Environment and Social Psychology (2025) Volume 10 Issue 4 ISSN: 2424-8975 (O)
doi: 10.59429/esp.v10i4.3575 2424-7979 (P)

RESEARCH ARTICLE

Fostering teamwork skills through PBL volleyball courses: A social psychological study of Chinese vocational college students

Yingying Xia[1,2,*], Kuan-Chun Tasi[1,*], Feifei Chen[3], Hsin-Chang Yu[1]

[1] *Chinese International College, Dhurakij Pundit University, Bangkok, 10400, Thailand*

[2] *Department of Basic Course Teaching, Ningbo City College of Vocational Technology, Ningbo, 315100, China*

[3] *Chinese International College, Dhurakij Pundit University, 10400, Thailand / Faculty of Sports Science, Ningbo University, 315211, China*

*** Corresponding author:** Kuan-Chun Tasi, kuan-chun.tsa@dpu.ac.th; Yingying Xia, xiayingying@nbcc.edu.cn

ABSTRACT

This study investigates the impact of Problem-Based Learning (PBL) volleyball courses on the development of teamwork skills among Chinese vocational college students, framed within a social psychological perspective. A quasi-experimental design was employed involving 81 students, divided into an experimental group (n = 41) receiving a PBL-based volleyball curriculum and a control group (n = 40) taught through traditional methods. Over a 12-week intervention, data were collected using a validated teamwork skills scale encompassing cognitive, emotional, and behavioral dimensions. Statistical analyses, including paired t-tests and ANCOVA, revealed that the experimental group exhibited significantly greater improvements across all dimensions of teamwork skills compared to the control group. These findings highlight the role of structured, socially interactive physical education environments in enhancing key psychosocial competencies. The study contributes to the broader discourse on how educational environments, when designed with collaborative and problem-solving frameworks, can shape student behavior, motivation, and social development. It underscores the effectiveness of integrating sports-based PBL models into vocational education as a means of cultivating teamwork, responsibility, and interpersonal coordination in young adults.

Keywords: problem-based learning (PBL); teamwork skills; social psychology; vocational education; volleyball; physical education environment

1. Introduction

In contemporary educational contexts, teamwork skills have emerged as critical competencies closely tied to psychological well-being, employability, and social adaptability[1,2]. In response to the evolving demands of cooperative work environments, higher education institutions are increasingly focusing on innovative pedagogical strategies that promote collaboration, communication, and interpersonal coordination. Sports-based courses, especially those situated in structured physical education settings, have shown promise in fostering such skills by simulating authentic social interactions and team-based dynamics[3,4].

ARTICLE INFO
Received: 26 March 2025| Accepted: 31 March 2025 | Available online: 18 April 2025

CITATION
Xia YY, Tasi KC, Chen FF.et.al. Fostering teamwork skills through PBL volleyball courses: A social psychological study of chinese vocational college students. *Environment and Social Psychology* 2025; 10(4): 3575. doi:10.59429/esp.v10i4.3575

Within Chinese vocational colleges, volleyball courses have long served not only as athletic training but also as platforms for developing student cooperation and social responsibility[5,6]. However, traditional instructional models in these settings have often lacked student engagement, collaborative tasks, and experiential learning elements[7,8]. To address these limitations, this study proposes a Problem-Based Learning (PBL) approach to volleyball instruction, aiming to cultivate teamwork skills through socially situated, problem-oriented, and group-based learning processes. The study also highlights the importance of comparing this strategy with other physical education environments to better understand its unique contributions.

2. Literature review

2.1. Teamwork skills

Teamwork skills are defined as a multifaceted set of competencies involving collaboration, communication, mutual trust, emotional awareness, and coordinated action[9]. In educational psychology, they are often assessed through both attitudes (e.g., willingness to cooperate) and behaviors (e.g., active participation, conflict resolution)[10]. These skills are essential for navigating the social demands of academic and workplace environments, and their development is particularly relevant in youth education settings[11,12].

2.2. Problem-based learning (PBL)

Problem-Based Learning (PBL) is a student-centered instructional approach that emphasizes collaborative problem-solving, group discussion, and real-world application [13, 14]. Originating in medical education, PBL has been widely adopted across disciplines to cultivate higher-order thinking, teamwork, and self-directed learning[15]. Studies in engineering, nursing, and vocational education consistently show PBL's effectiveness in promoting team interaction, leadership, and cooperation[16-18].

