



# Integrating Virtual Reality and Project Based Flipped Learning in Sport Massage Education: A Tri Pramana Based Innovation

Gede Doddy Tisna MS<sup>1ABCD</sup>, Anak Agung Ngurah Putra Laksana<sup>1CD</sup>,  
Komang Ayu Tri Widhiyanti<sup>2CDE</sup> and I Gede Dharma Utamayasa<sup>3CDE</sup>

<sup>1</sup>Universitas Pendidikan Ganesha

<sup>2</sup>Universitas PGRI Mahadewa

<sup>3</sup>Universitas PGRI Adi Buana Surabaya

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Corresponding Author: Gede Doddy Tisna MS, e-mail: gd.doddy@undiksha.ac.id

Accepted for Publication: September 18, 2025

Published: September 30, 2025

DOI: 10.17309/tmfv.2025.5.13

## Abstract

**Background.** Sport massage education often struggles to deliver effective practical experiences due to limited real-world practice opportunities and outdated teaching methods.

**Objectives.** This study aimed to develop and evaluate an innovative learning model that integrates Virtual Reality (VR), Project-Based Flipped Learning (PBFL), and the Tri Pramana philosophy to enhance student competence in sport massage.

**Materials and Methods.** Utilizing a Research and Development (R&D) approach with the ADDIE model, this study involved 80 undergraduate students enrolled in a sport massage course. Participants were divided into an experimental group receiving VR-PBFL learning and a control group using conventional methods. Data were collected through pre- and post-tests, observational checklists, and questionnaires.

**Results.** Statistical analysis using paired and independent sample t-tests showed a significant improvement in the experimental group's motor skills and theoretical understanding compared to the control group ( $p < 0.05$ ). Students also reported higher satisfaction and engagement levels with the VR-based learning environment. The integration of Tri Pramana — Pratyaksa (direct experience), Anumana (logical reasoning), and Sabda (credible sources) — provided a philosophical and cultural foundation for holistic learning. This study confirms that VR and PBFL, when grounded in local educational philosophy, can significantly enhance the quality of sport massage education.

**Conclusions.** The findings support the adoption of immersive and culturally adaptive technologies in physical education programs, thereby opening pathways for future innovation in health and sports science education.

**Keywords:** virtual reality, project-based flipped learning, sport massage education, Tri Pramana, immersive learning.

## Introduction

Sport massage education continues to face critical challenges in delivering effective and engaging learning experiences. Conventional methods, such as lectures and limited practical demonstrations, often fail to provide adequate opportunities for students to develop hands-on skills and real-time clinical judgment (Fang & Yao, 2021). Consequently, students may graduate with insufficient motor competence and limited confidence in applying

sport massage techniques. The increasing availability and affordability of immersive technologies, especially Virtual Reality (VR), has opened new opportunities in sports and health education. VR enables students to practice skills in a simulated environment that mirrors real-life settings, enhancing both cognitive understanding and psychomotor ability without physical risk (Moro, Štromberga, Raikos, & Stirling, 2017). Meta-analytic findings suggest VR applications significantly improve knowledge retention and practical outcomes in anatomy and clinical learning environments. Complementing VR is the pedagogical model of Project-Based Flipped Learning (PBFL), which combines the advantages of flipped classrooms and project-oriented instruction. PBFL allows students to engage with learning content before class and apply their understanding through

© Doddy Tisna MS, G., Putra Laksana, A. A. N.,  
Widhiyanti, K. A. T., & Utamayasa, I. G. D., 2025.

meaningful collaborative projects (Guo, Saab, Post, & Admiraal, 2020). This approach promotes learner autonomy, critical thinking, and problem-solving all of which are essential for practical disciplines like sport massage (Østerlie et al., 2023).

Despite the proven individual benefits of VR and PBFL, their integration in sport massage education has yet to be systematically explored. Existing studies have primarily focused on these approaches in broader contexts such as nursing, medical anatomy, or general physical education, with minimal focus on specialized massage training (Putranto et al., 2022; Radianti, Majchrzak, Fromm, & Wohlgenannt, 2020). This lack of integration represents a clear research gap. In Indonesia, the cultural and philosophical foundation of education emphasizes Tri Pramana a knowledge acquisition framework based on direct perception (Pratyaksa), inference (Anumana), and authoritative knowledge (Sabda). This indigenous epistemology aligns closely with the principles of experiential and reflective learning (Sindu, Sudarma, Hartati, & Gunantara, 2024). However, the Tri Pramana approach remains underutilized in contemporary, technology-enhanced instructional design. Integrating Tri Pramana into immersive, student-centered pedagogies like VR and PBFL offers a novel and culturally relevant model for sport massage education. While global literature highlights the pedagogical effectiveness of VR and PBFL, few studies have contextualized these innovations through indigenous philosophical frameworks, particularly in Southeast Asia. The inclusion of Tri Pramana may bridge the gap between global innovations and local educational values (Tisna et al., 2022).

