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# Case study: problem-based learning model for soccer basic movement skills and learning activity
# Estudio de caso: modelo de aprendizaje basado en problemas para las habilidades básicas de movimiento en el fútbol y actividad de aprendizaje

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**Abstract.** Background: The education curriculum is developed to prepare students to gain comprehensive experiences and life skills. Learning effectiveness, especially in physical education, depends on the teacher's ability to choose the right learning strategies, models and methods. However, problems often faced in the learning process include lack of student attention, teacher dominance in the learning process, and passive learning tendencies. The Problem-Based Learning (PBL) learning model emerged as a potential approach to address these issues and improve the quality of learning. Study Objectives: This study aims to evaluate the effectiveness of the Problem-Based Learning (PBL) learning model in improving the basic soccer movement skills and learning activities of elementary school students in the context of physical education. Materials and Methods: This study used a pseudo-experimental method with a one-group pretest-posttest design. The research subjects comprised 24 fifth-grade Krakitan State Elementary School, Klaten Regency students. The research instruments included basic soccer skills tests (dribbling and short passes) and student learning activity observation sheets. Data were analyzed using paired samples t-test to determine the effect of learning with the PBL model on primary skills of playing football and student learning activities. Results: The study revealed a substantial enhancement in both the basic soccer skills and student learning activities following the implementation of the PBL model. The average basic soccer skills score surged from 99.0833 in the pretest to 109.0417 in the posttest, marking a notable increase of 9.9584 points. Similarly, student learning activities showed a commendable rise, with the mean score climbing from 3.0833 at the start of the treatment to 4.3750 at the end, indicating a significant increase of 1.2917 points. Statistical analysis using paired samples t-test confirmed the significance of these improvements, with the calculated t values for basic soccer skills (6.89943) and learning activities (7.369) both surpassing the t table value (2.069). Conclusion: In conclusion, this study affirms the effectiveness of the Problem-Based Learning (PBL) model in enhancing students' basic soccer movement skills and learning activities in the context of physical education at the primary school level. The substantial improvements in both the technical ability to play soccer and in students' active engagement in the learning process underscore the potential of PBL as a potent learning strategy for physical education. These findings not only underscore the importance of problem-based learning approaches in enhancing physical skills but also in fostering students' cognitive and social engagement in the learning process, thereby making a significant contribution to the field of physical education.
**Keywords:** Problem Based Learning, Physical Education, Soccer Skills, Learning Activity, Primary School