3. Methodology

3.1. Study context

This study was conducted at a vocational college in Ningbo, China. A PBL-based volleyball curriculum was developed and validated by a panel of educational experts. The experimental group was taught using this curriculum, emphasizing group collaboration, role rotation, and reflective problem-solving. Specific problems taught in volleyball included strategies for offensive and defensive positioning, communication during gameplay, and resolving conflicts during team drills. The control group received standard instruction with no cooperative learning components. Both groups were taught by the same instructor under identical conditions over 12 weeks.The specific teaching procedures are illustrated in **Figure 1**.

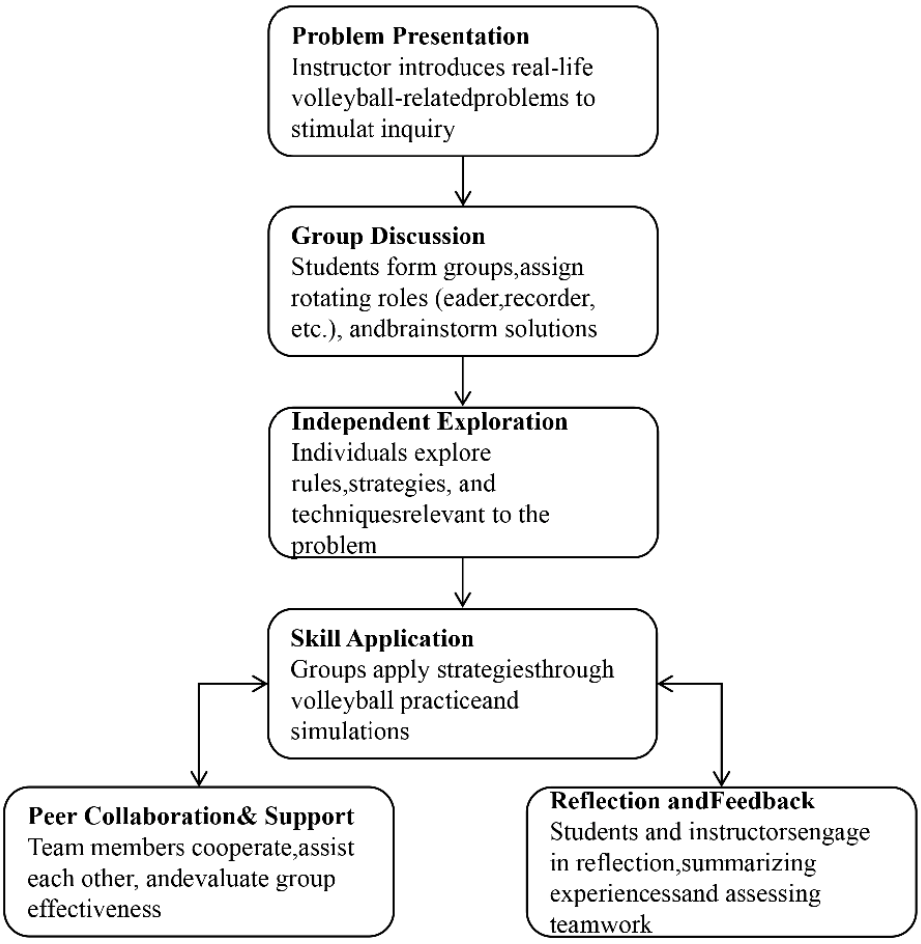

Figure 1. Instructional framework of the PBL volleyball course.

3.2. Participants

A total of 81 first-year vocational college students participated. The experimental group consisted of 41 students (16 males, 25 females) and the control group 40 students (18 males, 22 females). PBL participants were divided into 10 rotating-role teams. The control group followed traditional lecture-based instruction without structured collaboration.

3.3. Instruments

Teamwork skills were measured using the College Students' Teamwork Skills Scale[10], adapted to physical education contexts. The instrument contains 35 items across 7 dimensions and uses a 5-point Likert scale. The overall Cronbach's alpha was 0.943, indicating high reliability.

