Blended learning and online learning with project-based learning: Do they affect cognition and psychomotor learning achievement in physical conditions?
Aprendizaje combinado y aprendizaje en línea con aprendizaje basado en proyectos: ¿Afectan a la cognición y al rendimiento del aprendizaje psicomotor en condiciones físicas?

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Abstract. Background and the Aim of the Study. Online learning is only available in a limited capacity via the WhatsApp group. The WhatsApp group application is used to provide learning material which is often offered in the form of films obtained from YouTube, very brief explanations, and assignments. Therefore, special attention is needed in considering online learning methods so that learning objectives can be achieved. This study aims to determine the effect of blended learning and project-based learning on the cognitive and psychomotor capacities of Padang State University students. Material and Methods. This study uses a quantitative approach. This research was conducted at Padang State University with third-semester students enrolled in the 2022 physical condition course. A total of 80 students in the third semester of the physical condition course in 2022 were used as a sample. Data on learning outcomes and psychomotor learning achievements were obtained using an observation sheet of e-test skills in the form of video conferencing learning. Data analysis techniques in this study were assisted by using the SPSS application. Results. Cognitive learning outcomes of students who are taught with the project-based learning model reach an average of 72.3. This average is greater than the average of students studying the blended learning (BL) model, namely 63.5. Students who were taught using the project-based learning (PjBL) model had an average psychomotor learning result of 81.3 greater than students who were taught with the blended learning model which had an average of 76.3. Conclusions. The results show that blended learning and online learning models with project-based learning have a major impact on cognitive and psychomotor outcomes in learning achievements under physical settings. Testing the model on variables other than physical health can be used for additional study, and it is important to look at other variables that affect students' progress in cognitive and psychomotor learning.
Keywords: Blended Learning, Project-Based Learning, Psychomotor Learning

Resumen. Antecedentes y objetivo del estudio. El aprendizaje en línea sólo está disponible de forma limitada a través del grupo de WhatsApp. La aplicación del grupo WhatsApp se utiliza para proporcionar material de aprendizaje que a menudo se ofrece en forma de películas obtenidas de YouTube, explicaciones muy breves y tareas. Por lo tanto, es necesario prestar especial atención al considerar los métodos de aprendizaje en línea para poder alcanzar los objetivos de aprendizaje. Este estudio pretende determinar el efecto del aprendizaje combinado y del aprendizaje basado en proyectos sobre las capacidades cognitivas y psicomotoras de los estudiantes de la Universidad Estatal de Padang. Material y métodos. Este estudio utiliza un enfoque cuantitativo. Esta investigación se llevó a cabo en la Universidad Estatal de Padang con estudiantes de tercer semestre matriculados en el curso de condición física 2022. Se utilizó como muestra un total de 80 estudiantes del tercer semestre del curso de condición física de 2022. Los datos sobre los resultados del aprendizaje y los logros del aprendizaje psicomotor se obtuvieron utilizando una hoja de observación de habilidades de e-test en forma de aprendizaje por videoconferencia. Las técnicas de análisis de datos en este estudio se asistieron mediante el uso de la aplicación SPSS. Resultados. Los resultados de aprendizaje cognitivo de los alumnos a los que se les enseña con el modelo de aprendizaje basado en proyectos alcanzan una media de 72,3. Esta media es superior a la media de los alumnos que estudiaron con el modelo de aprendizaje semipresencial (BL), a saber, 63,5. Los alumnos a los que se enseñó con el modelo de aprendizaje basado en proyectos (PjBL) tuvieron un resultado medio de aprendizaje psicomotor de 81,3 mayor que los alumnos a los que se enseñó con el modelo semipresencial, que tuvieron una media de 76,3. Conclusiones. Los resultados muestran que el aprendizaje combinado y los modelos de aprendizaje en línea con aprendizaje basado en proyectos tienen un impacto importante en los resultados cognitivos y psicomotores en los logros de aprendizaje en entornos físicos. Es importante analizar otras variables que afectan al progreso de los estudiantes en el aprendizaje cognitivo y psicomotor.
Palabras clave: Aprendizaje Combinado, Aprendizaje basado en proyectos, Aprendizaje Psicomotor

