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Project-based learning model and self-efficacy: improving cognitive learning and sports massage skill

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Abstract

Current pupils have low achievement and poor massage learning skills. The purpose of the study was to ascertain how well Department of Physical Education students' cognitive learning accomplishment and sports massage abilities might be enhanced by the project-based learning model (PjBL) and self-efficacy. A post-test control group design was used in conjunction with a quasi-experimental design. There were 141 students in 6 classes in the Department of Physical Education. The samples for this study consisted of 4 groups (76 students), each of which had 19 students. The groups were formed based on self-efficacy and learning models. Multiple-choice tests were used to assess learning achievement, and a massage skills test was used to assess skills. The inferential statistical analysis of MANOVA was applied to the data analysis process. The findings indicated that the PjBL model and self-efficacy had a simultaneous and partial effect on improving cognitive learning achievement and sports massage skills; additionally, the PjBL had a greater impact on these outcomes than direct instruction; third, the high self-efficacy had a greater impact on these outcomes than the low self-efficacy; and finally, the interaction between the learning models (PjBL and direct instruction) with self-efficacy (high and low) had a significantly different effect on these outcomes. Therefore, the grouping of strong and low self-efficacy has varying effects on the learning model (PjBL and direct teaching) employed for cognitive learning achievement and sports massage abilities. In the Department of Physical Education, the PjBL model and self-efficacy are advised to enhance students' cognitive learning success and sports massage abilities.

Keywords: PjBL model, self-efficacy, cognitive, skills.

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INTRODUCTION

In the twenty-first century, disruption has marked every industry, including science and technology. This has resulted in changes to media, curriculum, and technology that have altered the paradigm of learning (Aslamiah et al., 2021; Jaiz et al., 2022; Rahayu et al., 2022). Technological development in the twenty-first century can improve the quality of learning (Rosnaeni, 2021). The 9Cs (critical thinking, communication, creative thinking, collaboration, computational, competition logic, culture understanding, culture appreciation, curiosity, care for self others, and planets) are the 21st-century competencies that can eventually boost learning accomplishment in the cognitive, affective, and skills domains (Azzahra et al., 2023).

The learning process needs to be changed to become more student-centered, with learning attainment serving as a gauge of how well students are teaching and learning in order to equip the next generation with 21st-century capabilities. An improvement in learning achievement is the result of revitalizing the learning process (Gumantan et al., 2021). Learning achievement is a crucial indicator for measuring student success, including cognitive, affective, and psychomotor factors after participating in a learning process (Ekpenyong et al., 2022). Learning achievement is influenced by internal factors, which include students' attitudes toward learning, students who have no interest, and students' low learning motivation. Meanwhile, environmental, familial, and educational factors are examples of external factors (Maesaroh, 2023). This means that in order to improve student learning accomplishment and provide them the skills they need for the twenty-first century, real efforts must be made, such as putting creative learning models into practice. It is necessary to alter the current learning paradigm in order for students to actively participate in the learning process (Kuncahyono et al., 2020).

Teachers must be able to use learning models that are appropriate for the qualities of their students or their subjects when teaching in higher education, especially when learning involves practice-dominant traits. The goal of implementing cutting-edge learning models is to assist every student in realizing their maximum potential, which includes achieving academic success (Huang et al., 2022; Kwangmuang et al., 2021). Students who are studying courses with dominant practice are required to be active and increase their practice experience to improve their skills (learning achievement). Based on previous findings regarding practical learning in massage courses, low learning achievement, and sports massage skills are caused by students not getting the opportunity to develop their knowledge, students not practicing sports massage outside of lectures, and the learning process is still conventional, so it is less interesting for students (Darni et al., 2018; Sugiarto et al., 2020; Widhiyanti et al., 2023).

Each student enrolled in the sports massage course must possess the necessary knowledge and abilities in the field of sports massage therapy (Tisna MS et al., 2023). The study of massage material consists of the history of sports massage, the benefits of sports massage, massage management, anatomy and physiology of the body, manipulation in massage, sports massage, and sports massage manipulation (Salvo, S. G., 2023). The goal of sports massage is to manipulate, or massage, specific body areas with the hands in a rhythmic manner to achieve physiological, therapeutic, or treatment benefits (Brilian et al., 2021).

