

The Role of the Augmented Real-Time Feedback to Overcome the Imbalance of Cognitive, Psychomotor, and Social Interaction in Physical Education Class

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Abstract: The motor learning process requires the inter-coordination of the cognitive, emotional, and psychomotor stages. Diversity in students' cognitive abilities and emotions is a challenge in physical education. The issue has been stated that physical education is an area of less interest, thus resulting in lower student interaction with the social environment. Peer teaching is a method offered to combine the cognitive and emotional aspects of performing psychomotor tasks. This study investigates whether peer teaching can be used as a solution to the imbalance between psychomotor performance and social interaction in physical education. For 10 years, consecutive international papers published in the years 2012-2022 have been screened and reviewed from the ERIC database website according to PRISMA guidelines with specific keyword criteria. Finally, a total of 10 journals were taken as final summarized in the conclusion explaining the results of this study. Peer teaching has been cited as one of the learning models that can overcome the imbalance between psychomotor skills and social interaction. It has a better transfer of knowledge, skills, and social interactions in multicultural classes. Concerning physical education, peer teaching serves as an effective learning model for improving cognitive skills, motor skills, and social interaction at the same time. In addition to student diversity, this learning model can balance student abilities parallel. The concept of peer teaching with peer assistance makes a positive contribution to the practice of physical education. Students' psychomotor skills that are unevenly distributed are supported by their peers, and so their social interaction skills are. It can be concluded as a novelty that Peer teaching provides a positive contribution to a healthier social life, improved motor skills, and behavioral coordination through physical education interaction.

Keywords: peer teaching, physical education, psychomotor, social interaction, school.

增强实时反馈在克服体育课中认知、心理运动和社会互动失衡中的作用

摘要：运动学习过程需要认知、情感和心理运动阶段的相互协调。学生认知能力和情感的多样性是体育教学中的一个挑战。这个问题已经指出，体育教育是一个不太感兴趣的领域，因此导致学生与社会环境的互动较少。同伴教学是一种结合执行心理运动任务的认知和情感方面的方法。本研究调查同伴教学是否可以用作解决体育运动中心理运动表现与社会互动之间不平衡的方法。10年来，根据系统评价的首选报告项目和元分析指南，以特定的关键词



标准，从教育资源信息中心数据库网站筛选和审查了 2012-2022 年连续发表的国际论文。最后，在解释本研究结果的结论中，最终总结了 10 种期刊。同伴教学被认为是可以克服心理运动技能和社会互动之间不平衡的学习模式之一。它在多元文化课程中更好地传递知识、技能和社交互动。在体育教育方面，同伴教学是一种有效的学习模式，可以同时提高认知技能、运动技能和社交能力。除了学生的多样性，这种学习模式还可以并行平衡学生的能力。同伴互助的同伴教学理念对体育教学实践做出了积极贡献。学生分布不均的心理运动技能得到同龄人的支持，因此他们的社交互动技能也是如此。可以得出结论，同伴教学通过体育互动为更健康的社会生活、提高运动技能和行为协调做出了积极贡献。

关键词：同伴教学、体育、心理运动、社会互动、学校。

1. Introduction

The rigorous development of the millennial era requires students to have multi-disciplinary competencies, including creative thinking, critical thinking, problem-solving, communication, and collaboration [1]. In line with this opinion, similar research requires teachers to develop learning methods that are oriented to the development of interdisciplinary competencies of students to complete complex tasks that will be faced [2]. In other words, Physical Education Learning Methods that develop single motor skills, present barriers to students in developing multidisciplinary competencies. This is confirmed by the findings that the learning pattern that emphasizes the development of a single discipline, has proven insufficient in equipping students to solve complex problems currently [3]. A school is a crucial learning center for developing multiple competencies, intelligence, skills, communication, and social interaction [4]. The development of multi-aspects for students such as critical thinking, creative and problem solving, and social collaboration is crucial to be considered by parents and teachers [5]. The interaction with teachers and friends at school provides opportunities for students to develop self-competence through cognitive, and psychomotor skills, as well as gain future knowledge and self-development concepts [6], [7]. The development of motor learning through social skills, and critical thinking for problem-solving in collaboration discussions need to be taken into account by teachers. Recent studies confirm that students' motor skills develop significantly through social interactions with people around them in an active frame of participating and providing feedback on the presented movement skills [8], [9].