3.4. Data analysis

Statistical analysis was performed using SPSS. Independent samples t-tests assessed baseline homogeneity. Paired t-tests examined pre-post differences within each group. ANCOVA was used to compare post-test results between groups while controlling for pre-test scores. ANCOVA is widely used in quasi-experiments, an explanation for its selection over ANOVA is provided in the discussion section.

4. Result analysis

4.1. Testing of teamwork skills at the same baseline level

To determine whether the initial teamwork skills were comparable between the experimental and control classes prior to the teaching experiment, an independent samples t-test was conducted. The results indicated that the t-values for the two groups ranged from 0.097 to 0.623, with p-values exceeding 0.050. This suggests that there were no significant differences in the dimensions of teamwork skills between the two groups before the experiment, meeting the requirement for homogeneity of initial ability. Therefore, these groups are suitable for the teaching experiment.

4.2. Group pre-test and post-test difference detection

To assess improvements in teamwork skills after the intervention, post-tests were administered to both the experimental and control classes. Paired samples t-tests were used to compare pre- and post-test scores within each group. The results showed that the mean pre-test scores for various dimensions in the experimental class ranged from 2.098 to 2.634, while the post-test means ranged from 4.896 to 4.829, indicating a significant improvement (p=.000). Similarly, the control class exhibited significant changes, with pre-test means ranging from 2.175 to 2.575 and post-test means from 3.600 to 3.775 (p=.000). These findings suggest that both groups demonstrated significant improvements in teamwork skills, but the experimental class outperformed the control class following the PBL volleyball course compared to the traditional curriculum.

4.3. Analysis of covariance (ANCOVA)

To investigate potential differences in pre- and post-test outcomes due to group variations, this study conducted a regression coefficient homogeneity test on teamwork skills before performing ANCOVA.

Table 4.1. Summary of the one-way ANCOVA for teamwork skills.

Item	Source	SS	df	MS	F	p
Cooperative cognition	PRE	.098	1	0.098	0.476	.492
	Group	26.275	1	26.275	127.186	.000
	Error	16.114	78	0.207		
Cooperative emotion	PRE	.137	1	0.137	0.612	.436
	Group	31.485	1	31.485	140.738	.000
	Error	17.450	78	0.224		
Cooperation intention	PRE	.239	1	0.239	0.971	.327
	Group	19.559	1	19.559	79.554	.000
	Error	19.177	78	0.246		
Member assistance	PRE	.565	1	0.565	1.920	.170
	Group	20.796	1	20.796	70.679	.000
	Error	22.950	78	0.294		
Conflict management	PRE	.148	1	0.148	1.565	.215
	Group	19.581	1	19.581	57.308	.000
	Error	26.652	78	0.342		
Emotional regulation	PRE	.142	1	0.142	0.063	.430
	Group	34.114	1	34.114	151.362	.000
	Error	17.580	78	0.225		
Organization and	PRE	.463	1	0.463	1.949	.167

Item	Source	SS	df	MS	F	p
leadership	Group	15.178	1	15.178	48.280	.000
	Error	24.522	78	0.314		
	PRE	.408	1	0.408	2.446	.122
Total	Group	21.696	1	21.696	130.051	.000
	Error	13.013	78	0.167		

Table 4.1. (*Continued*)

Note: *Data collected from this study.*

The homogeneity test results revealed no significant differences between the experimental and control classes (p>.050), indicating that students in both groups were equally influenced by the teaching methods, consistent with the assumption of homogeneous regression coefficients within groups. Subsequently, covariance analysis of teamwork skills was performed. As shown in **Table 4.1**, after controlling for pre-test scores, both the experimental and control classes exhibited significant effects on post-test team cooperation ability (p<.001). Notably, students in the experimental class achieved significantly higher post-test scores across all dimensions of teamwork skills compared to those in the control class. Thus, the PBL volleyball course effectively enhanced the students' teamwork skills in the experimental class relative to the control class.

Table 4.2. Group pre-test and post-test of Adj.M （N=81）.

