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The Impact of Digital-Based Learning on Learning Concentration and Fundamental Motor Skills in Physical Education at The Junior High School Level

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Abstract

This study examines how Digital Based learning (DBL) influences learning concentration and fundamental motorskills (FMS) among Junior High School students in physical education. This study was designed using a one-group pre-experimental model with pre-tests and post-tests, consisting of 46 eighth-grade students at Junior High School 1 Ciparay. The intruments used in study were a fundamental motorskills assessment and a learning concentration test. The results of this single-group pre-experimental (pre-test-post-test) study, involving 46 eighth-grade boys and girls junior high school students, showed different findings between the variables of learning concentration and Fundamental Motor Skills (FMS). Data analysis, including the Wilcoxon Signed-Rank Test, showed that the Digital-Based Learning (DBL) intervention significantly improved students' learning concentration, with a $p < 0.001$ value and a Z value of –5.8572. The ranking results showed that almost all students (45 out of 46) experienced an increase in their learning concentration3. Conversely, for the FMS variable, the DBL intervention did not show a significant difference between the pre-test and post-test, resulting in a $p = 0.240$ (> 0.05) and a Z value of –1.1744. This condition is reinforced by the fact that the number of students who experienced a decrease in FMS scores (23 students) was greater than those who experienced an increase (21 students), indicating that the DBL treatment did not have a significant positive effect on basic motor skills. This sugests that DBL can effectively support cognitive learning aspects. However, DBL alone cannot substitute direct physical activity in develoving fundamental motorskills.

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INTRODUCTION

Digital-based learning (DBL), is an education approach that has emerged through technological progress, aimimg to enhance student engagement and understanding, is one of the resasasasults of advances in digital technology that have transformed education (Matos et al., 2025). Previous studies have shown that DBL helps cognitive aspects such as learning motivation and concentration (Hidayat, 2021). Even so, there is still limited evidence about how DBL affects psychomotor aspects, particularly students' fundamental motor skills (FMS). In fact, FMS are important basic skills for physical development and form the foundation for more complex physical activities in the future (Nurcahyo & Budi, 2021).

Although digital media makes learning more interactive and enjoyable (Simanjuntak et al., 2022), in physical education it remains unclear whether DBL can support motor skills that depend on direcpriat physical activity. in physical education it remains unclear whether DBL can support motor skills that depend on direct physical activity (Louisa & Amalia, 2024). Therefore, there is a need to examine the extent to which DBL can contribute to the development of FMS.

Some studies have reported a decrease in students' physical activity as digital media use becomes more dominant (Jadidah et al., 2023), potentially reducing their fundamental motor skill development. In fact, basic motor skills play an important role in supporting children's physical, mental, emotional, and social development (Nurcahyo & Budi, 2021). This condition emphasizes the need for learning strategies that are able to integrate digital technology with the physical development needs of students.

Previous research conducted by Budiman Agung Pratama (2022) examined the use of Augmented Reality (AR) Mobile App media to improve fundamental motor skills (FMS) in elementary school students during the pandemic. The results showed that AR-based media effectively improved the basic motor skills of elementary school students in distance learning. Meanwhile, research by Ztella Rumawatine (2025) highlighted the influence of digital media use on improving the motor skills of elementary school students in the context of innovative post-pandemic learning. Introduction. Her study found that interactive digital methods can assist students in better understanding movements and maintaining learning motivation

This study brings a different methodology, focus, and context from the two previous studies. this research examines not only psychomotor aspects like FMS but also cognitive components such as learning concentration. The result is a more in-depth analysis of how effective digital learning is. In addition, this study was conducted at the Junior High School level, unlike previous studies that focused on elementary school students.

DBL, which is based on constructivism, enables students to learn actively through digital media and has been proven to be effective in improving learning concentration because the material can be repeated and presented in a more interesting way (Martha, 2025). However, the effectiveness of DBL on psychomotor aspects is still questionable, because FMS requires direct physical exercise and real interaction with the learning environment (Rudd et al., 2020). Based on this, this study was conducted to analyze the effect of DBL on the learning concentration and FMS of Junior High School students in physical education.

METHODS

This study used a quantitative approach with a quasi-experimental method (one-group pre-test-post-test). The study was conducted at Junior High School 1 Ciparay, Bandung Regency, in the even semester of the 2024/2025 academic year. The study population consisted of all eighth-grade students who took physical education classes, with a sample of 46 students selected through purposive sampling. This design has limitations because there is no control group, so the interpretation of results must be done carefully. A stronger alternative design is a quasi-experiment with a control group to increase the validity of the findings.

The instruments used in this research were a learning concentration test and an FMS (Fundamental Motor Skills) test. The learning concentration test was adapted from a standard instrument that measures the level of focus and attention of students during learning. The FMS test uses a basic motor skills assessment sheet (running, jumping, throwing, catching) (R. Isnanta , et al, 2022). The research procedure included a Pre-test, treatment with DBL, and a Post-test, then the data was analyzed using descriptive and inferential statistical tests (t-test/Wilcoxon) according to the data distribution.