Introduction

Education is an important component in building a quality and competitive nation (Almaududi Ausat, 2022; Raja & Lakshmi Priya, 2022; Suganda & Suharjana, 2013). Education must be carried out with clear and flawless concepts and guidelines so that the end result is as desired (Aziz et al., 2023; Hardinata et al., 2023; Suryadi, Samodra, et al., 2023). Because quality literacy learning produces quality human beings (Ince, 2022). However, the world of education had been in turmoil for the previous two years. The virus that triggered the shock was completely unexpected. Corona Virus Disease is the name given to the virus (Covid-19) (Fernández-Souto, Rivera, & Rúas-Araújo, 2023; Hortigüela-Alcalá, Hernando-Garijo, & Pérez-Pueyo, 2021). Covid-19 first appeared in the Wuhan region of China (Schmiege et al., 2020; Sevak, Singh Chauhan, Parihar, & Singh Rathore, 2022).

However, Covid-19 expanded significantly over time,

even as far as Indonesia. Many Indonesian people are affected and later die from this disease. The Indonesian government has taken several steps to prevent the transmission and spread of the Corona Virus (Setiawan, Musta'in, & Sparingga, 2022). One of the efforts made is by implementing social and physical distancing. The influence of this strategy can be seen by the people of Indonesia, especially in the social, economic, tourism, and most importantly education. As a consequence of the current Covid-19, the government issued a Circular Letter (SE) on March 18 2020 which stated that all kinds of activities, both outside and inside, were temporarily suspended in order to limit the spread of Covid-19, especially in the education sector (Kamoga & Varea, 2022; Pratiwi, 2022). As a result, education in Indonesia must undergo major changes in terms of its implementation (Samsudin et al., 2023).

Education, which was delivered face-to-face for the first time, experienced a shift in its implementation process. Learning that previously could be done face-to-face, now has to be done online (Sukmawati, Sujarwo, Soepriadi, & Amaliah, 2022). Online learning is a type of learning that occurs through the use of technological advancements such as computers, mobile phones, and internet-connected devices. Because online learning can be done anywhere and anytime, study time is very flexible (Greenland & Moore, 2022). The complexity of this satellite technology also allows students to continuously communicate with instructors through class applications, video conferencing, zoom, Microsoft Team, live chat, and Whatsapp groups. This has a significant effect on the learning process, especially at the elementary school level, when students are not old enough to be smartphone users, and not all students have them (observation results).

Online learning is software that organizes online learning lessons to reach many people (Alam, 2022)(Dautbašić & Bećirović, 2022). Learning can be widely distributed with an unlimited number of students by utilizing the network (Wang, 2022). Meanwhile, Kaye defines online media in general as any type or media format that can only be accessed via the internet and contains text, photos, video, and sound as a means of online communication, while online media, in particular, is interpreted as media in the context of mass communication (Kaye, Rousaki, Joyner, Barrett, & Orchard, 2022). Online learning is a non-face-to-face learning approach that uses a platform to assist the teaching and learning process, which can be done remotely (Lira Camargo et al., 2022). The goal of online learning is to provide high-quality learning services through a large network that can reach more study space enthusiasts

Learning competency is a key metacognitive phenomena that emerges and varies during active learning activities depending on the students' motivational orientation. While in school, students determine their cognitive goals, develop their general cognitive function, and become more picky with their knowledge acquisition techniques. The process of acquiring learning abilities is started by engaging in various learning activities and the subsequent changes in the cognitive domain (Flogie & Aberšek, 2021). Cognitive learning achievement is the level of academic ability that is determined by the results of standardized tests (O'Connell & Marks, 2022). The student will benefit from having this information when applying for jobs or continuing their school because it will be utilized to determine whether they pass, fail, or earn a grade raise (Ramakrishnan et al., 2022; Tomkin & West, 2022). It examines the quantifiable results of students' intellectual efforts in a range of educational activities as a result of the teaching and learning process.

Following the emergence of the Covid-19 pandemic in this hemisphere, the education system was forced to innovate to carry out the process of teaching and learning activities to achieve a solid and superior quality of education. Furthermore, the Circular of the Minister of Education and Culture Number 4 of 2020 suggested that all activities at the education level be physically separated and all teaching and learning procedures be carried out online (Azzahra, Maryanti, & Wulandary, 2022). Institutions, on the other hand, do not fully understand what innovations can be implemented to maintain the quality of teaching and learning during a pandemic. Some educational institutions are currently adapting due to technological challenges and inadequate infrastructure. Online learning with project-based learning (PjBL) and Bended Learning (BL) learning approaches were used in this study and then compared. The effectiveness of these two learning strategies is then compared.