**Resumen.** Antecedentes: El currículo educativo se elabora con el fin de preparar a los alumnos para que adquieran experiencias integrales y habilidades para la vida. La eficacia del aprendizaje, especialmente en educación física, depende de la capacidad del profesor para elegir las estrategias, los modelos y los métodos de aprendizaje adecuados. Sin embargo, los problemas a los que suele enfrentarse el proceso de aprendizaje incluyen la falta de atención de los alumnos, el dominio del profesor en el proceso de aprendizaje y las tendencias pasivas de aprendizaje. El modelo de aprendizaje basado en problemas (ABP) surgió como un enfoque potencial para abordar estos problemas y mejorar la calidad del aprendizaje. Objetivos del estudio: Este estudio tiene como objetivo evaluar la eficacia del modelo de aprendizaje basado en problemas (ABP) para mejorar las habilidades básicas de movimiento en el fútbol y las actividades de aprendizaje de los estudiantes de primaria en el contexto de la educación física. Materiales y métodos: Este estudio utilizó un método pseudo-experimental con un diseño pretest-postest de un grupo. Los sujetos de la investigación fueron 24 alumnos de quinto curso de la Escuela Primaria Estatal de Krakitan, Regencia de Klaten. Los instrumentos de investigación incluían pruebas de habilidades futbolísticas básicas (regate y pases cortos) y hojas de observación de las actividades de aprendizaje de los alumnos. Los datos se analizaron mediante la prueba t de muestras emparejadas para determinar el efecto del aprendizaje con el modelo PBL en las habilidades primarias para jugar al fútbol y en las actividades de aprendizaje de los alumnos. Resultados: El estudio reveló una mejora sustancial tanto en las habilidades básicas para jugar al fútbol como en las actividades de aprendizaje de los alumnos tras la aplicación del modelo PBL. La puntuación media de las habilidades básicas para jugar al fútbol pasó de 99,0833 en el pretest a 109,0417 en el postest, lo que supone un notable aumento de 9,9584 puntos. Del mismo modo, las actividades de aprendizaje de los alumnos mostraron un aumento encomiable, ya que la puntuación media pasó de 3,0833 al inicio del tratamiento a 4,3750 al final, lo que indica un incremento significativo de 1,2917 puntos. El análisis estadístico mediante la prueba t de muestras emparejadas confirmó la importancia de estas mejoras, ya que los valores t calculados para las habilidades futbolísticas básicas (6,89943) y las actividades de aprendizaje (7,369) superaron el valor de la tabla t (2,069). Conclusiones: En conclusión, este estudio afirma la eficacia del modelo de Aprendizaje Basado en Problemas (ABP) en la mejora de las habilidades básicas de movimiento de fútbol de los estudiantes y las actividades de aprendizaje en el contexto de la educación física en la escuela primaria. Las mejoras sustanciales tanto en la habilidad técnica para jugar al fútbol como en la participación activa de los alumnos en el proceso de aprendizaje subrayan el potencial del ABP como potente estrategia de aprendizaje para la educación física. Estos resultados no sólo subrayan la importancia de los enfoques de aprendizaje basados en problemas para mejorar las habilidades físicas, sino también para fomentar el compromiso cognitivo y social de los estudiantes en el proceso de aprendizaje, haciendo así una contribución significativa al campo de la educación física.
**Palabras clave:** Aprendizaje Basado en Problemas, Educación Física, Habilidades Futbolísticas, Actividad de Aprendizaje, Escuela Primaria

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## Introduction

Physical education (PE) plays a crucial role in the holistic development of students, contributing to their physical, cognitive, and social well-being (Luna-villouta et al., 2023) and (Bailey, 2006). However, traditional PE teaching methods often face challenges in engaging students effectively and developing critical thinking skills alongside physical competencies (Kirk, 2010). This study explores the potential of Problem-Based Learning (PBL) as an innovative approach to address these challenges in elementary school PE, explicitly focusing on soccer skills development and overall learning engagement.

Research has consistently highlighted several issues in PE instruction. Ennis (2011) noted that many PE classes need help with student motivation and engagement, mainly when teaching complex motor skills. Similarly, Hastie and Wallhead (2016) found that traditional, teacher-centred approaches often fail to develop students' decision-making abilities in game situations. These findings suggest a need for more student-centered, cognitive-engaging teaching methods in PE.

Moreover, Quay and Peters (2008) argued that PE often focuses too narrowly on physical skill development at the expense of cognitive and social learning outcomes. This imbalance can lead to a disconnect between PE and other academic subjects, potentially undermining the subject's perceived value in the curriculum (Penney & Chandler, 2000)(Luna et al., 2019).

Problem-based Learning, initially developed in medical education (Barrows & Tamblyn, 1980), has shown promise in various educational contexts. In PE, PBL offers a unique approach that could address many of the challenges above. Rosenshine's (2012) principles of instruction emphasize the importance of guided practice and independent application of skills and align well with PBL's structure.

Several studies have explored PBL's application in PE, though research at the elementary level still needs to be completed. O'Neil and Hopkins (2002) found that PBL improved high school students' tactical understanding of team sports. Similarly, Chow et al. (2007) reported increased student engagement and enhanced decision-making skills when using PBL in secondary school PE classes.

However, more literature should be on PBL's effectiveness in elementary PE, particularly in teaching specific sports skills like soccer. (Rebolledo-cobos et al., 2023) and While Dyson et al. (2004) demonstrated the benefits of cooperative Learning in elementary PE, their study did not specifically address PBL or focus on soccer skills development.