Recent studies explain that the process of motor learning in physical education requires mastery of cognitive and affective aspects at the previous stage. Therefore, physical education learning has an imperative opportunity to develop multiple

competencies simultaneously compared with other fields [10]. Studies of Educational confirm that the process of mastering psychomotor skills in the movement learning process is the final stage of the cognitive and affective processes in the previous phase [11]. The understanding of cognitive abilities refers to the performance abilities of the neurophysiological profile in the brain needed [12]. It refers to the ability for understanding knowledge, information, and tasks from the simplest to the most complex [13], which includes the process of remembering, problem-solving, and decision-making [14]. Simultaneously, the affective ability is explained in behavioral studies as an attitude of the body's response to a stimulus within the framework of expressing feelings, emotions, appreciation, enthusiasm, values, and interests [15]. This is also reinforced in the findings of an outdoor-class study [16], where the physical education learning model is used recently as a medium for developing multi-competence such as creative thinking, collaboration, and leadership through outbound activities. Students who have limitations in understanding the basic concepts of motion in cognitive processes will have difficulty displaying affective expressions [17], [18]; therefore, the appearance of psychomotor skills will be constrained [19]. The critical issues in physical education learning methods are the demands for learning changes that focus on cognitive, affective, and psychomotor domains [20] at the individual micro level become a critical issue [21]. Physical education learning methods need to be transformed into an integrated active participation model in social interactions, critical thinking, and problem-solving in the task of motoric sports [22]. The task assignment in the learning process must involve cognitive, affective, and psychomotor aspects simultaneously [23]. Teachers must convert the learning method that originally acted as a one-way single resource in delivering materials, into two-way communication between students through problem-solving interaction-based learning to activate student

participation [24].

In terms of implementing the motor learning process, the method that originally emphasized the practical process with a lecturer-centered approach must be converted into a student-centered method [25]. It is recommended in a similar study finding that students are not only given individual practical presentation tasks but simultaneously, must be sensitive in analyzing, thinking creatively, and focusing on problem-solving through direct feedback given to peers on the obstacles faced [26]. This provides opportunities for a balanced learning emphasis on the cognitive, and affective domains, thus providing significant results on the quality of the psychomotor skills presented [27].

However, the conversion process of this physical education learning model requires the availability of various references as study material for teachers and students [28]. Additionally, teachers should increase their knowledge and experience in designing case - study learning models with a student-centered approach. Furthermore, the preparation and development of assessment instruments for learning achievement are also needed as a monitoring and control tool in the learning process [29].

PT is a learning model that is oriented toward giving students multiple assignments, where in addition to having to present individual practical assignments in front of classmates and teachers, students act as tutors to provide direct feedback to classmates' presentations in group environmental studies [30]. A learning evaluation study explains that PT has a positive influence on learning interactions, converting teaching strategies effectively and involving the cognitive domain more interactive in studying and understanding the practical presentation of classmates [31]. Another finding shows that students' affective activities were found to be more active in the process of social interaction, expressing emotions, feelings, and sensitivity in conveying learning feedback.

In the learning management conclusion, PT makes the quality of learning time more optimal and provides many opportunities for more varied learning; therefore, the monotonous physical education learning model with emphasis on a single domain such as psychomotor aspects can be avoided [32], [33]. Within the framework of learning quality assurance, the success of physical education learning with the Peer-Teaching approach is a shared responsibility. Teachers must provide sufficient learning materials, and students are supposed to learn independently to obtain optimal standards of understanding and knowledge [34], [35].

