(RESEARCH ARTICLE)

Check for updates

Implementation of A Barcode-Based Physical Fitness Basic Movement Learning Model For Students of Phase D, Grade 8, SMP Negeri 3 Palembang

Galih Bambang Yudoyono, Defliyanto * and Hartati

Study Program of Physical Education and Health, Faculty of Teacher Training and Education, Universitas Sriwijaya, Palembang, Indonesia.

Abstract

This study aims to describe the application of a barcode-based physical fitness basic movement learning model for phase D students of grade VIII of SMP Negeri 3 Palembang. The study used a qualitative descriptive method with data collection techniques in the form of observation, interviews, and documentation. The subjects of the study were grade VIII students involved in Physical Education learning activities. The results of the study indicate that the use of barcode media makes it easier for students to access materials, understand movements through videos and visual guides, and improve skills, interest, and learning motivation. Barcode media also helps teachers deliver materials more efficiently and interactively. Physical fitness measurement data shows that 7% of students are in the excellent category, 21% are good, 33% are sufficient, 17% are less, and 23% are very less. These findings indicate that the barcode-based learning model is effective in improving students' understanding and participation in physical fitness activities and is relevant to developments in educational technology. Further research is recommended to be conducted at the high school level with a wider scope and additional variables to strengthen learning outcomes.

Keywords: Barcode; Innovation; Physical Fitness; Learning Model

1. Introduction

National education based on the values of Pancasila and the 1945 Constitution of the Republic of Indonesia aims to develop the potential of students to become people who are faithful, have noble morals, are healthy, knowledgeable, creative, independent, and able to participate actively in social and national life [1-2]. This goal is reinforced by Law Number 20 of 2003 concerning the National Education System which emphasizes the importance of providing quality, relevant, and adaptive education to the development of the times [3].

At the Junior High School (SMP) level, one of the subjects that plays a strategic role in supporting educational goals is Physical Education, Sports, and Health (PJOK). PJOK learning not only focuses on improving physical fitness, but also supports the development of motor skills, mental, social, and character of students [4]. In Phase D, learning outcomes require students to be able to practice specific movement skills, carry out fitness activities according to training principles, and demonstrate personal and social responsibility in physical activities. Basic movement material, including physical fitness activities, is an important part that must be mastered by students at this level [5].

Facts on the ground show that physical fitness learning in junior high schools still uses a conventional approach, where teachers only rely on direct demonstrations without the support of digital media. This approach tends to make learning monotonous, less interesting, and unable to maximize active student participation—especially for eighth grade students who are at a stage of rapid physical and motor development and require more independent and meaningful learning.

* Corresponding author: Defliyanto

The low variety of methods results in decreased interest in learning, a lack of understanding of movement, and less than optimal physical fitness learning outcomes [6].

Advances in information technology have opened up opportunities for teachers to develop more innovative, efficient, and interactive learning models. One innovation increasingly used in learning is barcode or QR code technology. This technology allows students to quickly and flexibly access learning materials, demonstration videos, movement instructions, and visual guides. Various studies have shown that the use of QR codes has been proven to improve student understanding, motor skills, learning motivation, and active participation in learning activities [7-9].

Despite its great potential, the use of barcodes as a learning medium for basic physical fitness movements is still rarely implemented in junior high schools. Initial observations at SMP Negeri 3 Palembang showed that teachers have not yet optimally utilized digital media in physical fitness instruction. This has resulted in a lack of student enthusiasm and understanding of basic movements and fitness concepts. Therefore, learning innovations are needed that can bridge students' needs for more engaging, flexible learning, and support independent learning.

Based on these problems, this study develops and applies a Barcode-based basic physical fitness movement learning model through flashcard media containing theoretical materials and practical videos. This media is expected to be able to provide an interactive, easily accessible, and enjoyable learning experience for students. The selection of the title "Implementation of the Barcode-Based Basic Physical Fitness Movement Learning Model for Phase D Students of Class VIII of SMP Negeri 3 Palembang" is based on the need to present learning innovations that are relevant to the development of educational technology and are able to improve students' understanding and motor skills optimally.