Theoretically, this research is grounded in constructivist learning theory, which emphasizes that meaningful learning occurs when learners actively engage in constructing knowledge through experience and reflection. In this framework, VR supports direct experiential learning (Pratyaksa), PBFL fosters analytical reasoning (Anumana), and instructional scaffolding provides the reliable guidance of Sabda. These three components collectively offer a holistic approach to learning in physical education (Adinata et al., 2024). Given this foundation, the current study aims to develop and evaluate a sport massage learning model that integrates VR, PBFL, and Tri Pramana. Specifically, the research examines the impact of this integrative model on students' motor skills, theoretical understanding, and reflective capacity in sport massage practices. This study contributes to the literature by offering a pedagogical innovation that fuses immersive technology and student-centered learning with culturally rooted philosophical perspectives. The results are expected to inform both theory and practice in physical education, particularly in designing culturally responsive and technologically enriched sport massage curricula.

In today's rapidly evolving educational landscape, physical education must adapt to the demands of Education 4.0, where digital literacy, critical thinking, and contextual adaptability are core competencies (Bento & White, 2018). This evolution is especially crucial in practice-based fields like sport massage, where learning must be both technologically enriched and pedagogically sound. The fusion of VR and PBFL within a Tri Pramana framework aligns with global trends in personalized, immersive,

and reflective learning, offering a robust response to the limitations of outdated instructional practices. Furthermore, empirical evidence supports the idea that culturally relevant pedagogy can significantly enhance student motivation and learning engagement (Gay, 2018). Integrating Tri Pramana into instructional design not only situates learning within local wisdom but also fosters deeper cognitive and emotional connections to the learning material. This is particularly important in Indonesia, where philosophical and spiritual values are deeply intertwined with education and well-being (Winataputra, 2017). By grounding learning in both technology and tradition, this model creates a more meaningful and transformative educational experience.

Ultimately, this study proposes a novel instructional model that responds to both global innovation and local educational philosophy. It serves as a pioneering step toward integrating immersive technology, student-centered pedagogy, and indigenous knowledge in physical education. The implications of this research extend beyond sport massage, offering valuable insights for curriculum developers, instructional designers, and policymakers seeking to elevate learning outcomes through culturally grounded digital pedagogy.

## Materials and Methods

### Research Design

This study employed a Research and Development (R&D) approach using the ADDIE instructional design model (Analysis, Design, Development, Implementation, and Evaluation) to create and test an innovative instructional model. The model integrates Virtual Reality (VR), Project-Based Flipped Learning (PBFL), and the Tri Pramana framework to enhance learning outcomes in sport massage education. To assess the effectiveness of the developed model, a quasi-experimental design with a pretest-posttest control group was used in the implementation phase.

### Participants

Participants consisted of 80 undergraduate students enrolled in a sport massage course at the Faculty of Sports and Health, Universitas Pendidikan Ganesha, Indonesia. Participants were selected using purposive sampling based on enrollment and prior experience. They were divided into two equal groups:

- The experimental group (n = 40), which received instruction using the developed VR-PBFL-Tri Pramana model.
- The control group (n = 40), which received traditional instruction using lectures and direct demonstration without VR or project-based activities.

All participants gave informed consent, and ethical approval was obtained from the university's ethics committee prior to data collection.

### Procedure

*Analysis Phase.* A needs analysis was conducted through literature review, student surveys, and focus group discussions with educators to identify gaps in current sport

massage instruction. The analysis focused on technological limitations, pedagogical approaches, and cultural dimensions often neglected in conventional learning.

*Design Phase.* Based on the findings, a conceptual instructional model was developed. The model combined immersive VR content for simulating sport massage techniques, PBFL for encouraging active learning and collaboration, and Tri Pramana principles (Pratyaksa, Anumana, and Sabda) for epistemological grounding.