In the terms of the psychomotor learning process with the Peer-Teaching approach, the similarity of the level of knowledge and perception between teachers and students to a certain psychomotor topic is the main prerequisite that must be fulfilled to ensure the learning

process is applied successfully [36]. Therefore, the references regarding the characteristics of peer teaching, issues in motor skills inequality, and social interaction need to be explained comprehensively using literature from several studies [37].

The framework of this study is to present a discussion related to the motor learning process with a peer teaching approach as a solution to overcome the imbalance of psychomotor and social abilities in physical education learning. The purposes of this literature study are to determine whether peer teaching can be used as a solution to resolving the imbalance in psychomotor abilities and social interaction in physical education learning.

2. Method

This study documentation was conducted according to PRISMA guidelines involving the steps such as: 1) literature browsing, 2) study identification, 3) study coding 4) quality assessment, and 5) thematic analysis. An electronic systematic literature search was conducted on the ERIC Journal databases (January 2005 to December 2021) by comparing the published article with a restriction on the date of publication or language on peer teaching in physical education learning.

The search was completed using the following keyword strings: ("Peer-Teaching" OR "Peer Teaching" OR "Teaching Peers" OR "Survey" OR "Review" OR "Analysis" OR "Systematic Analysis") AND ("Physical Education" OR "Teaching Sports" OR "Psychomotor" OR "Psychomotoric" OR "Motor Learning" OR "Social" OR "Interaction" OR "Social Interaction") AND ("Cognitive" OR "Cognition" OR "Affective" OR "Affection"). All reference citations were imported into a reference manager software such as the Mendeley Program, and duplicates were removed by the Author.

3. Research Design

The selection of articles that meet the initial requirements is carried out using the following 3 steps. The first step begins with article filtering carried out by the main author on all articles found in the database, adjusted to the specified keyword constraints. The following stage is to evaluate the abstracts of all articles found independently by the first author and co-authors, followed by selecting a certain number of articles that are considered relevant to the intended topic. In the last step, the author identifies the selected articles filtered in the second stage by reading the whole content and conducting the final feasibility test by screening articles that are under the topic boundaries intended as the chosen articles.

In the case where the main author has a difference in agreement with other authors, the decision-making process is carried out by the consensus method.

Furthermore, the involvement of other authors is needed in decision-making, when a consensus process cannot be reached in agreement. The main objective of this study is to present a complete reference through a process of comparing several articles contained on the ERIC Database with the topic of peer teaching as a solution to overcome the problem of inequality in psychomotor, cognitive, affective, and social interactions in physical education learning.

In particular, this article assesses the potential of the peer teaching-learning model as an alternative solution

in developing students' multi-competencies in learning creative thinking, problem-solving, and collaborative frameworks in physical education learning. Furthermore, to assess the effectiveness of peer teaching as a method to balance the cognitive, affective, and psychomotor domains in equal portions in the social interaction environment through the physical education learning process. The systematic flow carried out by the author starting from selecting the article to the conclusion can be seen in the Fig. 1.