Item	Group	Adj.M	M	n
Dimensions	EC	4.830	0.072	41
	CC	3.691	0.071	40
Cooperative cognition	EC	4.897	0.740	41
	CC	3.647	0.750	40
Cooperative emotion	EC	4.757	0.077	41
	CC	3.774	0.078	40
Cooperation intention	EC	4.784	0.085	41
	CC	3.771	0.086	40
Member assistance	EC	4.679	0.091	41
	CC	3.695	0.092	40
Conflict management	EC	4.758	0.082	41
	CC	3.710	0.083	40
Emotional regulation	EC	4.592	0.086	41
	CC	3.726	0.087	40
Organization and leadership	EC	4.746	0.064	41
	CC	3.711	0.065	40

Note: *Data collected from this study.*

It can be seen from **Table 4.2** that the Adj.M values of each dimension after adjustment in the experimental class range from 4.592 to 4.897, and the Adj.M values of each dimension after adjustment in the control class range from 3.647 to 3.774, and the average value of post-test after adjustment in the

experimental class is higher than that in the control class. Therefore, after the intervention of PBL volleyball course, the level of teamwork ability of experimental class is higher than that of control class.

5. Discussion

This study confirms that problem-based learning (PBL) volleyball instruction significantly enhances teamwork skills in vocational college students. The structured and interactive PBL environment fosters peer interaction, emotional regulation, and team coordination, aligning with social constructivist principles. Within this framework, students engaged in experiential learning, practiced peer collaboration, and develop emotional adaptability—key elements of social psychological competence[19,20].

Additionally, the findings reveal that structured group activities, assigned roles, and cooperative challenges enhance psychological engagement, motivation, and identity development. These results reinforce the potential of physical education settings as effective platforms for fostering socio-emotional skills when integrated with collaborative learning approaches.

This study uses ANCOVA (Analysis of Covariance) instead of ANOVA (Analysis of Variance) because ANCOVA allows for controlling pre-existing differences between groups (e.g., baseline teamwork skills) before analyzing the post-test results. While ANOVA is suitable for comparing group means, it assumes that groups are equivalent at the start of the experiment. If groups differ in baseline characteristics (e.g., teamwork skills), ANOVA cannot account for these differences, which may confound the results. By using ANCOVA, the researchers ensure that the observed improvements in teamwork skills are attributed to the PBL volleyball course, rather than differences in initial abilities.

However, this study focused only on volleyball instruction, and the generalizability of its conclusions may be limited. Future research should compare PBL in volleyball with other physical education environments, such as basketball or track and field, to contextualize its unique impact.

Limitations include reliance on self-report measures, a restricted sample, and a singular context. It is recommended that subsequent studies combine qualitative methods, longitudinal tracking, and explore additional psychological outcomes such as empathy, resilience, and civic responsibility.

6. Conclusion

This study demonstrates the effectiveness of integrating Problem-Based Learning (PBL) into physical education to enhance teamwork skills among Chinese vocational college students. Using a quasi-experimental design, 41 students in the experimental group received a PBL-based volleyball curriculum over 12 weeks, while 40 students in the control group received traditional instruction. Although both groups showed improvements in teamwork abilities, the experimental group exhibited significantly greater gains across all measured dimensions. The findings highlight the value of socially interactive, problem-centered learning environments in fostering key interpersonal competencies—such as collaboration, emotional regulation, and peer support—that are essential for both academic development and future professional success. These results underscore the potential of PBL as an instructional strategy that not only supports physical development but also promotes meaningful social psychological growth in vocational education settings.

Conflict of interest

The authors declare no conflict of interest.