*Development Phase.* VR learning modules were developed using Unity 3D and integrated with gamified features. These included motion tracking, visual simulation of massage points, feedback mechanisms, and real-time practice in virtual environments. Learning materials for flipped learning and project guidelines were also prepared, supported by theoretical content aligned with the Tri Pramana philosophy.

*Implementation Phase.* Over a period of 8 weeks, both groups underwent instruction. The experimental group engaged in:

- Pre-class activities (video lectures and readings).
- In-class VR simulations.
- Project-based collaborative tasks.
- Guided reflection using Tri Pramana.

The control group participated in standard classroom lectures and practice on mannequins without VR or flipped instruction.

*Evaluation Phase.* Formative and summative assessments were carried out to measure learning outcomes. Student performance, feedback, and engagement were documented through a combination of quantitative and qualitative instruments.

#### Data Collection Instruments

- *Skill Performance Rubric:* Assessed students' practical abilities in performing sport massage techniques (motor domain).
- *Written Test:* Measured theoretical understanding of sport massage concepts and anatomy.
- *Reflective Journal Checklist:* Evaluated how students applied Tri Pramana elements in their learning reflection.
- *Questionnaires:* Captured students' perceptions of learning experience, motivation, and satisfaction using a validated 5-point Likert scale.
- *Observational Protocols:* Used by instructors to document student behavior, interaction, and application of techniques during sessions.

#### Statistical Analysis

Quantitative data were analyzed using IBM SPSS 26.

- Descriptive statistics (mean, standard deviation) were used to summarize overall performance.
- Paired sample t-tests were conducted within groups to compare pretest and posttest scores.
- Independent sample t-tests compared mean score differences between experimental and control groups.
- A significance level of  $p < .05$  was used for all statistical tests.

- Qualitative data from journals and observations were coded thematically to identify patterns in student learning behavior related to the Tri Pramana framework.

#### Validity and Reliability

All instruments were reviewed by sport education experts to ensure content validity. A pilot test with 10 non-participating students was conducted to assess instrument clarity and internal consistency. Cronbach's alpha scores for the motivation and satisfaction questionnaires were  $\alpha = 0.86$  and  $\alpha = 0.89$ , respectively, indicating high reliability.

#### Ethical Considerations

This study complied with ethical research guidelines in educational research. Written informed consent was obtained, and participants were assured of the confidentiality and anonymity of their responses. The intervention posed no risk and was conducted as part of regular course activities.

#### Results

This study evaluated the impact of an instructional model integrating Virtual Reality (VR), Project-Based Flipped Learning (PBFL), and the Tri Pramana framework on students' performance in sport massage education. The findings are presented in the following subsections: learning performance improvements, between-group comparisons, student perceptions, and qualitative reflection based on Tri Pramana.

#### Learning Performance Improvement (Within-Group Analysis)

The paired sample t-test results show a significant improvement in the experimental group's performance from pretest to posttest. The average pretest score was  $M = 64.85$  ( $SD = 7.12$ ), while the posttest score increased to  $M = 84.30$  ( $SD = 6.98$ ). This difference was statistically significant,  $t_{(39)} = 15.24$ ,  $p < .001$ . Similarly, the control group improved from a mean pretest score of  $M = 65.22$  ( $SD = 6.97$ ) to a posttest score of  $M = 73.55$  ( $SD = 7.34$ ), with  $t_{(39)} = 7.89$ ,  $p < .01$ , although the magnitude of improvement was notably smaller than in the experimental group.

**Table 1.** Pretest and Posttest Scores Within Groups (Paired Sample t-test)

Group	Test Type	Mean (M)	SD	t	p
Experimental	Pretest	64.85	7.12	15.24	< .001
	Posttest	84.30	6.98		
Control	Pretest	65.22	6.97	7.89	< .01
	Posttest	73.55	7.34		

#### Between-Group Comparison of Posttest Scores

To evaluate the effectiveness of the VR-PBFL-Tri Pramana learning model, an independent samples t-test was conducted. The posttest scores of the experimental group ( $M$

= 84.30, SD = 6.98) were significantly higher than those of the control group (M = 73.55, SD = 7.34), with  $t(78) = 6.87$ ,  $p < .001$ . This demonstrates that the integration of immersive learning and project-based instruction grounded in local epistemology led to improved academic outcomes.