If students employ the appropriate learning models, they will acquire good knowledge and abilities in sports massage because learning media will facilitate information acquisition (Selwyn et al., 2020), and the appropriate learning model can serve as a roadmap to help students reach their objectives (Oke & Fernandes, 2020). Previously, researchers had developed learning media for digital-based sports massage lectures called D-MESS (Tisna MS et al., 2023) whose implication was as an additional reference that suited the characteristics of its users (generation Z). Furthermore, it has also implemented a quantum learning model in sports massage lectures using a quantum learning model (Astra & Tisna, 2023). But the findings only showed modest progress in certain areas of the student's character. Thus, it is now essential to conduct more comprehensive research on learning outcomes in the form of student knowledge and abilities through the use of cutting-edge learning models that incorporate D-MESS as a learning tool. To address the issues raised above and those about the massage course, it is essential to integrate learning models and strategies with learning media to enhance learning achievement and sports massage skills. By delving into significant challenges, the project-based learning (PjBL) paradigm fosters conceptual knowledge and produces real products (Wu & Wu, 2020).

Numerous studies have documented the effectiveness of PjBL in raising student achievement. (Lazić et al., 2021; Maros et al., 2023; Mursid et al., 2021). PjBL can assist in enhancing abilities and integrating knowledge. (Rio & Rodriguez, 2022). Meanwhile, the implementation of the PjBL model on learning outcomes in movement or sports learning needs to be studied, especially in sports massage lectures, so that current findings can expand the scientific knowledge of learning. Therefore, this research aims to reveal the effect of implementing the project-based learning model on learning achievement and massage skills.

PjBL focuses on student engagement in a project and learning with understanding (Mou, 2020). PjBL in higher education has good goals, especially in increasing student motivation and learning various skills independently (Goyal et al., 2022). This viewpoint demonstrates how crucial student freedom is to the PjBL concept. In this instance, self-efficacy—a quality of students—and independence are associated. Student internal characteristics, such as self-efficacy, impact the learning model's implementation, which includes the PjBL model. (Yada et. al., 2022).

Extant research is indicative of the significant relationship between self-efficacy with the academic achievement of the students (Chang & Tsai, 2022; Zhao et. al., 2021). During the learning process, the student’s actions are based on the expectations of their performance

and the perceptions they have about their competence. It means that self-efficacy beliefs have a significant effect on the academic achievement of the students. Meanwhile, the effect of self-efficacy on learning outcomes in movement or sports learning needs to be studied, especially in sports massage lectures, so that current findings can expand the scientific knowledge of learning. Therefore, this research aims to reveal the effect of self-efficacy on learning achievement and massage skills.

Self-efficacy can be a mediator to enhance student learning achievement or a reference for analysis when developing the learning process. (Tisna, 2023). In PjBL which uses self-efficacy as a moderator, students with high self-efficacy can work on the given project tasks with full responsibility, diligently, tenaciously, and exert all efforts, so that it has an impact on optimal learning achievement. Meanwhile, students with low self-efficacy will tend to give up easily, while students with high self-efficacy will try harder to overcome existing challenges (Ningsih & Hayati, 2020). Low self-efficacy in students might make them feel incapable of finishing projects and solving issues in PjBL, which can lead to less-than-ideal learning outcomes. Thus, the purpose of this study is to determine how learning achievement and massage skills are affected by the interplay between PjBL and self-efficacy.

METHOD

This study used a posttest-only, non-equivalent control group design in a quasi-experimental setting (Tisna, 2023). The study's process was grouped into experimental classes and control classes. The experimental group was given a treatment of PjBL. The control group was given a treatment of direct instruction. Posttests are given to experimental and control groups to determine the differences in their learning achievement and their massage skills. The population was 6 classes (141 students) in the Department of Physical Education. There were 4 groups (76 students) of the samples of this study, which were determined based on learning models and self-efficacy and each group was divided into 19 students.

In this study, tests and questionnaires were used to collect data. The test was used to gauge the students' learning objectives, while the questionnaire was used to gauge the students' self-efficacy. A self-efficacy questionnaire with a 1–5 item score range was used to gather data. The self-efficacy questionnaire was developed based on three dimensions, namely level (dimension related to the level of difficulty of the task), generality (dimension related to the breadth of mastery of the task), strength (dimension related to the level of strength) (Kustyarini,

2020). An item score range of 0 to 1 on a multiple-choice exam was used to gather data on learning achievement. The cognitive domain of Anderson's updated Bloom's taxonomy—that is, the domain of remembering, comprehending, applying, analyzing, evaluating, and creating—was the foundation for the development of the learning achievement test (Parwati, 2019). Massage skills were the scores obtained by students when practicing sports massage, which were measured through a sports massage practice assessment rubric with a score range of 1-4 (Table 1). Skills tests based on skill domains follow Anderson's revised Bloom's taxonomy, which at least includes aspects following the operational verbs of basic competence (Susanto, 2018).