2. Material and methods

This study uses a qualitative approach with a descriptive method that aims to describe in depth the application of the Barcode-based basic physical fitness movement learning model for phase D students of grade VIII at SMP Negeri 3 Palembang. The qualitative approach was chosen because it allows researchers to understand the phenomenon comprehensively through the direct experiences of students and teachers, without using numerical or statistical analysis. The focus of the study is directed at how Barcode technology can be used as a medium in PJOK learning, as well as how it impacts students' understanding and basic movement skills.

The research was conducted at SMP Negeri 3 Palembang for six weeks, involving eighth-grade students in phase D as the primary subjects. This location was chosen purposively because the school has facilities to support physical fitness learning and has previously implemented a barcode-based learning model, making it relevant to the research context. The physical education teacher and eighth-grade students also served as primary informants in data collection.

The research data was obtained through three data collection techniques: observation, interviews, and documentation. Observations were conducted to directly observe the learning process, student interactions with the Barcode media, and their level of engagement during practical activities. Interviews were conducted with the Physical Education (PJOK) teacher, the principal, and several students selected based on certain criteria to explore their experiences, perceptions, and responses to the implementation of the Barcode-based learning model. Documentation studies were used to supplement the research data through document reviews such as syllabi, lesson plans, activity photos, and other relevant learning notes.

The data analysis process uses the Miles and Huberman model, which includes three main stages: data reduction, data presentation, and conclusion drawing. In the data reduction stage, researchers simplify and group data based on specific categories, such as learning effectiveness, student understanding, and learning constraints. The next step is presenting the data in narrative form for easy understanding and further analysis. The final stage is conclusion drawing, where researchers interpret all analyzed data to gain an understanding of the effectiveness of the Barcode-based learning model.

3. Results and discussion

Data analysis in this study was conducted by calculating the norm categories for each component of the students' physical fitness test. The measurement results were then grouped into five categories: very good, good, sufficient, poor, and very poor. Each fitness indicator was analyzed to determine the students' overall physical condition. The following table presents the analysis results for each test component.

Table 1 Results of Student Physical Fitness Data Analysis

No	Indicator	Very good	Good	Enough	Less	Very less
1	Muscular Endurance	0%	0%	0%	0%	100%
2	Arm Muscle Strength	3%	16%	20%	47%	14%
3	Abdominal Muscle Strength	30%	24%	20%	27%	0%
4	Agility	3%	37%	59%	0%	0%
5	Flexibility	0%	26%	67%	9%	0%
Rata-rata		7%	21%	33%	17%	23%

Based on the table, it is known that the average physical fitness condition of students is in the sufficient category at 33%. Meanwhile, the good and very good categories reached 21% and 7%, respectively. On the other hand, the poor category was 17% and very poor at 23%. This data shows that although some students are in good physical condition, a significant proportion still needs improvement, especially in the endurance component, where all students are in the very poor category (100%). The data visualization is displayed in a diagram depicting the distribution of students' physical fitness categories. Overall, students' fitness tends to be moderate, but interventions are still needed to address endurance and arm muscle strength.

Data analysis results show that the use of barcode media in basic physical fitness movement learning has a positive impact on student participation and engagement. Observations revealed that students appeared enthusiastic and more active during the activity. They followed instructions better and showed a high level of interest in the material presented by the teacher. The barcode media used contains images and videos demonstrating various physical fitness tests, such as the Illinois Agility Test, sit-ups, push-ups, the Sit and Reach, and the Bleep Test. By scanning the barcode, students can access the materials directly using their digital devices, both at school and at home. This makes learning more flexible, interactive, and easy to follow. The use of demonstration videos helps students understand movement techniques correctly, thus reducing errors. This also significantly improves motor skills, particularly muscle strength and endurance. These findings align with the skills assessment results, which showed good and excellent improvement in several elements of physical fitness. Interviews with students confirmed these findings. Most students stated that barcode-based learning felt more modern, engaging, and made it easier for them to understand the movements. They felt more confident practicing because they could view video examples whenever needed. Furthermore, the flexibility in accessing materials made students more motivated to practice independently. Overall, the implementation of Barcode media has proven to be relevant to developments in educational technology and effective in improving the quality of physical education (PJOK) learning. This media not only enriches learning methods but also makes a positive contribution to improving students' conceptual understanding, practical skills, and motivation in physical fitness activities.