Integrated Curriculum (IC) is a project-based learning system (DeCoito & Briona, 2023; He et al., 2022). Each class will be assigned a project related to the subject. This learning approach does not only cover one subject but also connects with other learning methods (Lei et al., 2022). Using this strategy, in addition to students working together on projects, additional teachers are allowed to do team teaching with teachers from other courses (Veteska, Kursch, Svobodova, Tureckiova, & Paulovcakova, 2020). Since this technique will be implemented using an internet system, a unified curriculum can be implemented for all students in all locations. As a result, the implementation of an integrated curriculum is considered quite safe for students [29]. Blended Learning (BL) is a strategy that combines two methodologies at once (Mielikäinen, 2022). In some ways, this technology combines online systems with face-to-face communication via video conferencing. Consequently, even though students and teachers study remotely, they may still engage with each other (Ng, Ng, & Chu, 2022). According to Selznick, an integrated learning strategy is an excellent strategy to improve students' cognitive abilities (Selznick, Dahl, Youngerman, & Mayhew, 2022).

Online learning is only available in a limited capacity via the WhatsApp group. The WhatsApp group application is used to provide learning materials which are often offered in the form of films obtained from YouTube, very brief explanations, and assignments to students. As a result, this type of learning has a significant influence on children's cognitive and psychomotor development. In addition, it turns

out that physical fitness is an absolute requirement to improve the performance of an athlete (Martins, Honório, & Cardoso, 2023; Mérida, Palma-Leon, Arias-Arias, & Calvo-Lluch, 2023; Rubiyatno et al., 2023; Saputra et al., 2023; Suryadi, 2022; Suryadi & Rubiyanto, 2022; Suryadi, Samodra, & Purnomo, 2021; Suryadi, Suganda, et al., 2023), which can be stated as a prerequisite that cannot be postponed or renegotiated". are all components of physical fitness (Gabbett, Jenkins, & Abernethy, 2009; Kashapov & Kashapov, 2022). Fayazmilani, however, defines sport as "activities that improve physical condition", which is an important aspect for athletes (Fayazmilani, Abbasi, Hovanloo, & Rostami, 2022).

Based on the above, this article explores the effect of online learning during the Covid-19 outbreak on students' cognitive and psychomotor abilities in physical condition courses. The purpose of this study was to determine the effect of online learning on the cognitive and psychomotor capacity of Padang State University students.

Materials and Methods

This study uses a quantitative approach. The quantitative approach is a research method that uses a lot of numbers (Yalcin, Kilic, & Delen, 2022). Starting with data collection and ending with data analysis. While research techniques require a thorough examination of all information. Quantitative research is a methodical, planned, and structured type of research (Köhler, Smith, & Bhakoo, 2022). Quantitative research methods are characterized as part of a series of systematic explorations of phenomena through data collection, which is then assessed using mathematical or computer statistical tools (Knight, Chidlow, & Minbaeva, 2022). Most of this research was conducted using a statistical approach to obtain quantitative data through research projects. SPSS is used to calculate the data in this article.

During the pandemic, data was collected using digital-based observation techniques as well as literature reviews from various relevant magazines and scientific articles. When researchers use observational techniques, they travel directly to the field to study the behavior and activities of people in the study area. Text and language were observed using digital observation techniques. Then an e-test of cognitive and psychomotor learning outcomes was carried out. Three experts agreed on digital-based e-test instruments and online observation sheets. Next, the validity and reliability of the instrument are investigated. Expert judgment produces a value of 0.94 with a very valid category. Only 15 out of 20 cognitive learning outcomes data items in the extended multiple choice form were considered valid and reliable. Data on learning outcomes and psychomotor learning achievements were obtained using an observation sheet of e-test skills in the form of video conferencing learning which shows the physical condition of students.

Partisipant
This study was conducted at Padang State University with third-semester students enrolled in the 2022 physical condition course. A total of 80 third semester students of the 2022 physical condition course were used as the sample. The total number of courses used was four, with two classes of 40 students treated with project-based learning and two additional classes of 40 students as control classes.

Prosedure
Researchers conducted online studies in two courses which were designated as the experimental class and the other two classes were designated as the control class. Researchers used project-based learning (PjBL) for learning activities in the experimental class, while online blended learning using Zoom was used for learning activities in the control class. Project-based learning is taught in accordance with the existing disciplines at the time, especially physical condition subjects. The researcher's job here is only as a facilitator. Students are expected to explore their knowledge while adhering to the norms and applying project-based learning. Learning activities include: (1) building basic questions; (2) creating a project strategy; (3) making a schedule; (4) project progress monitoring; (5) test results; and (6) assessing experience.