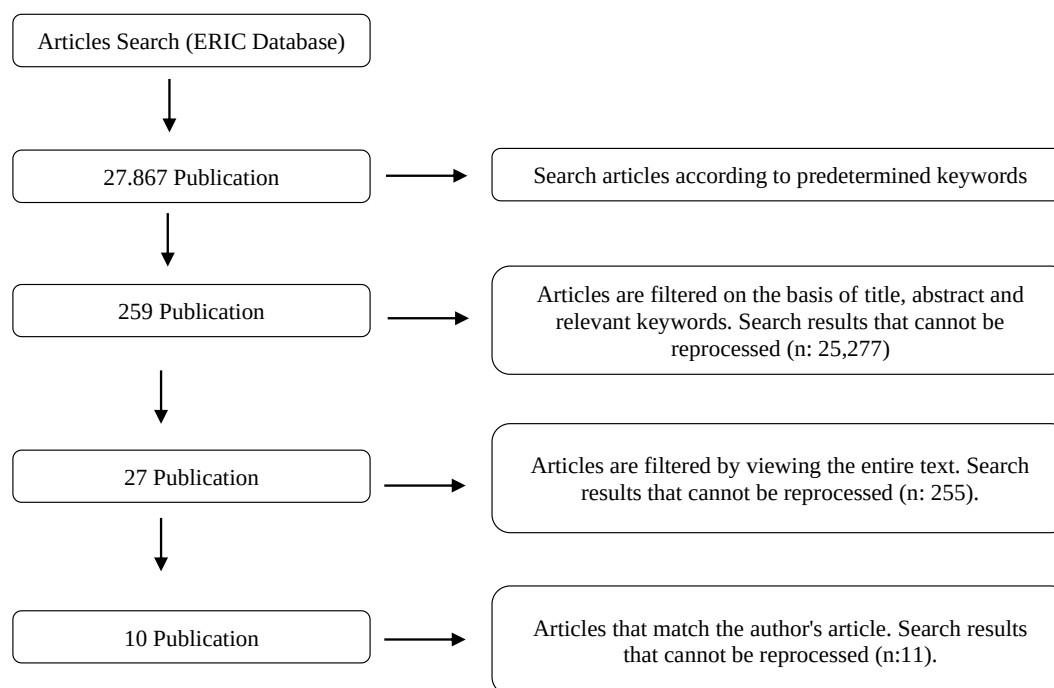


Fig. 1 Schematic process of searching, screening, selection, viewing, and final selection of literature according to the specified keywords

4. Results

This study was conducted to identify the relationship and potential of the peer teaching-learning model in the problem of imbalances in cognitive, motoric, and social interactions in physical education learning. The database used in this article is sourced from all articles published on the ERIC database website, which explain the outline of peer teaching and

solutions to overcome imbalances in cognitive abilities, psychomotor skills, and social interaction in physical education learning as the main topic of discussion. In conclusion, the author and his team concluded 10 articles published in the period 2010 to 2022 as a reference in making conclusions in this study. The table below will outline the main discussion points of the selected articles.

Table 1 The results of the article findings according to the keywords

No.	Titles	Authors	Years	Remarks
1.	A Systematic Analysis of Research on Teaching in Physical Education: Two Decades of Progress	Martinen, Risto; Landi, Dillon; Novak, Dario; Silverman, Stephen	2020	Peer-Teaching has proven to be a successful teaching strategy effective in improving the quality of learning time, increasing physical activity, improving skills to move students, healthy living behavior, and developing interactive and social skills.
2.	The Effects of Peer Teaching on the University Students' Achievements in Cognitive, Affective, Psychomotor Domains and Performances in Volleyball Courses	Mirzeogluand Ayse Dilsad	2018	The findings stated that Peer-Assisted Learning was found to be more effective than the command method, creating a more interactive learning atmosphere, and two-way discussion, increasing student comfort in the learning process
3.	Peer-Teaching Learning Methods in Physical Education: An Overview of Research and Theory	Phillip Ward and, The Ohio State University, Myung-Ah Lee, Indiana State University	2017	Peer teaching significantly enhances students' cognitive and social interaction compared to the conventional method used. The psychomotor competencies in the motor assignment of the experiment group also show