RESULTS AND DISCUSSION

The normality test shows the significance value (Sig.) for the four research variables. The Pretest_Consistency variable has a Sig. = 0.226 and Posttest_Consistency = 0.290, both of which are greater than 0.05, so the data is considered to be normally distributed. The Posttest_Fundamental Motor Skills variable is also normally distributed with a Sig. = 0.099. However, the Pretest_Fundamental Motorskills variable has a Sig. = 0.028 (< 0.05), which means it is not normally distributed. Thus, the majority of variables are normally distributed, except for Pretest FMS. This condition is the basis for using nonparametric analysis to maintain the accuracy of the research results.

The homogeneity test results shows that the Pre_Post_Consistency variable has a Sig. value of 0.159, and the Pretest_Final_Fundamental_Motor_Skills variable has a Sig. value of 0.456. Both are greater than 0.05, so it can be concluded that the data on both variables are homogeneously distributed. This means that the variance distribution between the Pretest and Posttest values for both concentration and Fundamental Physical Motor Skills is uniform, thus fulfilling the assumption of homogeneity and making it suitable for further analysis.

The results of the Wilcoxon Signed Ranks Test show that in the learning concentration variable, no students experienced a decrease in scores (negative ranks = 0), while 45 students experienced an increase with an average ranking of 23.00, and 1 student remained the same (ties = 1). This shows that almost all students experienced an increase in learning concentration after the DBL intervention.

Conversely, in the Fundamental Motor Skills variable, there were 23 students who experienced a decline with an average ranking of 25.89, 21 students experienced an increase with an average ranking of 18.79, and 2 students remained the same. This condition shows that the number of students who experienced a decline was greater than those who improved, and the average ranking of the decline was also higher. Thus, the treatment given did not have a significant positive effect on physical Fundamental Motor Skills.

Overall, the results of this rank test reinforce the finding that the DBL intervention is more effective in improving students' learning concentration, but does not have a significant effect on Fundamental Motor Skills.

The results of the Wilcoxon Signed Ranks Test showed a significant difference in the learning concentration variable, with a Z value of –5.857 and $p < 0.001$. This means that the DBL intervention was proven to be able to significantly improve students' learning concentration.

Conversely, for the Fundamental Motor Skills variable, a Z value of –1.174 was obtained with $p = 0.240$ (> 0.05), indicating no significant difference between the pretest and posttest. Thus, the DBL intervention did not have a significant effect on students' fundamental motor skills.

Overall, the results of this test confirm that DBL is more effective in improving cognitive aspects such as learning concentration, but does not have a significant effect on psychomotor aspects such as basic motor skills.

The results of the study show that Digital Based Learning (DBL) can significantly improve students' concentration. This finding is in line with Cognitive Load theory (Sweller, 2020), which emphasizes the importance of interactive visual presentations to reduce cognitive load. Through digital media such as animations, simulations, and videos, students find it easier to focus their attention on the main content, thereby increasing their concentration. This also supports previous studies showing that DBL can strengthen motivation and focus in learning due to the more interesting and flexible presentation of material (Wulandari & Febrianta, 2024).

Conversely, DBL does not have a significant effect on the development of fundamental motor skills (FMS). Basic motor skills such as coordination, agility, and balance require direct physical exercise and real movement experience, which are difficult to replace with digital media (Wijayanto, 2023). The Constraint-Led Approach theory (Rudd et al., 2020) explains that FMS develops optimally through interactions between individuals, tasks, and the physical environment. Thus, although DBL can support cognitive aspects, mastery of motor skills still requires repeated practice in the field.

As a basic skill, FMS is also seen as an important foundation for supporting more complex physical activities in the future (Barnett et al., 2016). This view is reinforced by (Schmidt et al., 2018) in Motor Control and Learning, which emphasizes that motor skills can only be mastered through direct movement experience and repeated physical practice. Therefore, the findings of this study, which show no significant improvement in FMS, confirm that digital-based learning only serves as a complement, not a substitute for real motor experience.

The limitations of this study are the short

duration of the intervention and the absence of intensive physical training, which may be the cause of the lack of significant changes in FMS. In addition, the pre-experimental research design without a control group also limits the strength of the generalization of the results. Therefore, further research is recommended using a quasi-experimental design with a control group and a longer intervention duration to obtain a more comprehensive picture.

Thus, Digital Based Learning (DBL) serves as a complement, not a substitute, in physical education learning. In cognitive aspects such as concentration, DBL has a positive and significant impact, as technology can manage cognitive load, increase motivation, and maintain student focus. However, in psychomotor aspects such as FMS, DBL only functions as a support (for example, for movement demonstrations or digital assessments), while motor skill mastery must still be obtained through a practical, repetitive, and direct physical activity-based approach.

CONCLUSION

This study concludes that Digital Based Learning (DBL) is effective in improving the learning concentration of Junior High School students, but does not have a concrete effect on fundamental motor skills (FMS). These results emphasize the importance of combining the use of DBL with direct physical exercise in physical education learning so that cognitive and psychomotor goals are achieved in a balanced manner.

The limitations of this study are its pre-experimental design without a control group and the short duration of the intervention, so the results must be interpreted with caution. Further research is recommended using a quasi-experimental design with a control group and a longer intervention period to obtain a more comprehensive picture.

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