Accessing lecture materials (books, files, doc, ppt, jpg), pages, and email is made easier by Zoom Class. Other learning activities include completing assignments (text and online files), participating in discussions (forums), assessing reading comprehension (lessons/feedback), and presenting material (web conference/Zoom meeting).

Blended Learning is used to carry out learning activities for the control class. Students can access course materials and enrichment resources, complete assignments, and send feedback emails to professors using this paradigm, just as they have done in the past. Both sessions used the same material and theme, with an emphasis on physical conditioning courses. At the end of the study, the researcher managed data on cognitive learning achievement tests and psychomotor learning achievement which were collected with skill test observation sheets in the form of videos doing physical condition assignments to determine the success rate of the learning model used in the research.

Statistical Analysis
Identifying the necessary conditions for analysis, such as the collinearity test, variance homogeneity test, total variance-covariance homogeneity test, and normality test of the data distribution, is the first step in the hypothesis testing process. Wilk's Shapiro test was used to determine the normality of the data distribution, while Levene's test, Box's test, and the homogeneity of variance-covariance test were used to determine the homogeneity of variance and collinearity, respectively. Next, descriptive analysis of the data was performed using Multivariate Analysis of Variance. (MANOVA). A significance level of 0.05 was used for all hypothesis testing when utilizing the Statistical Package for the Social Sciences 25.0 for Windows program.

Results

While the control group received the BL learning model, the experimental group received the IC learning model. Following the adoption of two learning models in each group, posts were made to assess the impact of the two models on the cognitive and psychomotor learning accomplishments of the students. The descriptive analysis of the students' cognitive and psychomotor learning achievement scores based on the learning model's findings is summarized in Table 1.

Table 1.
Cognitive and Psychomotor Learning Achievement Physical Conditions of Students

Data Explanation	IC		BL	
	Cognitive Learning Achievement (n= 40)	Psychomotor Learning Achievement (n = 40)	Cognitive Learning Achievement (n = 40)	Psychomotor Learning Achievement (n = 40)
Means	72.3	81.3	63.5	76.3
median	72.0	80.0	63.0	75.0
Deviation standart	6.5	7.678	6.453	8.005
Difference	42.2	58.9	41.6	64.1
Minimum	62	65	53	60
Maximum	87	95	77	90

According to Table 1, students who were taught using the PjBL approach had cognitive learning results that averaged 72.3. This average is higher than the 63.5 average of students who are studying the BL model. The average psychomotor learning result for students who were taught using the PjBL model was 81.3, which was higher than the average for students who were taught using the BL learning model, which was 76.3. The results are described in Figure, which is attached for clarification.
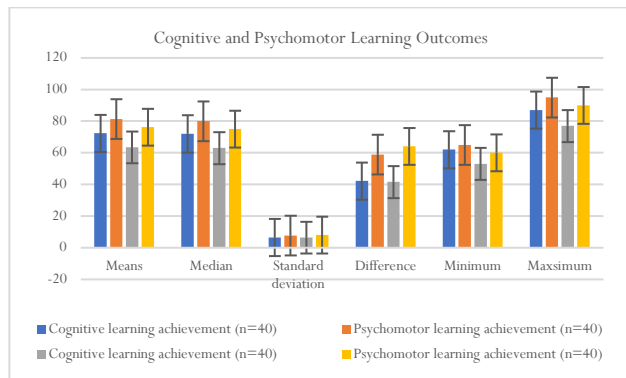

Figure 1. Description of cognitive and psychomotor learning outcomes data of students' physical condition

Analysis of prerequisite test results

Additionally, the MANOVA test was used to examine the normality of the data distribution, the homogeneity of variance between groups, and the variance-covariance matrix in order to investigate the impact of the learning model on cognitive and psychomotor learning outcomes. The results are summarized in Table 2-4.

With a p-value larger than 0.05, Table 2 shows the results of the normality test for student data on cognitive and psychomotor learning outcomes, demonstrating that the data is normally distributed.