Table 1. Massage Skill Assessment Rubric

Skill Indicator	Score	Description
Calf/back/arm massage	4	Students practice all massage manipulations on the calves/back/arms in the correct order and the massage techniques are all correct.
	3	Students practice all massage manipulations on the calves/back/arms out of sequence, but the massage techniques are all correct Students practice 3 (three) massage manipulations following the sequence and the massage technique is correct.
	2	Students practice 3 (three) massage manipulations on the calves/back/arms, not in the order, but the massage technique is correct Students practice 2 (two) massage manipulations following the sequence and the massage technique is correct.
	1	Students only practice 2 (two) massage manipulations on the calves/back/arms, not in the correct order, but the massage technique is correct Students practice more than 1 (one) massage manipulation in sequence with the correct massage technique.

Data collecting was carried out during the posttest to get information on learning achievement and massage skills. The control group studied direct teaching for eight meetings, whereas the experimental group studied project-based learning. MANOVA data analysis was performed using SPSS at a 5% significance level. The Shapiro-Wilk test was utilized in the data distribution normality test. Levene's test was incorporated into the Homogeneity Test of Variance between Groups. Box's M test was utilized for the variance-covariance matrix's homogeneity test. The collinearity test was tested with the variance inflation factor (VIF). Next, the data was analyzed descriptively and by multivariate variance analysis (MANOVA). A significance level of 5% was used for the hypothesis testing.

RESULTS

The study's findings showed that there were differences in students' achievement and skills in massage learning between those who studied with project-based learning and those who studied with direct instruction. Additionally, there were differences in students' self-efficacy—between high and low—and learning models—between project-based learning and direct instruction. These differences in learning models were caused by the interaction between high and low levels of self-efficacy. Multivariate analysis was used to assess the hypothesis based on the outcomes of the prerequisite tests that had been passed. This multivariate analysis was carried out with SPSS 26.0 for Windows. Table 2 displays the findings of the multivariate analysis performed on the research data.

Table 2. The result of the Multivariate Test

Effect		Value	F	Hypothesis df	Error df	Sig.
Learning model	Pillai's Trace	0.276	13.527	2.000	71.000	0.000
	Wilks' Lambda	0.724	13.527	2.000	71.000	0.000
	Hotelling's Trace	0.381	13.527	2.000	71.000	0.000
	Roy's Largest Root	0.381	13.527	2.000	71.000	0.000
Self-efficacy	Pillai's Trace	0.117	4.686	2.000	71.000	0.012
	Wilks' Lambda	0.883	4.686	2.000	71.000	0.012
	Hotelling's Trace	0.132	4.686	2.000	71.000	0.012
	Roy's Largest Root	0.132	4.686	2.000	71.000	0.012
Learning model*Self-efficacy	Pillai's Trace	0.210	9.432	2.000	71.000	0.000
	Wilks' Lambda	0.790	9.432	2.000	71.000	0.000
	Hotelling's Trace	0.266	9.432	2.000	71.000	0.000
	Roy's Largest Root	0.266	9.432	2.000	71.000	0.000

Based on Table 2, the first result was in line with the statistical scores at the learning model of Pillai's Trace, Wilks'Lambda, Hotelling's Trace, and Roy's Largest Root, with a statistical score of F = 13.527 and a significant score of 0.000, and this score is smaller than the significant score of 0.05 ($p < 0.05$). It may be inferred that there were differences in massage learning achievement and massage skills between students who studied with project-based learning and those who studied with direct instruction. The second result was in line with the statistical scores at self-efficacy of Pillai's Trace, Wilks'Lambda, Hotelling's Trace, and Roy's Largest Root, with a statistical score of F = 4.686 and a significant score of 0.012, and this score is smaller than the significant score of 0.05 ($p < 0.05$). It may be inferred that there were differences in massage learning achievement and massage skills between students who have

high self-efficacy and those who have low self-efficacy. The third result was in line with the statistical scores at learning model*self-efficacy of Pillai's Trace, Wilks'Lambda, Hotelling's Trace, and Roy's Largest Root, with a statistical score of F = 9.432 and a significant score of 0.000, and this score is smaller than the significant score of 0.05 ($p < 0.05$). It may be inferred that there were differences in massage learning achievement and massage skills due to the interaction between learning models (project-based learning and direct instruction) with self-efficacy (high and low).

