

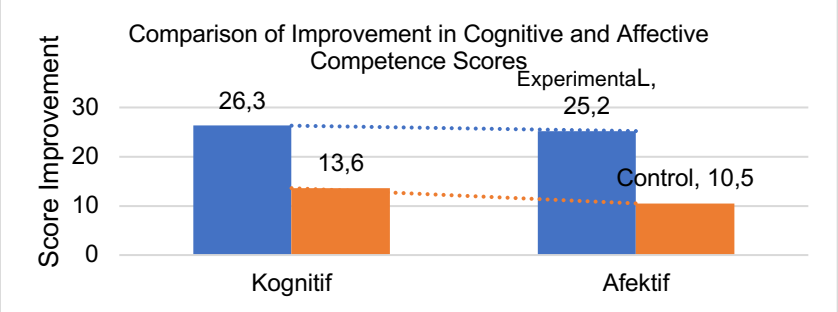

Figure 1. Comparison of Improvement in Cognitive and Affective Competence Scores

The results of the normality and homogeneity tests show that the data are normally and homogeneously distributed, as shown in Table 8 and Table 9.

Table 8. Normality Test Results (Kolmogorov-Smirnov)

Group	Variables	Sig. Pretest	Sig. Posttest	Description
Experimental	Cognitive	0.187	0.2	Normal
Experimental	Affective	0.138	0.2	Normal
Control	Cognitive	0.144	0.173	Normal
Control	Cognitive	0.168	0.193	Normal

All significance values (p) > 0.05, which means that the data are normally distributed and meet the assumptions for parametric tests.

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Table 9. Results of Homogeneity Test

Variable	F Count	Sig. (p)	Description
Cognitive	1.327	0.254	Homogeneous
Cognitive	1.108	0.296	Homogeneous

A significance value (p) > 0.05 for all variables indicates that the data have homogeneous variance, thus meeting the requirements for an independent t-test.

A paired t-test showed that the increase in scores from pre-test to post-test in both groups was statistically significant ($p < 0.05$). Meanwhile, an independent t-test on the difference in scores between the experimental and control groups also showed significant differences in both competency variables, as shown in Tables 10 and 11.

Table 10. Paired t-Test Results for Pre-test & Post-test

Group	Variables	t-count	df	Sig. (2-tailed)	Description
Experimental	Cognitive	12.35	29	0	Significant ($p < 0.05$)
Experimental	Affective	11.87	29	0	Significant ($p < 0.05$)
Control	Cognitive	7.21	29	0	Significant ($p < 0.05$)
Control	Affective	5.43	29	0	Significant ($p < 0.05$)

In the experimental group, there was a highly significant increase in cognitive ($t = 12.35$; $p = 0.000$) and affective ($t = 11.87$; $p = 0.000$) aspects. Similarly, in the control group, although the increase was lower, both aspects still showed significant results. This indicates that both mobile app-based blended learning and conventional learning can improve student competency, but with varying levels of effectiveness.

Table 11. Results of the Independent T-Test for Comparison Between Groups

Variable	t-count	df	Sig. (2-tailed)	Description
Cognitive	5.68	58	0	There is a significant difference
Affective	6.04	58	0	There is a significant difference

The analysis results showed a significant difference between the two groups, both in cognitive competence ($t = 5.68$; $p = 0.000$) and affective competence ($t = 6.04$; $p = 0.000$). This means that the mobile application-based blended learning model is more effective than conventional learning in improving student competence, especially in physical education learning.

DISCUSSION

This study shows that a mobile app-based blended learning model can significantly improve students' cognitive and affective competencies compared to conventional learning. These findings support the notion that the integration of digital technology, particularly mobile apps, into physical education learning has a positive impact on student learning outcomes beyond just motor skills.

The improvement in cognitive competency indicates that students in the experimental group were able to better understand basic physical education concepts. This aligns with constructivist theory, which states that understanding is optimal when students actively construct their knowledge through interactions with rich and diverse learning materials (Husnita et al., 2023; Lim, 2017; Peng, 2024). Mobile apps in blended learning provide access

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to learning resources such as videos, texts, quizzes, and discussion forums, all of which play a role in stimulating students' independent and in-depth thinking processes (Fanany et al., 2024; Raibowo et al., 2023).

Meanwhile, affective competency also experienced a significant increase, indicating that students became more enthusiastic, responsible, and exhibited a positive attitude toward physical education learning. This confirms previous research findings that the use of interactive learning media can increase students' interest and positive attitudes toward learning (Hidayati et al., 2024; Mujallid, 2024). In the context of blended learning, social interactions maintained through online discussion forums and enjoyable learning experiences through applications can strengthen students' affective aspects.

In terms of uniqueness, this study emphasizes that the systematic integration of blended learning strategies with mobile technology in physical education subjects has not been widely studied before. Most previous research has been limited to the use of blended learning for theory-based subjects or motor skill-based sports learning (Østerlie et al., 2023; Rahayu et al., 2020; Saputra et al., 2023). This research provides a new perspective that this model can also develop students' cognitive and affective domains in a balanced manner (Bagheri Toolaroud et al., 2024; Staiano et al., 2022; S. Wang & Higgins, 2006).

An important implication of this research is that physical education learning no longer has to be limited to physical activity on the field but can be enhanced with digital materials that broaden students' understanding and foster positive attitudes toward a healthy and active lifestyle. Teachers also gain access to alternative, more flexible, innovative, and accessible learning models tailored to the needs of students in the digital age (Indarto et al., 2024; Mushtaq & Iqbal, 2024).

Although the research results demonstrate high effectiveness, there are several limitations. First, the relatively short duration of the learning intervention (only two months) does not reflect the sustainability of long-term effects. Second, the mobile application used is still in its early development stages, so its interactive and analytical features are limited. Third, the effects of blended learning on motor skills were not explored in this study, thus comprehensive learning based on the three domains (cognitive, affective, and psychomotor) was not fully explored.

Therefore, further research is recommended over a longer period and combining analysis of all three learning domains. Furthermore, developing mobile applications with more complex features and personalized content will enhance the effectiveness of blended learning in the physical education context.

CONCLUSION

This study concludes that the implementation of mobile app-based blended learning has proven effective in improving students' cognitive and affective competencies in physical education. This learning model offers an innovative and adaptive alternative to address the challenges of learning in the digital era, where students are required not only to understand the material theoretically but also to develop positive attitudes and values toward physical activity. Blended learning allows the integration of online learning through apps with face-to-face learning while maintaining the physical practice aspect, thus creating a more comprehensive learning experience. The improvement in competency indicates that this approach can encourage active student engagement, enhance conceptual understanding, and foster a sense of responsibility, discipline, and interest in physical education.

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