Table 2.
Normality Test of Students' Cognitive and Psychomotor Learning Achievement

Variabel	Online Learning	Kolmogrov-Smirnova			Shapiro-Wilk		
		Statistik	df	Sig.	Statistic	df	Sig.
Cognitive Learning Achievement	IC	0,114	40	0,200*	0,957	40	0,137
Psychomotor Learning Achievement	BL	0,136	40	0,062	0,964	40	0,221
Cognitive Learning Achievement	IC	0,132	40	0,079	0,953	40	0,093
Psychomotor Learning Achievement	BL	0,132	40	0,078	0,952	40	0,087

Table 3.
Variant Test of Homogeneity of Cognitive and Psychomotor Learning Achievement

Variabel		Statistik Levene	df1	df2	Sig.
Cognitive Learning Achievement	Based on Mean	0,005	1	78	0,944
	Based on Median	0,001	1	78	0,978
	Based on median and adjusted df	0,001	1	77.999	0,978
	Bases on timmed mean	0,004	1	78	0,949
Psychomotor Learning Achievement	Based on mean	0,064	1	78	0,802
	Based on median	0,053	1	78	0,818
	Based on median and adjusted df	0,053	1	77.868	0,818
	Based on timmed mean	0,071	1	78	0,790

Data on psychomotor learning outcomes and success rates are shown in Table 3, where p> 0.05 denotes uniform variation across groups of learning models. The results of the variance matrix homogeneity are displayed in Table 4.

Table 4.
Result of Variances/Covariance Matrixs Homogenity

M square	0,460
F	0,149
df1	3
df2	1.095.120.000
Sig.	0,930

According to Table 4's variance matrix, which has a value of F = 0.149 and a p value greater than 0.05, the correlation between students' cognitive learning outcomes and their psychomotor learning outcomes is homogenous.

The calculation results of the MANOVA method are explained.

The MANOVA exam may be continued if test results satisfy all of its conditions. The findings of the MANOVA test are summarized in Tables 5 and 6.

Table 5.
Cognitive and Psychomotor Learning Models of Learning Achievement in Influence Courses

	Influence	Mark	F	df Hypotesis	df Error	Sig.
Intercept	Jejak Pillai	0,994	6.242.904a	2.000	77.000	0.000
	Lambda Wilks	0,006	6.242.904a	2.000	77.000	0.000
	Jejak Hotelling	162.153	6.242.904a	2.000	77.000	0.000
	Akar Terbesar Roy	162.153	6.242.904a	2.000	77.000	0.000
Online Learning	Jejak Pillai	0,322	18.293a	2.000	77.000	0.000
	Lambda Wilks	0,678	18.293a	2.000	77.000	0.000
	Jejak Hotelling	0,475	18.293a	2.000	77.000	0.000
	Akar Terbesar Roy	0,475	18.293a	2.000	77.000	0.000

Table 5 displays the trace values of Pillai, Wilks' Lambda, Hotelling, and Roy obtained with F = 18.293 and p 0.05 which indicates that the learning model influences cognitive and psychomotor learning achievement in physical conditioning courses.

Table 6.
Manova Result

Source	Dependent Variable	Type III Sum Squared	df	Means Squared	F	Sig.
Corrected	Coginitive Learning Achievement	1.522.512a	1	1.522.512	36.293	0.000
Model Junc-tion	Psychomotor Learning Achievement	500.000b	1	500.000	8.127	0,006
	Cognitive Learning Achievement	369.240.313	1	369.240.313	8.801.713	0.000
	Psychomotor Learning Achievement	497.701.250	1	497.701.250	8.089.752	0.000
Online Learn-ing Model	Cognitive Learning Achievement	1.522.513	1	1.522.513	36.293	0.000
	Psychomotor Learning Achievement	500.000	1	500.000	8.127	0,006
Result	Cogjnitive Learning Achievement	3.272.175	78	41.951		
	Psychomotor Learning Achievement	4.798.750	78	61.522		
Total	Cognitive Learning Achievement	374.035.000	80			
	Psychomotor Learning Achievement	503.000.000	80			
Corrected To-tal	Cognitive Learning Achievement	4.794.687	79			
	Psychomotor Learning Achievement	5.298.750	79			

The impact of the learning model on cognitive learning achievement is seen in Table 6, where a F value of 36.293 and a p value of 0.000 show that the learning model has an impact on cognitive learning achievement. It may be concluded that the learning model effects psychomotor learning achievement because F = 8.127 and p-value = 0.006 revealed the effect of learning models on psychomotor learning achievement.