Moreover, results from the Test of Between-Subjects Effect research validate that independent variables have a partial effect on the dependent variable. The analysis's findings provide significance values for each unit of analysis, specifically for the data on massage skills and learning achievement. The results of the statistical test analysis of the Tests of Between-Subjects Effects in this study are presented in Table 3.

Table 3. The result of Tests of Between-Subjects Effects

Source			**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Learning model	Massage achievement	learning	159.268	1	159.268	7.199	0.009
	Massage skills		2105.263	1	2105.263	26.483	0.000
Self-efficacy	Massage achievement	learning	179.135	1	179.135	8.097	0.006
	Massage skills		347.451	1	347.451	4.371	0.040
Learning model*Self-efficacy	Massage achievement	learning	380.084	1	380.084	17.180	0.000
	Massage skills		594.161	1	594.161	7.474	0.008
Error	Massage achievement	learning	1592.916	72	22.124		
	Massage skills		5723.684	72	79.496		
Total	Massage achievement	learning	521789.845	76			
	Massage skills		396015.625	76			
Corrected total	Massage achievement	learning	2311.403	75			
	Massage skills		8770.559	75			

Based on Table 3 test findings for the Test of Between-Subjects Effects, the first result was in line with the statistical scores at the learning model of massage learning achievement, with a statistical score of F = 7.199 and a significant score of 0.009, and this score is smaller than the significant score of 0.05 ($p < 0.05$). It may be deduced that students who studied with project-based learning and those who studied with direct instruction achieved

different levels of success in their massage education. Pairwise comparisons of learning model data, as shown in Table 4, support this finding.

Table 4. Pairwise Comparisons of Learning Models on Massage Learning Achievement

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.
Massage learning achievement	Experiment (I)	Control (J)	2.895	1.079	0.009

Table 4 shows that the difference between the experimental and control groups, with a positive value of 2.895 and a significance score of 0.009, is more significant than the significance score of 0.05. This suggests that in terms of massage learning achievement, students who studied using project-based learning performed better than those who learned using direct teaching.

With a statistical score of F = 8.097 and a significant score of 0.006, the second result was consistent with the self-efficacy of massage learning achievement. Notably, this score is less than the significant score of 0.05 ($p < 0.05$). It can be deduced that students with high self-efficacy and those with low self-efficacy had different massage learning achievement levels. This conclusion is strengthened by pairwise comparisons of learning model data as presented in Table 5.

Table 5. Pairwise Comparisons of Self-Efficacy on Massage Learning Achievement

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.
Massage learning achievement	Experiment (I)	Control (J)	3.071	1.079	0.006

Table 5 indicates that the significance score of 0.05 is not as high as the difference between the high self-efficacy and low self-efficacy groups, with a positive value of 3.071 and a significance score of 0.006. This indicates that those who have high self-efficacy are better than students who have low self-efficacy in accession to massage learning achievement.

With a statistical score of F = 17.180 and a significant score of 0.000, the third result was consistent with the learning model*self-efficacy of massage learning achievement. Notably, this score is less than the significant score of 0.05 ($p < 0.05$). Due to the relationship between the two learning models—project-based learning and direct instruction—and self-efficacy levels—high and low—it is possible to deduce that there were variations in the

achievement of massage learning. The interaction shows disordinal interaction as presented in Figure 1 which represents the effect of the learning model (project-based learning and direct instruction) on massage learning achievement is not the same for all levels of self-efficacy (high and low).