The rationale for implementing PBL in elementary PE, especially for teaching soccer skills, is multifaceted:

1. Cognitive Engagement: PBL can bridge the gap between physical skill acquisition and mental development, addressing the concern raised by Quay and Peters (2008). By presenting students with realistic soccer scenarios to solve, PBL may enhance their tactical understanding alongside technical skills.
2. Motivation and Engagement: The contextual, problem-solving nature of PBL aligns with Deci and Ryan's (2000) Self-Determination Theory, potentially increasing intrinsic motivation in PE classes.
3. Holistic Skill Development: As a complex team sport, soccer requires physical skills and decision-making abilities. PBL's emphasis on critical thinking and problem-solving (Hmelo-Silver, 2004) is well-suited for developing these multifaceted competencies.
4. Age-Appropriate Learning: While most PBL studies in PE focus on secondary education, adapting PBL for elementary students could provide a foundation for lifelong physical activity and problem-solving skills (Bailey et al., 2009).

Despite the potential benefits, there needs to be more empirical research on PBL's effectiveness in elementary PE, particularly in teaching soccer skills and enhancing overall learning engagement. This study aims to address this gap by examining the impact of a PBL approach on both the physical and cognitive aspects of elementary students' soccer learning.

The primary objectives of this study are:

1. To evaluate the effectiveness of a PBL model in improving elementary school students' basic soccer movement skills, specifically dribbling and short passing.
2. To assess the impact of PBL on students' learning activities and engagement in PE classes.
3. To analyze the relationship between improved soccer skills and increased learning engagement through the PBL approach.

By addressing these objectives, this study seeks to contribute to the growing body of knowledge on innovative PE teaching methods and provide practical insights for educators looking to enhance both physical skills and cognitive engagement in elementary PE classes.

This research is particularly timely given the increasing emphasis on developing 21st-century skills across all subject areas (Trilling & Fadel, 2009). By investigating PBL's potential to integrate critical thinking and problem-solving with physical skill development, this study may offer valuable insights into creating more holistic and effective PE programs at the elementary level.

## Material and methods

This study used a pseudo-experimental method—research design with one group pretest-postest. The subjects in this study were fifth-grade students of Krakitan State Elementary School, Bayat sub-district, Klaten Regency, totalling 24.

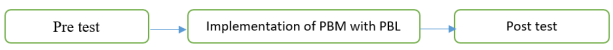


Figure 1. Research Stages

The research instrument measured the essential ability to play football with two test items, namely 1) a dribbling test with a validity of 0.72 reliability 0.61 and 2) a short test with a validity of 0.66 reliability 0.69 from Daral Fauzi. The student learning activity instrument uses an observation sheet by a teacher who experts have validated to find out: 1) paying attention to the explanation of the teacher or friends during lessons or discussions, 2) asking questions, 3) doing assignments, and 4) happy and excited in learning by checking the list.

Data analysis in this study used SPSS with paired samples t-tests to determine the effect of learning with the Problem-Based Learning (PBL) model on the basic skills of playing soccer and student learning activities in learning soccer game material. The use of SPSS, a statistical software widely used in social science research, allowed us to conduct paired samples t-tests, a robust statistical method, to compare the mean scores of the same group of students before and after the PBL intervention. This analysis is crucial in understanding the impact of the PBL model on both the basic skills of playing soccer and student learning activities.

## Results

The results of descriptive statistical research can be addressed in table 1 below:

Table 1.
Statistical Results Description of Learning Activities and Football Playing Ability of Students with Problem Based Learning Model

| | N | Range | Minimun | Maximum | Mean | median | mode | SD | Variance |
|---|---|---|---|---|---|---|---|---|---|
| Initial Learning Activity Treatment | 24 | 4,00 | 1,00 | 5,00 | 3,0833 | 3,0000 | 3,00 | 1,13890 | 1,297 |
| Learning Activity End of treatment | 24 | 3,00 | 2,00 | 5,00 | 4,3750 | 5,0000 | 5,00 | 0,92372 | 0,853 |
| Pretest | 24 | 20,00 | 92,00 | 112,00 | 99,0833 | 98,000 | 96.00 | 5,59438 | 31,297 |
| Postest | 24 | 25,00 | 98,00 | 123,00 | 109.0417 | 109,000 | 110,00 | 5,90121 | 34.824 |
| Valid N | 24 | | | | | | | | |