4.	Reciprocity of Peer tutorials in Physical Education Settings: The Effect of Peer Tutorial Learning Methods with the same Gender on Students' Motor Ability and Self-Efficacy.	Cláudio Farias, Isabel Mesquita, Peter A. Hastie, and Toni O'Donovan	2011	better results than the control group This study found that participants who received training had better motor skills and coordination, as well as a more accurate accuracy in manifesting students' self-efficacy compared with students who only did spontaneous training.
5.	Mediation-based peer teaching for alternative Learning: Classroom Action Research Interventions for Three consecutive Seasons in the Sports Education process	Anna-Maria Nurmi & Marja	2016	Peer teaching has succeeded in improving communication between teams, clarity of instructions delivered, and improving students' tactical skills and performance. Students show improvement in their ability to adapt to the forms of gameplay that are packaged in game conditions. Although sports education forms students who have competence as teachers, capable mentors, and are responsible for student instructional tasks, increasing the ability to develop situational-based learning is needed to increase technical teaching abilities.
6.	Determining the Factors of Teaching Effectiveness for Physical Education	Boonsem, Aungkana; Chaoensupmanee, Thongchai	2020	This study was designed to determine the performance-determining factors of teaching effectiveness for physical education. The learning method using the Peer Teaching model based on augmented mirror talk has the most significant influence on the development of student's cognitive competence, attitudes, and movement skills. However, the clustering of learning methods according to the gender and ability of students is an obstacle that must be considered in the implementation of this learning.
7.	Knowledge, Education, and Use of Teaching Styles in Physical Education	Fernández, María; Espada, María	2021	This study analyzes the relationship between degrees, knowledge, and learning methods used for the competence of physical education students. The command style is the most common method used by undergraduate teachers of physical education learning, whereas postgraduate teachers use the peer teaching method. In the peer-teaching group, it was found that analytical skills, critical thinking, and problem-solving were better, compared with the command style. However, the periodic incorporation of teaching methods increased students' knowledge and creativity
8.	Improving the academic achievement of sports students through the Near-Peer Teaching method	Ricardo Borges Viana, Douglas de Assis Teles Santos, Rodrigo Vancini, and Claudio Andre Barbosa de Lira	2018	The study found that the implementation of peer teaching-learning is an effective, and affordable strategy to improve the solutive thinking ability of sports science students. Additionally, students have good creative opinions, which stimulate student participation, especially those who have learning difficulties or low academic achievement
9.	Effects of Peer-Mediated Instruction with Task Cards on Motor Skill Acquisition in Tennis	Peter Iserbyt, Bob Madou, Lieven Vergauwen, and Daniel Behets	2011	Learning that is conditioned with a peer-mediated model with task cards can offer a strong learning environment and enforce social and motoric goals in physical education
10.	Peers as Teachers in Physical Education Hip Hop Classes in Finnish High School	Anna-Maria Nurmi & Marja	2018	Peers as a dancing teacher is regarded as an important subject on the weekly curriculum. On one hand, the teacher's peers enjoyed the freedom of creating the class to feel like their own, the learning speed was increased, and their confidence was improved. On the other hand, most of them were critical of themselves and felt ashamed when making a mistake. They also felt uncomfortable teaching their coeval or older peers and shocked by the unwanted behavior, such as arrogance, from their students. This article illustrates that peer teaching experiments not only results in difficulties, it also offers positive experience and involves students in sports education school

In several physical education reports, it was found that the Peer teaching model was different from other teachers; however, has the same purpose to create an attractive learning environment, where students can do

various assigned tasks while helping other students in the learning process. Here, it can be interpreted that students in addition to learning independently in doing individual tasks, also learn to replace the role of the

teacher with the task designs that have been prepared. The special feature of peer teaching-learning is that students receive help from their peers in the learning process. The development of this model is based on the direct peer learning model so that the implementation of learning is felt similar to direct instruction learning by the teacher.

It can be concluded as a novelty that three concepts are needed to be considered in the peer teaching model [38], [39]. First, the implementation of this learning model depends on the strategies used by each student in teaching other students. The learning model can be said to be peer teaching only if it has been planned and implemented based on the examples that will be discussed [40], [41].