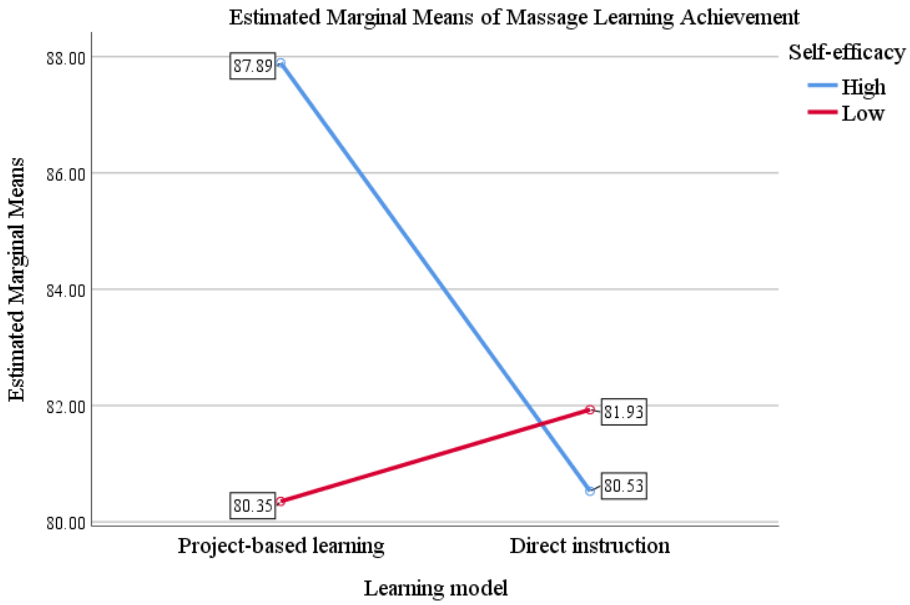

Figure 1. Interaction Profile of Learning Models with Self-Efficacy on Massage Learning Achievement

Based on Figure 1, it can be explained that: (1) at a high self-efficacy level, there is a large difference in the average massage learning achievement between project-based learning and direct instruction, and (2) at a low self-efficacy level, there is a smaller difference in the average of massage learning achievement between the project-based learning and direct instruction. Thus, to achieve massage learning achievement, the grouping of high self-efficacy and low self-efficacy has a varying effect on the learning model (project-based learning and direct instruction) used.

With a statistical score of F = 26.483 and a significant score of 0.000—a value that is less than the significant score of 0.05 ($p < 0.05$)—the fourth outcome was consistent with the statistical scores for the learning model of massage skills. It can be assumed that students who studied with project-based learning and those who learned with direct instruction had different massage skills. Pairwise comparisons of learning model data, as shown in Table 6, support this finding.

Table 6. Pairwise Comparisons of Learning Models on Massage Skills

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.
Massage skills	Experiment (I)	Control (J)	10.526	2.045	0.000

Table 6 shows that the difference between the experimental and control groups, with a positive value of 10.526 and a significance score of 0.000, is more significant than the significance score of 0.05. This suggests that students who learned through project-based learning performed better in their acquisition of massage skills than students who learned through direct teaching.

The fifth result was in line with the statistical scores for self-efficacy of massage skills, with a statistical score of F = 4.371 and a significant score of 0.040, and this score is smaller than the significant score of 0.05 ($p < 0.05$). It may be inferred that there were differences in massage skills between students who have high self-efficacy and those who have low self-efficacy. This conclusion is strengthened by pairwise comparisons of learning model data as presented in Table 7.

Table 7. Pairwise Comparisons of Self-Efficacy on Massage Skills

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.
Massage skills	Experiment (I)	Control (J)	4.276	2.045	0.040

Table 7 indicates that the significance score of 0.05 is not as high as the difference between the high self-efficacy and low self-efficacy groups, with a positive value of 4.276 and a significance score of 0.040. This indicates that those who have high self-efficacy are better than students who have low self-efficacy in accession to massage skills.

The sixth result, which had a statistical score of F = 7.474 and a significant score of 0.008, was consistent with the learning model*self-efficacy of massage abilities. This score was less than the significant score of 0.05 ($p < 0.05$). Given the interplay of learning modalities (project-based learning and direct instruction) with self-efficacy (high and low), it can be assumed that there were variations in massage skills. As illustrated in Figure 2, the interaction demonstrates disordinal interaction, indicating that the learning model's (project-based learning and direct instruction) impact on massage skills varies depending on the self-efficacy level (high and low).