Based on the research results, the application of the Barcode-based basic physical fitness movement learning model shows that understanding the nature of the learning model is an important foundation in designing an effective, directed, and contextual learning process. The learning model in this context functions as a conceptual framework that guides teachers in planning, implementing, and evaluating learning activities systematically. This is in line with the opinion of Marsanda & Kurniawan (2023) who emphasized that the physical fitness learning model must be designed in a structured manner to be able to develop students' basic movement competencies [10]. Similarly, Reno et al. (2022) stated that understanding the nature of the learning model allows teachers to implement strategies that are more adaptive, enjoyable, and oriented towards improving learning outcomes [11].

Research findings show that the Barcode-based learning model not only acts as a technical instrument, but also becomes an innovative strategy that encourages active educational interactions between teachers, students, and learning media. The use of Barcode as a digital media presents a more interesting, interactive, and relevant learning process with technological developments that are close to students' daily lives. This is reinforced by research by Suardi et al. (2023) which proves that the use of QR codes in physical education can increase student engagement and curiosity [12]. Darsi et al. (2025) also showed the high effectiveness of QR code-based media through the PJOK module with a validity level of 0.86 (very valid category) and a practicality of 4.0 [13].

Teachers' understanding of the nature of the learning model also influences the success of Barcode implementation in the learning process. The teacher's role shifts from a sole source of knowledge to a facilitator, making the learning

process more student-centered. Teachers guide the exploration of material, while students can access videos and movement guides independently through Barcode. This finding aligns with the research of Kamaruddin et al. (2023) which states that the integration of digital media in physical education learning improves teacher-student interaction and develops independent thinking skills [14]. Andriana et al. (2025) even reported an N-Gain value of 0.84 (high category) in QR code-based learning, indicating a significant increase in students' understanding of basic motor techniques [15].

The results of observations and interviews in this study showed that students showed high enthusiasm in participating in activities using barcodes. They actively scanned codes containing video links to demonstrations of push-ups, sit-ups, bleep tests, agility tests, and sit and reach. This enthusiasm was formed because barcode media made it easy to understand movement techniques visually and could be studied repeatedly. Research by Hartawan (2024) supports this finding by showing that the use of interactive digital media based on QR codes effectively increases understanding of movement techniques and reduces motor errors [8]. Meanwhile, Ramadita et al. (2023) emphasized that barcode-based audio-visual media also increases student motivation and activeness during physical fitness activities [16].

The results of the physical fitness test showed an increase in students' physical abilities after implementing the Barcode-based learning model. The most significant improvements were seen in arm muscle strength, cardiorespiratory endurance, and agility. These findings are consistent with Rafi et al. (2022) who stated that the use of digital technology in fitness learning improves the effectiveness of training and students' physical performance [17]. Salomo Leuwol et al. (2023) also found that digital innovation in physical education learning can increase student participation and motivation, which directly impacts physical performance [9].

In addition to improving physical skills, barcode implementation also positively impacts learning motivation and the learning environment. The integration of digital elements makes the learning process more enjoyable and modern. Research by Hartoto et al. (2021) shows that QR code-based athletics modules can increase student enthusiasm due to their more contextual and innovative presentation of the material [18]. Verianti & Najib (2022) add that technology-based media creates an interactive and efficient learning environment, although certain technical challenges remain [19].

From a pedagogical perspective, the barcode-based learning model represents a blended learning approach that combines face-to-face learning with digital learning resources. This approach supports the concept of student-centered learning, where students become active subjects constructing their understanding through digital exploration and hands-on practice. Research by Awwalina & Indana (2022) supports this finding by demonstrating that QR code-based e-modules effectively enhance student learning independence and learning experiences [20].

However, this study also identified several obstacles, particularly related to device availability and internet connection. These obstacles can be minimized through the use of offline barcode flashcards and technical briefings prior to learning. This finding aligns with Bayu et al. (2023), who emphasized the importance of infrastructure readiness and digital literacy in implementing technology-based learning media in schools [21]. In addition, Yansyah et al. (2025) highlighted that the development of digital learning resources, such as digital textbooks in physical education, must be accompanied by adaptive design and alternative offline access to ensure effective implementation in diverse school contexts [22].

Overall, the findings of this study are consistent with various previous studies that confirm that barcode or QR code-based learning is an effective innovation in physical education. The integration of digital technology with physical activity not only increases students' motivation, participation, and understanding, but also has a real impact on improving their physical abilities. Thus, the implementation of the barcode-based basic physical fitness movement learning model at SMP Negeri 3 Palembang has proven to be a modern approach that is effective, relevant, and in accordance with the demands of interactive and student-centered 21st-century learning.