**Table 2.** Comparison of Posttest Scores Between Groups (Independent Sample t-test)

Group	N	Posttest Mean	SD	t	p
Experimental	40	84.30	6.98	6.87	< .001
Control	40	73.55	7.34		

### Student Motivation and Satisfaction

Student perceptions of the learning experience were measured using a validated Likert-scale questionnaire (1–5). Results indicate that students in the experimental group had higher motivation (M = 4.44, SD = 0.46) and greater satisfaction (M = 4.52, SD = 0.41) compared to the control group (motivation: M = 3.65, SD = 0.63; satisfaction: M = 3.71, SD = 0.55). Independent sample t-tests confirmed these differences were statistically significant ( $p < .001$  for both).

**Table 3.** Student Motivation and Satisfaction Scores

Dimension	Group	Mean (M)	SD	t	p
Motivation	Experimental	4.44	0.46	6.12	< .001
	Control	3.65	0.63		
Learning Satisfaction	Experimental	4.52	0.41	7.03	< .001
	Control	3.71	0.55		

### Reflection on Learning Experience Based on Tri Pramana

Qualitative findings from student journals and instructor observations supported the successful integration of Tri Pramana components:

- Pratyaksa (direct experience): Students stated that VR helped them feel as if they were practicing on real patients.
- Anumana (reasoning): Group discussions and project work helped students critically analyze sport massage procedures.
- Sabda (trusted knowledge): Theoretical references and instructor feedback reinforced student understanding during debriefings.

Approximately 88% of students in the experimental group agreed that the learning approach effectively connected theory and practice. In contrast, only 55% of control group students reported similar outcomes.

### Discussion

The findings of this study demonstrate that the integration of Virtual Reality (VR), Project-Based Flipped Learning (PBFL), and Tri Pramana significantly enhances students' cognitive and psychomotor outcomes in sport massage education. The experimental group outperformed the control group in both theoretical understanding and practical skill performance. This aligns with prior evidence

suggesting that immersive technologies provide highly engaging and effective environments for kinesthetic learning, especially in domains that require procedural mastery (Merchant et al., 2014). The significant increase in posttest scores within the experimental group supports the notion that immersive environments such as VR can replicate the depth of real-life experiences. When students can visualize and simulate movements and techniques in a virtual setting, they are more likely to achieve better skill acquisition and memory retention (Makransky & Mayer, 2022). Moreover, by using VR as a tool for experiential learning, the study affirms Kolb's experiential learning cycle, which emphasizes concrete experience and active experimentation as critical to skill development (Kolb, 2015).

The project-based flipped learning model further contributed to the success of the instructional approach by placing learners at the center of the knowledge construction process. The flipped model allowed students to access theoretical content in advance and engage in applied learning during in-class VR sessions. This echoes findings from van Alten et al. (2019), who concluded that flipped classroom models improve knowledge transfer and promote deeper learning when combined with active learning tasks. Additionally, the project-based component fostered teamwork and problem-solving, reinforcing the real-world application of sport massage techniques (Thomas, 2000). Integrating the Tri Pramana philosophical framework added a unique cultural and cognitive dimension to the instructional model. Students' reflections showed evidence of applying Pratyaksa (direct experience) through VR, Anumana (reasoning) during group discussions, and Sabda (authoritative knowledge) via instructor feedback and literature. Incorporating such indigenous epistemologies into learning has been shown to enhance engagement and contextual understanding, particularly in Southeast Asian educational settings (Tuhwai Smith, 2012; Sarathchandra & Dhand, 2021). This integration bridges the gap between Western instructional design models and local philosophical traditions, creating a more inclusive and resonant learning experience.

The improvement in motivation and satisfaction observed in the experimental group further emphasizes the impact of learner-centered, technology-supported instruction. Students found the immersive, project-based approach more meaningful, likely because it provided a sense of autonomy and real-world relevance. According to Deci and Ryan's Self-Determination Theory, motivation increases when learners experience autonomy, competence, and relatedness—elements inherently present in the VR-PBFL model (Deci & Ryan, 2000). This supports the argument that educational innovation must address both cognitive and affective domains to foster optimal learning outcomes. Overall, this study contributes to the growing body of literature advocating for immersive and culturally adaptive pedagogy in physical education. While previous research has examined VR and flipped learning separately, this study is among the few that combines both with a local philosophical approach in a practice-based course. As educational institutions increasingly aim for curriculum internationalization while maintaining cultural integrity, this model provides a promising example of how global and local paradigms can be harmonized to support holistic learning.