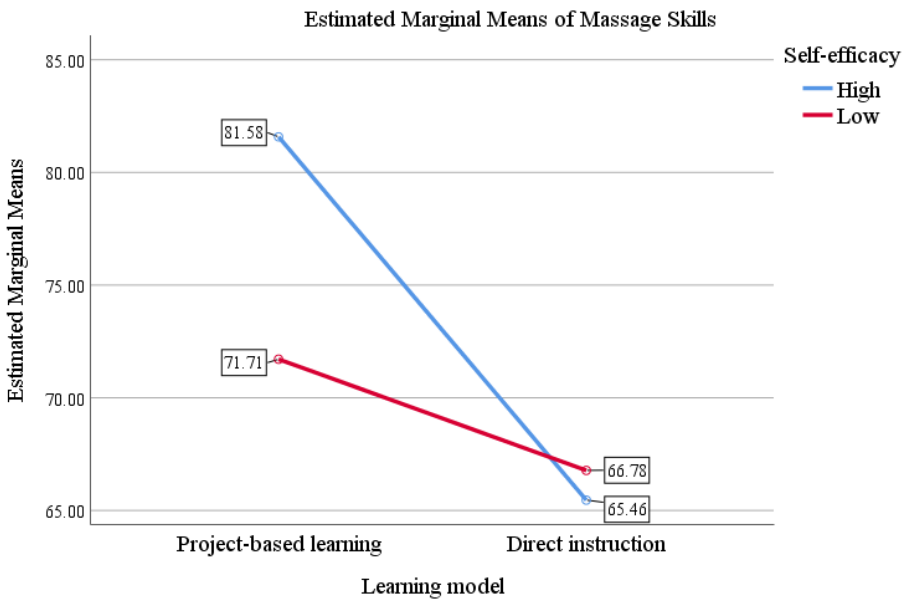

Figure 2. Interaction Profile of Learning Models with Self-Efficacy on Massage Skills

Figure 2 provides an explanation for the following findings: (1) there is a significant difference in the average massage skill between project-based learning and direct instruction at high self-efficacy levels; and (2) there is a smaller difference between project-based learning and direct instruction at low self-efficacy levels. The combination of high and low self-efficacy thus has a variable impact on the project-based learning and direct instruction learning paradigm that is employed to acquire massage skills.

DISCUSSION

Based on these results, a number of issues can be reviewed, including the superiority of the group of students who studied with project-based learning over the group who studied with direct instruction, the superiority of the group of students who studied with high self-efficacy over the group of students who study with low self-efficacy, and the impact of the interaction between the two learning models—project-based learning and direct instruction—with self-efficacy (high and low) on the achievement and skills of massage learning. Project-based learning can assist in strengthening abilities and integrating knowledge (Rio & Rodriguez, 2022). Through meaningful assignments and problem-solving, project-based learning gives students the chance to work autonomously and produces actual products (Sudjimat et. al., 2021). This learning model invites students to carry out investigations by directing students to create or develop products related to the real world (Arizona et al., 2020; Hernáiz-Pérez et al., 2021).

A cutting-edge teaching method called project-based learning includes students by having them begin with basic questions and then conduct in-depth study on them (Medina et al., 2020). Through collaborative projects that develop products based on real-world problems, this PjBL model also gives students experience in designing engaging learning experiences (Setyo Retno, 2022). This strategy also fosters student inquiry, teamwork, and solution-building to assist students in solving real-world challenges (Almulla, 2020).

First, from the perspective of project-based learning foundational constructivist learning theory. The following characteristics of project-based learning are derived from constructivist learning theory: Understanding is produced by interaction with problem scenarios and the learning environment; (2) cognitive dissonance is created during the problem-solving and problem-discovery processes, which facilitates learning; and (3) knowledge is obtained through collaborative social negotiation and evaluation of opposing viewpoints (Arizona et al., 2020; Jazuli & Zakir, 2022). Project-based learning, which is based on constructivist learning theory, encourages students to actively construct their own knowledge rather than taking what they learn for granted (Dewi & Fauziati, 2021; Handhika et al., 2021). Constructivist learning and discovery-based approaches, which both depend on the inquiry process and students' capacity to create answers based on their viewpoints and ways of thinking, are the foundations of project-based learning (Jalinus et. al., 2017). Project-based learning seeks to improve learning in postsecondary education by integrating, using, and creating knowledge in cooperative group settings to solve challenging issues (Guo et. al., 2020).