References

1. Salas, E., Shuffler, M. L., Thayer, A. L., Bedwell, W. L., & Lazzara, E. H. (2015). Understanding and improving teamwork in organizations: A scientifically based practical guide. Human Resource Management, 54(4), 599-622. https://doi.org/10.1002/hrm.21628
2. Lavi, R., Tal, M., & Dori, Y. J. (2021). Perceptions of STEM alumni and students on developing 21st century skills through methods of teaching and learning. Studies in Educational Evaluation, 70, Article e101002. https://doi.org/10.1016/j.stueduc.2021.101002
3. Khudolii, O., Iermakov, S., & Bartik, P. (2020). Didactics: Methodological basis of motor learning in children and adolescents. Journal of Learning Theory and Methodology, 1(1), 5-13. https://doi.org/10.17309/jltm.2020.1.01
4. Brinkley, A., McDermott, H., & Munir, F. (2017). What benefits does team sport hold for the workplace? A systematic review. Journal of Sports Sciences, 35(2), 136-148. https://doi.org/10.1080/02640414.2016.1158852
5. Tan, L. Q. (2017). Correlation between vocational core competence and physical education curriculum connotation. Journal of Guangzhou Sport University, 37(5), 126-128. http://www.cqvip.com/qk/83074x/201705/673350416.html
6. Wang, Y., Sun, C., & Guo, Y. (2021). A multi-attribute fuzzy evaluation model for the teaching quality of physical education in colleges and its implementation strategies. International Journal of Emerging Technologies in Learning, 16(2), 159-172. https://doi.org/10.3991/IJET.V16I02.19725
7. Chen, L. K., & Lin, J. (2020). Study on the current situation of volleyball courses in higher vocational medical colleges: A case study of four institutions in Fujian Province. Contemporary Sports Technology, 10(12), 198-200. https://www.cqvip.com/qk/86064a/202012/7101773797.html
8. Liu, Z. L., Feng, J. C., Yu, J. J., & Gong, J. L. (2019). Integrating MOOCs into the classroom teaching model of sports education. Journal of Guangzhou Sport University, 39(4), 110-112. http://www.cqvip.com/qk/83061x/201904/7002593577.html
9. Hashim, M. H. M. (2015). The practice of employability teamwork skills. International Journal of Vocational Education and Training Research, 1(2), 16-21. https://doi.org/10.11648/j.ijvetr.20150102.11
10. Li, F. R., Wang, B., Ma, H. Y., Hou, B., & Fang, J. W. (2013). Development of a cooperative ability scale for college students. Journal of Hubei Sports Science, 32(6), 519-522. http://www.cqvip.com/qk/83088x/201306/47016660.html
11. Stout, R. J., Cannon-Bowers, J. A., & Salas, E. (2017). The role of shared mental models in developing team situational awareness: Implications for training. In Salas, E. (Eds.), Situational Awareness (pp. 287-318). Routledge. https://apps.dtic.mil/sti/trecms/pdf/AD1120672.pdf
12. Hebles, M., Yaniz-Alvarez-de-Eulate, C., & Jara, M. (2023). Teamwork competence and collaborative learning in entrepreneurship training. European Journal of International Management, 20(2), 238-255. https://doi.org/10.1504/EJIM.2023.131368
13. Barrows, H. S. (1985). How to design a problem-based curriculum for the preclinical years. Springer.
14. Schmidt, H. G., Van Der Molen, H. T., Te Winkel, W. W. R., & Wijnen, W. H. F. W. (2009). Constructivist, problem-based learning does work: A meta-analysis of curricular comparisons involving a single medical school. Educational Psychologist, 44(4), 227-249. https://doi.org/10.1080/00461520903213592
15. Kolmos, A., Holgaard, J. E., & Dahl, B. (2013). Reconstructing the Aalborg model for PBL: A case from the Faculty of Engineering and Science, Aalborg University. In K.
16. Samsuria, N. S., Yusof, K. M., Jumaria, N. F., Zakariab, Z. Y., Hassanb, H., & Manb, S. H. C. (2017). Developing teamwork skills among first year chemical engineering students using cooperative problem-based learning in "introduction to engineering" course. Chemical Engineering, 56, 1105-1110. https://doi.org/10.3303/CET1756185
17. Allert, C., Dellkvist, H., Hjelm, M., & Andersson, E. K. (2022). Nursing students' experiences of applying problem-based learning to train the core competence teamwork and collaboration: An interview study. Nursing Open, 9(1), 569-577. https://doi.org/10.1002/nop2.1098
18. Suprapto, E., & Basri, K. (2017). The application of problem-based learning strategy to increase high order thinking skills of senior vocational school students. International Education Studies, 10(6), 123-129. https://files.eric.ed.gov/fulltext/EJ1144605.pdf
19. Seymour, A. (2013). A qualitative investigation into how problem-based learning impacts on the development of team-working skills in occupational therapy students. Journal of further and Higher Education, 37(1), 1-20. https://doi.org/10.1080/0309877X.2011.643774
20. Shipton, B. (2022). Maximising PBL in police education: Why understanding the facilitator role is a key factor in developing learning for police problem solving. Australian Journal of Adult Learning, 62(1), 56-75. https://doi.org/10.3316/informit.491532114227634