4. Conclusion

Based on the results of research on the application of the Barcode-based basic physical fitness movement learning model to Phase D students of grade VIII at SMP Negeri 3 Palembang, it can be concluded that the integration of Barcode media in learning can have a positive impact on improving students' understanding, motivation, and motor skills. Barcode media containing visual guides and demonstration videos of basic movements is proven to make it easier for students to access materials independently or during learning, so that the learning process becomes more interactive, interesting, and in accordance with developments in educational technology. Teachers also find it easier to deliver materials because the use of Barcode helps create more efficient, varied, and student-centered learning. The results of the physical fitness test showed that students' physical abilities were in the very good category by 7%, good 21%, sufficient 33%,

less than 17%, and very poor 23%, so that overall the average physical fitness condition of students was in the sufficient category. These findings indicate that even though students' fitness levels were in the intermediate category, the application of the Barcode-based learning model has the potential to support improvements in physical condition if implemented in a sustainable and structured manner. Overall, this study proves that the Barcode-based learning model is an effective, relevant innovation, and is able to improve the quality of PJOK learning while raising students' awareness of the importance of maintaining and improving students' physical fitness.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Maronta, Y., Sutarto, J., & Isdaryanti, B. (2023). The Influence of Digital Flashcard-Based Media on Early Reading Skills of 5-6 Year Old Children. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *7*(1), 1142–1161. https://doi.org/10.31004/obsesi.v7i1.4152.

[2] Hamer, W., & Rohimajaya, N. A. (2020). Using Flash Card as Instructional Media to Enrich the Students' Vocabulary Mastery in Learning English. Journal of English Language Studies, 3(2), 167. https://doi.org/10.30870/jels.v3i2.3875.

[3] Riadoh Riadoh, & Larasati Larasati. (2024). The Use of Flash Card Media in Developing Early Childhood Language Skills. Morfologi: Jurnal Ilmu Pendidikan, Bahasa, Sastra Dan Budaya, 2(4), 167–180. https://doi.org/10.61132/morfologi.v2i4.815.

[4] Shilfani, S., Biringkanae, A., Taulabi, N., & Sudarsi, E. T. (2023). English Language Training for Junior Guides Using Flash Cards Based on Local Wisdom at the Ke'te'Kesu' Tourist Site in North Toraja. Madaniya, 4(3), 1288–1294.

[5] Oktadinata, A., Herman Subarjah, Komarudin, Yusuf Hidayat, & Ilham. (2023). The Effect of Integrating Basic Physical Education Movement Exercises on Elementary School Students' Motor Development During the Covid-19 Pandemic. Jurnal Elementaria Edukasia, 6(2), 506–517. https://doi.org/10.31949/jee.v6i2.5263.

[6] Hoerudin, C. W. (2023). Implementation of Flash Card Media in Indonesian Language Subjects as an Effort to Improve Students' Reading Skills. Jurnal Primary Edu (JPE), 1(2), 235–245.

[7] Sundari, M. J. I., Handayani, S., & Rizkasari, E. (2023). The Effect of Using Flash Card Media on the Beginning Reading Skills of Grade I Students. Widya Wacana: Jurnal Ilmiah, XVII(1), 16–35.

[8] Hartawan, I. N. B., Dirgayusari, A. M., Ni Wayan Suardiati Putri, & Lopez, F. T. M. D. (2024). Implementation of QR-Code Technology to Improve Elementary School Students' Literacy Skills. ASPIRASI : Publikasi Hasil Pengabdian Dan Kegiatan Masyarakat, 2(1), 262–271. https://doi.org/10.61132/aspirasi.v2i1.352.

[9] Salomo Leuwol, F., Basiran, B., Solehuddin, M., Vanchapo, A. R., Sartipa, D., & Munisah, E. (2023). The Effectiveness of Technology-Based Learning Methods in Increasing Student Learning Motivation in Schools. Edusaintek: Jurnal Pendidikan, Sains Dan Teknologi, 10(3), 988-999. https://doi.org/10.47668/edusaintek.v10i3.899.