Based on the results of the average calculation, it can be seen that there is an increase in learning activities (paying attention to the explanation of the teacher or friends during lessons or discussions, asking questions, doing assignments, and being happy and excited in learning) of students at the initial meeting of treatment and the final meeting of treatment by 1.2917. Likewise, the results of the basic skills of playing soccer based on the average pretest and posttest there is an increase with the application of the Problem-Based Learning learning model of 9.9584.

The results of the t-test (Paired-simple T-Test) with SPSS 22 related to the relationship between students' learning activities at the beginning of treatment and the end of treatment, as well as the essential ability to play soccer at the beginning and end of treatment by applying the Problem-Based Learning learning model, are presented in table 2.

Table 2.
The Relationship between Students' Learning Activities at the Beginning and End of Treatment, as well as the Basic Ability to Play Football at the beginning and end of treatment

| | | N | Corelation | Sig |
|---|---|---|---|---|
| Pair 1 | Initial Basic Skills & Final Basic Skills | 24 | 0,207 | 0,333 |
| Pair 2 | Early Learning Activity & Late Learning Activity | 24 | 0,672 | 0,000 |

The relationship between the initial ability to play soccer before treatment and the ability to play soccer after treatment is 0.207 (weak). When viewed from the Sig value (0.333) > α, it can be concluded that the correlation is insignificant. Meanwhile, the relationship between learning activities before and after treatment is 0.672 (quite strong). When viewed Sig value (0.000) < α, it can be concluded that there is a significant relationship.

Table 3.
Paired-simple T-Test of Basic Ability to Play Football Before and After Treatment, as well as Students' Learning Activities Before and After Treatment

| Paired Samples Test | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | Initial Basic Skills - Final Basic Skills | -9,95833 | 7,24406 | 1,47869 | -13,01723 | -6.89943 | -6,735 | 23 | 0,000 |
| Pair 2 | Initial Learning Activity - Final Learning Activity | -1,29167 | 0,85867 | 0,17528 | -1,65425 | -.92908 | -7,369 | 23 | 0,000 |

In table 3, the Paired-simple T-Test of basic skills of playing soccer before and after treatment with the Problem Based Learning model learning approach obtained a t count of 6.89943. The Problem-Based Learning model is an educational approach that encourages students to learn through problem-solving and real-life scenarios. Meanwhile, the t table value (23; 0.025) is 2.069. Thus, as the t count (6.89943) is greater than the t table value (2.069), we reject the null hypothesis (Ho). This rejection indicates that the basic ability to play soccer significantly improved after treatment with the Problem-Based Learning model learning approach. The results of the Paired-simple T-Test of students' learning activities before and after treatment with the Problem-Based Learning model learning approach obtained a t count of 7.369. Meanwhile, t table (23; 0.025) is 2.069. Thus, t count (6.89943) > t table (23; 0.025) (2.069), so Ho is rejected. So, students' learning activities before and after treatment with the Problem-Based Learning model learning approach are significant.

## Discussion

The results of this study indicate that applying the

Problem-Based Learning (PBL) learning model significantly positively impacts elementary school students' basic soccer movement skills and learning activities. These findings have important implications for physical education practice and learning strategies in primary schools. The significant improvement in students' basic soccer skills, with the mean score increasing from 99.0833 in the pretest to 109.0417 in the posttest, demonstrates the effectiveness of this approach in developing students' motor skills. This finding aligns with previous research that emphasizes the importance of problem-based learning in developing practical skills.

The unique benefits of the PBL model in improving soccer skills are evident in this study. The model's emphasis on active problem-solving in a relevant context, such as game scenarios that require dribbling and short passing skills, leads to a significant improvement in students' understanding and performance of football-specific skills.