Second, the implementation of peer teaching must be different from learning together, where students work in pairs by changing their roles in the educational activity. To meet the requirements for peer teaching, students must be given responsibility for the subjects given by their teachers, and have a good understanding, then students must have a clear understanding and description of the role of the tutor (peer teacher) that will be carried out.

Finally, is learning on a smaller scale. Group learning indeed requires students to teach other students, but the setting is different. In peer teaching, tutors must pay attention to the presentation of assignments, concentrate on supervising learning, have good verbal communication skills when giving instructions and feedback, and know students' capacities [42]. Here, students must receive feedback from tutors, ask tutors about unclear information, and practice diligently under the tutor's supervision. Overall, students will be able to develop their reciprocal relationships based on the individual responsibilities assigned [43].

5. Conclusion

On the issue of the role of peer teaching with motor imbalances, several studies explain that peer teaching can mediate various motor skills by giving assignments that are tailored to the abilities of student tutors [44]. Students who can complete high-level motor skills will be given different tasks from students who have low motor skills [45]. Class participation between the two groups forms a learning atmosphere that must be pursued so that barriers to differences in motor skills will disappear in cooperative learning atmosphere [46]. It was mentioned in a similar study that peer teaching-learning is more effective than conventional learning models in improving motor skills [47]. A similar study confirmed that task card-based peer-mediated learning could offer a more relaxed learning environment, emphasizing the social interaction in completing a given motor task [48]. The pattern of peer teaching was

found to have a positive role in the issue of imbalanced social interaction [49]. Several obstacles in social interaction were found in students who had difficulty interacting with their friends or teachers [50].

In terms of learning physical education, differences in students' motor skills will form the boundaries of social interaction between students amid differences in abilities between individuals possessed. Peer teaching is central to maintaining social interaction between students in the physical education learning process amid differences in student skills. The research findings explain that the peer-teaching learning model in physical education can improve students' inter and intrapersonal abilities better [51]. Tutor students who become leaders in game sports teams have better interpersonal skills in providing support and think cooperatively in teaching teammates to collaborate in completing motor tasks together [52]. Additionally, in the case of students with weak motor skills, this study found a high sense of trust, togetherness, and a sense of comfort in the learning process with the peer-teaching model; therefore, so the problem of social interaction due to differences in motor skills has lowered [53], [54]. This is also confirmed by the study evaluation stating that the increase in motor skills and the feedback accuracy obtained by students realizing better self-efficacy, compared with conventional learning.

However, other studies convey several notes related to peer teaching that the benefits obtained by novice students will be optimal if the initial requirements related to the preparation of the teaching and learning process are well planned [55]. A similar study explains that poor preparation, unclear division of tasks, and differences in understanding due to poor planning make peer teaching inefficient [56]. On the other hand, most students will become self-critical and feel ashamed when they make mistakes [57]. Students will also not feel comfortable when teaching peers or older and will be surprised by unwanted behavior, such as arrogance, from their students [58]. The opinion above emphasizes the peer teaching ability in improving students' ability to interact with peers and gain insight into the teacher's duties. As a result, they will realize the importance of communicating with friends or teachers. In the concept of game sports, peer teaching can allow players to complete the game and increase their interaction with other players. A study shows that when using the peer teaching model, players show an increase in their ability to adapt individual game patterns to the team playing conditions [59]. The limitation of the study is that it has not carried out an analysis related to teaching readiness documents, testing the similarity of students' cognitive, affective, and psychomotor comprehension levels in the material to provide; therefore, so the results obtained are still general and do not yet know the impact on each student.

Peer teaching is often used to describe teaching strategies and models that facilitate students learning with peers. The peer teaching model is a teaching strategy that can transfer knowledge, skills, and social interaction better. Peer teaching in physical education has a role as an effective learning model to improve cognitive skills, and motor and social interactions. In addition to the diversity of students, peer teaching can even out students' skills. Peer teaching also can contribute to physical education for a healthier social life, as well as better motor skills and behavioral adaptation.

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