Discussion

Learning Model's Impact on Students' Achievement of Cognitive and Psychomotor Learning Outcomes

According to the descriptive data, students studying sports massage in the PjBL group had an average value of cognitive learning mastery that was higher than students in the BL group. The descriptive study's findings demonstrate that psychomotor sports massage has a higher learning achievement than BL. (Table 1). With a value of F = 18.293 and p = 0.05, multivariate analysis shows that the learning model influences cognitive and psychomotor learning achievement in physical condition courses (Table 5). Balasubramani found that learning through project work in the form of student-centered teaching aids is very significant and beneficial for students' cognitive, emotional, and psychomotor development, which supports the findings of this study (Balasubramani, Aamer, & Sonawane, 2022). By allowing students to apply what they have learned in real-world circumstances, practical work helps students comprehend teachings, enhance their psychomotor skills, and dexterity.

These exercises can teach students skills like observing, measuring, classifying, documenting data, generating, altering, controlling variables, and conducting scientific experiments, to name just a few [43]. Cognitive learning success is related to one's intellectual ability. The affective and psychomotor abilities of students are very closely related to cognitive learning abilities. This is because the cognitive, emotional, and psychomotor domains are all related to learning behavior (Enoch, Abraham, & Singaram, 2022). Students who excel in cognitive learning can increase their affective and psychomotor domains (Savic & Kashef, 2013). The purpose of Bloom's Taxonomy is to motivate teachers to focus on the cognitive, psychomotor, and affective domains. Within each discipline, there are many degrees of

learning, ranging from simpler, surface-level learning to more intricate, in-depth learning. The amount of learning will vary depending on (1) the type of event, (2) the developmental stage of the kids participating, and (3) the duration and intensity of the experience (Eisele et al., 2022).

The Influence of the Learning Model on the Achievement of Students' Cognitive Learning Achievement

According to the findings, there was a significant difference between students who studied using the BL model and students who studied using the BL learning model in terms of cognitive learning achievement (F = 36.293, p 0.05). According to the descriptive statistics, the DI-eL class had an average score of 63.58 and the PjBL class had an average cognitive learning mastery score of 72.30 (SD: 6.501). (SD: 6.453). In this study, BL was more effective than BL at raising students' achievement in cognitive learning. The findings of this study echo previous findings of substantial variation in achievement between students studying the IC and DI models (Privitera, Zhou, & Xie, 2023). Students who study using the IC paradigm perform better academically. Students who study using the IC and BL models have different critical thinking skills and learning achievements (Oh & Leventhal, 2022), while students who learn using the IC model do better. According to research (Escobar, Rojas-Gualdrón, Velez, & Santos-Pinto, 2022), the e-learning-assisted IC paradigm influences learning outcomes in understanding concepts. The findings of this investigation support previous studies. When compared to the standard learning model, the BL model with online assessment gives better results (Huh et al., 2022).

The PjBL model outperforms the BL in terms of students' achievement in cognitive learning because of the strong correlation between the study findings and the accepted theory. A third argument makes the case that teachers should help low-income students by utilizing hands-on learning strategies since they are more likely to fail in school and run into significant problems later in life if they do not improve their academic performance. The vast majority of students should be trained via hands-on learning methodologies because they can also aid in reducing social and behavioral challenges. Because direct learning enhances academic development and student welfare, it is possible to implement it in the classroom (See et al., 2022). Students that participate in PjBL can improve their problem-solving skills, creativity, internal drive and interest, responsibility,

interpersonal communication skills, and social skills. Additionally, students who participate in BL are assigned real-world projects to help them connect the dots between the principles being taught and how they are used in practice (Bizami, Tasir, & Kew, 2023).

The PjBL approach can help students understand things more deeply and creatively than traditional classroom-based learning. Student creativity increases after utilizing PjBL by showing innovative ideas, trying their best to come up with fresh ideas for excellent projects, and students actively participating in the learning process (Chen, Chen, & Wang, 2022). To achieve the desired goals, the project scope, resources, and planning activities are used to implement and manage the resources. It is possible to comprehend the project's scope, simulate real-world challenges, develop concepts and creativity, cultivate interpersonal skills, assess actual knowledge, choose real-world scenarios, and assess student abilities (Bellas, Guerreiro-Santalla, Naya, & Duro, 2022).