The second review can be seen from the learning steps in project-based learning. When adopting project-based learning, five steps need to be completed: (1) formulating fundamental questions; (2) creating a project plan; (3) creating a schedule; (4) keeping track of students' and projects' progress; (5) testing the findings; and (6) evaluating the experience (Alhayat et al., 2023; Nurasiah et al., 2022). Based on these phases, students participate more actively in the learning process and generate knowledge that has real value (Yustina et al., 2020). PjBL integration will make it possible to construct discussion boards and assignments that require both individual and group work (Chua & Islam, 2021). Students can interactively pour their thoughts into concrete solutions that can be turned into innovative and creative production works, identify and solve problems, and evaluate through the teaching platform (Azmi et al., 2022; Mursid et al., 2021; Tong et al., 2020).

Third, it is in terms of the learning process that took place during the research. Students were shown to be more engaged in group discussions during the learning process when using

project-based learning. Students actively discussed real-world problems given by the teacher to find solutions. In this instance, the teacher has acted as a facilitator, and the focus of the lesson has been on the needs of the individual students (Potvin et al., 2021). The project-based learning approach fosters students' development as autonomous learners. Project-based learning contributes positively to increasing learner motivation to participate in the learning process guided by lecturers or lecturers who act simultaneously as designers, facilitators, and managers (Pan et. al., 2019). Students will produce a learning product and make strong connections between the concepts and facts they are studying in order to become active learners who actively seek out knowledge instead of just being passive recipients of it (Agustina et al., 2023).

Numerous earlier research, such as those showing that the project-based learning approach can enhance learning achievement and higher-order thinking, support the aforementioned opinion (Demir & Önal, 2021). In addition to enhancing learning outcomes, this learning methodology helps students expand their knowledge, uncover new information, and explore ideas in-depth. The results of research on the impact of learning models on massage talents align with the findings of studies conducted by (Distyasa et al., 2021; Jazuli & Zakir, 2022; Surahman et al., 2019). Enhancing students' skills is one of the learning outcomes that the project-based learning approach influences more than direct instruction.

Through project-based learning, children develop the cognitive, emotional, and psychomotor skills necessary to learn on their own (Goyal et. al., 2022). This viewpoint demonstrates how crucial student independence is to project-based learning. In this instance, self-efficacy—a quality of students—and independence are associated. An individual's view of their capacity to apply efficient learning techniques, time management, problem-solving techniques, and flexible thinking approaches in the context of academic work is known as self-efficacy (Yuen & Datu, 2021). People can grow appropriately good thoughts about their own abilities, which can enhance achievement, foster self-belief in one's abilities, increase motivation internally, and allow students to take on more difficult objectives (Pratiwi & Hayati, 2021).

Efficacy is the ability to evaluate oneself, determining whether one can perform tasks correctly or erroneously, effectively or poorly, and able to fulfill requirements (Kotova et. al., 2021). While efficacy describes self-ability, efficacy describes an ideal that should be attained. An individual's assessment of their capacity or competency to carry out a task, accomplish a goal, or get over difficulties is known as their self-efficacy (Kustyarini, 2020). Self-efficacy is

the conviction that one can execute and oversee an action to produce the best possible results (Yusuf & Efendi, 2019). When tackling issues, students that have high self-efficacy put forth more effort (Hidayat & Noer, 2021; Laksmiwati et. al., 2022). Conversely, pupils who have poor self-efficacy feel under pressure from their skills and give up on addressing difficulties more quickly.

According to this explanation, the study's results support established theories and previous research findings. Therefore, project-based learning is a better model to use than direct instruction to produce higher massage learning achievement and massage abilities. This study's shortcoming stems from the researcher's failure to account for the sample's initial level of knowledge. This is a chance for additional research to yield more thorough results.

CONCLUSIONS

The results of this study indicate that students' cognitive learning achievement and skills can be improved by incorporating project-based learning and self-efficacy into sports massage courses. The project-based learning approach adheres to 21st-century learning, which calls for the development of 9C skills and technological competence. Apart from that, the model also provides real learning activities that suit students' needs and are better prepared to face real-world demands or challenges. The interaction of project-based learning and self-efficacy constitutes the originality of this study. The accession of massage learning achievement and massage skills in the group of high self-efficacy and low self-efficacy has a varying effect on the learning model (project-based learning and direct instruction) used. Project-based learning is more suitable for students who have high self-efficacy, while direct instruction is more suitable for students who have low self-efficacy. Thus, this learning model can be effectively implemented in higher education, particularly in theory and practical courses related to sports massage; nevertheless, it is advised that future study consider the beginning knowledge level as a covariate variable.

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