[10] Marsanda, P., & Kurniawan, A. (2023). Analysis of Physical Fitness Levels in Class X Students of MAN 1 Tanjung Jabung Barat. Cerdas Sifa Pendidikan, 12(1), 49–63. https://doi.org/10.22437/csp.v12i1.26244.

[11] Reno, R., Iyakrus, I., Usra, M., **Hartati**, H., Yusfi, H., & Bayu, W. I. (2022). Development of a Training Program Model to Improve the Physical Fitness of Athletic Athletes. Bravo's: Jurnal Program Studi Pendidikan Jasmani dan Kesehatan, 10(2), 89-99.

[12] Suardi, S., Hijrah, H., Ramlan, H., Mutiara, I. A., Syarifuddin, S., Firdaus, F., Nur, S., Nur, R., & Nur, H. (2023). Strengthening Teacher and Student Literacy Through Quick Response Codes (Barcodes) for Independent Curriculum Books and Board Game Media in the Campus Teaching 6 Program in Elementary Schools. Jurnal Abdimas Indonesia, 3(4), 400–413. https://doi.org/10.53769/jai.v3i4.571.

[13] Darsi, H., Salman, E., Zulbahri, Z., & Surahman, Fadli (2025). Development of a QR Code-Based Physical Education Module with Basic Techniques Floor Gymnastics at State Senior High School 4 Lebong. Journal of Education, Teaching, and Learning, 10, 303-314.

[14] Kamaruddin, I., Leuwol, F. S., Putra, R. P., Aina, M., Suwarma, D. M., & Zulfikhar, R. (2023). The Impact of Gadget Use on Students' Mental Health and Learning Motivation at School. Journal on Education, 6(1), 307-316. https://jonedu.org/index.php/joe/article/view/2944.

[15] Andriana, M., Supriyadi, M., & Syafutra, W. (2025). Development of a QR Code-Based Game Modification Learning Module for Motor Skills of Grade III Students at Sd Negeri 1 Sidoharjo. Jurnal Ilmiah Penjas (Penelitian, Pendidikan Dan Pengajaran), 11(1), 170-180. https://doi.org/10.36728/jip.v11i1.3890.

[16] Ramadita, P., Rozaq, A. B., Syahrianto, S., Hartanto, H., Fuorteino, J., & Imansyah, F. (2023). Efforts to Instill Basic Physical Fitness Movement Knowledge Through Audio Visual Media for Students. Musamus Journal of Physical Education and Sport (MJPES), 5(02), 64–71. https://doi.org/10.35724/mjpes.v5i02.5171.

[17] Rafi, S., Abdul Gani, R., & Iqbal, R. (2022). Development of an Interactive Multimedia-Based Physical Fitness Learning Model for High Schools in Indramayu Regency During the Covid-19 Pandemic. Jurnal Pendidikan Olahraga, 11(1), 15–36. https://doi.org/10.31571/jpo.v11i1.3141.

[18] Hartoto, M. ., Mulyono, D. ., & Syafutra, W. (2021). Development of QR code-assisted athletic learning modules. Edu Sportivo: Indonesian Journal of Physical Education, 2(1), 51–60. https://doi.org/10.25299/es:ijope.2021.vol2(1).6567.

[19] Verianti, G., & Najib, M. (2022). The Effectiveness of Online Physical Education Learning During the Covid-19 Pandemic. Jurnal BELAINDIKA (Pembelajaran Dan Inovasi Pendidikan), 4(1), 41–45. https://doi.org/10.52005/belaindika.v4i2.94.

[20] Awwalina, N. M., & Indana, S. (2022). Development of a QR Code-Based Interactive E-Module to Train the Science Literacy of Grade X High School Students on Ecosystem Material. Berkala Ilmiah Pendidikan Biologi (BioEdu), 11(3), 712–721. https://doi.org/10.26740/bioedu.v11n3.p712-721.

[21] Bayu, W. I., Yusfi, H., & Usra, M. (2023). Assistance in measuring physical fitness based on self-assessment through the Sriwijaya Bugar application. PROMOTIF: Jurnal Pengabdian Kepada Masyarakat, 3(2), 108-114.

[22] Yansyah, Y., **Hartati, H**., **Defliyanto, D**., & Yusfi, H. (2025). Development of a Digital Textbook for Physical Education Management and Learning Strategies. *Jurnal Terapan Ilmu Keolahragaan*, *10*(2), 93-100.