In addition to skill improvement, the study also showed a significant increase in student learning activity, with the mean increasing from 3.0833 to 4.3750. This indicates that the PBL model successfully increased students' active involvement in the learning process, consistent with previous studies that showed the effectiveness of PBL in improving students' critical thinking skills and participation. This increase in learning activity can be attributed to the key elements of PBL, including student-centred learning, problem contextualization, collaboration, and the development of problem-solving skills.

These findings strengthen the argument that a more interactive and problem-based learning approach can overcome the problem of student passivity often encountered in traditional teaching methods. PBL encourages students to take an active role in the learning process, makes learning more relevant and exciting through real scenarios in football, enhances interaction through group work, and stimulates students' curiosity and intrinsic motivation through the problem-solving process.

The results of this study have several important implications for physical education practice. First, schools and educators must consider integrating the PBL model more widely in the physical education curriculum. Secondly, there needs to be a focus on teacher training in implementing PBL models effectively, especially in physical education. Thirdly, educators must design learning scenarios incorporating PBL elements with sport-specific skills. Finally, assessment methods must be adjusted to reflect improvements in physical skills and developments in problem-solving and teamwork.

Although the results of this study are promising, there are some limitations to consider. The relatively small sample size (24 participants) limits the generalizability of the findings. Future research with larger samples may provide more robust results. In addition, longer-term studies are needed to assess the sustainability of improving learning skills and activities. Future studies must also consider factors such as individual learning style, initial motivation, and previous exercise experience. Comparative studies between PBL and other teaching methods may provide further insight into the relative effectiveness of PBL.

Future research could explore the application of PBL in various other sports, the impact of PBL on psychosocial aspects such as self-confidence and teamwork, and the integration of technology in implementing PBL for physical education. This study provides strong empirical evidence of the Problem-Based Learning model's effectiveness in improving primary school students' basic soccer movement skills and learning activities. The findings confirm the potential of PBL as a valuable pedagogical approach in physical education, overcoming student passivity challenges and promoting active engagement in learning. Nonetheless, successful implementation requires careful preparation, institutional support and continuous professional development for educators.

## Conclusion

This study provides strong empirical evidence regarding the effectiveness of the Problem-Based Learning (PBL) learning model in improving elementary school students' basic soccer movement skills and learning activities. This study successfully demonstrated significant changes in both aspects through a quasi-experimental design with a one-group pretest-posttest approach.

The results of the analysis showed a substantial improvement in students' basic soccer skills, specifically in areas such as dribbling, passing, and shooting, with a mean increase of 9.9584 points from pretest to posttest. This improvement was evident from the numbers and proved statistically significant through the paired samples t-test, where the t-count (6.89943) far exceeded the t-table (2.069). This indicates that the PBL model is effective in facilitating the development of these specific motor skills required in soccer games.

In addition, student learning activities also showed a marked improvement. The average learning activity increased by 1.2917 points, supported by significant statistical test results (t count 7.369 > t table 2.069). This increase reflects that PBL succeeded in encouraging students' active participation in learning, increasing their attention to the material presented, and stimulating a higher learning spirit.

These findings provide important implications for physical education practice at the primary school level. The PBL model is proven to be an effective alternative to overcome common problems in learning, such as students' lack of attention due to passive learning methods and teacher dominance in the learning process. By implementing PBL, teachers can create a more interactive and student-centered learning environment, where they are challenged to solve problems and develop skills independently.

The successful application of PBL in physical education,

particularly in soccer learning, shows the flexibility of this model in various learning domains. This opens up opportunities for educators to adapt and implement PBL in other physical education materials, with the potential for similar outcomes regarding improved learning skills and activities.

Nonetheless, it should be noted that this study has limitations in terms of sample size and intervention duration. Follow-up studies with larger samples and more extended intervention periods may provide a more comprehensive understanding of the long-term effects of PBL in physical education.

In conclusion, this study confirms that the problem-based learning model is an effective strategy to improve specific movement skills, such as in football, and students' overall learning activities. The findings support the broader adoption of problem-based approaches in physical education curricula, potentially significantly improving the quality of learning and educational outcomes.

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