Blended learning evaluation requires careful supervision, authentic assessment, and careful collection of student work (Srivatanakul, 2022). To track project progress, social media is used for evaluation (Moretta, Buodo, Demetrovics, & Potenza, 2022). BL helps students to immerse themselves in subjects and can help them achieve higher learning outcomes (Anthony Jnr, 2022). Interaction between students and lecturers, students and other students, as well as students with learning materials, will help the learning process (Le et al., 2022).

The influence of the learning model on the achievement of psychomotor learning achievement

The average PjBL class psychomotor learning achievement was 81.38 (SD: 7.678), while the BL class average was 76.38. (SD: 8005). The learning model showed a statistically significant effect on psychomotor learning achievement, according to multivariate analysis (F: 8.127, p-value 0.05). In this learning, IC emphasizes group responsibility for mastering and teaching the material studied with other group members, so that each student is responsible for ensuring that the material as a whole can be understood by each group, while BL emphasizes individual responsibility for understanding and completing the task. The psychomotor domain is related to learning outcomes obtained through the manipulation skills of physical and muscle strength. Psychomotor subjects are those that focus more on movement and emphasize physical reflexes and hand skills. The skill itself shows the level of a person's proficiency in a particular activity or group of tasks. A study by Perry defined psychomotor aptitude as having six stages: reflex movement, fundamental movement, perceptual ability, physical movement, skilled movement, and non-discursive communication (Perry, Bridges, & Burrow, 2022). Reflex movements are involuntary motor reactions that appear when newborns are born. Basic moves are moves that lead to more advanced talents.

Perceptual ability is a synthesis of cognitive and physical skills. The capacity to create skilled movements is referred to as physical ability. Skilled movements are movements that need to be learned, such as sports skills. The capacity to communicate with gestures is known as non-discursive communication. Stylos' research categorizes psychomotor learning outcomes as specific responses, motor circuits, and the use of rules. Students at a certain response level can respond to physical objects (which can be heard, seen, or touched) or perform unique tasks, such as holding a racket or table tennis mat (Stylos, Bigné, & Bellou, 2022). Students studying motor chaining can combine more than two basic abilities into one integrated ability, such as hitting a ball, sawing, using calipers, and so on. At the rule-using level, students can use their skills to perform sophisticated skills, such as hitting the ball correctly for better results with the same energy. More emphasis should be placed on conditioning skills exams as they best represent a person's conditioning skills (ten Cate & Schumacher, 2022).

The teaching and learning process in BL is mainly centered on lecturers who convey information or knowledge to students. This understanding is comparable to the lecture learning approach, where the speaker gives almost all the material to the students. Lecturers define learning as a collection or memorization of facts given in the form of information or subject matter (Sasson, Yehuda, Miedijensky, & Malkinson, 2022). Teacher-centered BL is the foundation of BL; however, teaching techniques that do not allow instructor support do not work and damage students at risk (Grecu, Hadjar, & Simoes Loureiro, 2022). Cognitive and affective components of students' psychomotor development must be integrated, which requires clarity in planning, goals, and implementation (Nix, Shelton, & Song, 2022). Although the BL paradigm improves students' cognitive and psychomotor learning outcomes, many obstacles can hinder this process: 1) Students still have to adjust to the new approach being taught. The classical approach is well-known among students. Due to the COVID-19 outbreak, students are not used to learning with a new paradigm because the teaching and learning process is quite short and is carried out online; 2) students have limited internet quota, so the learning process cannot run according to regular face-to-face time; and 3) additional variables that researchers have not mastered properly and can affect the success of student's cognitive and psychomotor learning. A drawback of this study is that we did not assess the pretest findings on the multivariate test. Pre-test findings can be used as a covariate that influences the final outcome. This research is also limited to one university. Future studies should focus on the peculiarities of various subjects.

Conclusions

The research's conclusions and analysis demonstrate how the PjBL model affects the success of cognitive and psychomotor learning. With regard to cognitive and psychomotor learning outcomes, the PjBL model class fared better

than the BL model class. While the PjBL model has an impact on cognitive learning, it has no impact on psychomotor learning. The PjBL model for learning has strengths in understanding the scope of work, simulating real-world scenarios, enhancing interpersonal skills, developing concepts and creativity, interactions between students and teachers, students with other students and students, and learning materials. In order to enhance cognitive and psychomotor learning outcomes, particularly in the wake of the COVID-19 epidemic, the PjBL model is recommended as an approach. Testing the model on variables other than physical health can be used for additional study, and it is important to look at other variables that affect students' progress in cognitive and psychomotor learning.

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Conflicts of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and publication of this article

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