## Conclusion

This study developed and evaluated an innovative instructional model that integrates Virtual Reality (VR), ProjectBased Flipped Learning (PBFL), and the Tri Pramana philosophical framework to enhance sport massage education. The quasiexperimental results demonstrated that students exposed to the VRPBFLTri Pramana model achieved significantly higher gains in both practical skills ( $M\Delta = 19.45$  vs.  $8.33$ ) and theoretical understanding compared to those in a conventional learning environment. They also reported markedly greater motivation and satisfaction, indicating that immersive, studentcentered, and culturally grounded pedagogy can more effectively engage learners in complex psychomotor domains. By combining immersive simulation, active learning projects, and indigenous epistemology, this model addresses critical gaps in traditional sport massage instruction—namely limited practice opportunities, passive content delivery, and lack of cultural context. The findings support the adoption of mixedreality technologies and flipped, projectbased approaches within physical education curricula, while also demonstrating the value of situating innovation within local philosophical constructs. Future research should explore scalability across different institutions and disciplines, longterm retention effects, and costbenefit analyses to guide broader implementation. This integrative framework holds promise not only for sport massage but for any practicebased discipline seeking to harmonize global pedagogical advances with cultural relevance.

## Acknowledgement

The authors would like to express their sincere gratitude to the Ministry of Higher Education, Science, and Technology of the Republic of Indonesia (Kementerian Pendidikan Tinggi, Sains, dan Teknologi Republik Indonesia) for providing financial support for this research through its competitive research grant program. This study would not have been possible without the funding assistance provided under contract number 100/C3/DT.05.00/PL/2025. The authors also acknowledge the administrative and academic support from Universitas Pendidikan Ganesha and all participating students who contributed to the success of this project.

## Conflict of Interest

The authors declare that there is no conflict of interest.

## References

- Fang, M., You, F., & Yao, R. (2021). Application of virtual reality technology (VR) in practice teaching of sports rehabilitation major. *Journal of Physics: Conference Series*, 1852(4), 042007. <https://doi.org/10.1088/1742-6596/1852/4/042007>
- Moro, C., Štromberga, Z., Raikos, A., & Stirling, A. (2017). The effectiveness of virtual and augmented reality in health sciences and medical anatomy. *Anatomical Sciences Education*, 10(6), 549-559. <https://doi.org/10.1002/ase.1696>
- Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and measures. *International Journal of Educational Research*, 102, 101586. <https://doi.org/10.1016/j.ijer.2020.101586>
- Østerlie, O., Sargent, J., Killian, C., Garcia-Jaen, M., García-Martínez, S., & Ferriz-Valero, A. (2023). Flipped learning in physical education: A scoping review. *European Physical Education Review*, 29(1), 125-144. <https://doi.org/10.1177/1356336X211059173>
- Putranto, J. S., Heriyanto, J., Kenny, Achmad, S., & Kurniawan, A. (2022). Implementation of virtual reality technology for sports education and training: Systematic literature review. *Procedia Computer Science*, 216, 293-300. <https://doi.org/10.1016/j.procs.2022.12.139>
- Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education*, 147, 103778. <https://doi.org/10.1016/j.compedu.2019.103778>
- Sindu, I. G. P., Sudarma, M., Hartati, R. S., & Gunantara, N. (2024). Classification of Tri Pramana learning activities in virtual reality environment using convolutional neural network. *IAES International Journal of Artificial Intelligence*, 13(3), 2840-2853. <https://doi.org/10.11591/ijai.v13.i3.pp2840-2853>
- Tisna, G., Parwati, N., Warpala, I., Sudatha, I. G., Sudarmika, P., & Suartama, I. K. (2022). The impact of project-based e-learning on cognitive and psychomotor learning achievement in sports massage course. *Cypriot Journal of Educational Sciences*, 17(12), 4393-4408. <https://doi.org/10.18844/cjes.v17i12.7751>
- Adinata, K. C., Ganesha, U. P., & Ganesha, P. (2024). Increasing cognitive learning and sport massage skills through a project-based blended learning model. *Edu Sportivo*, 7(2), 134-148. <https://doi.org/10.31258/sportivo.7.2.134-148>
- Bento, F., & White, L. (2018). Education for life in the era of Education 4.0: Reflections from a critical perspective. *International Journal of Education and Learning*, 7(1), 47-59.
- Gay, G. (2018). *Culturally responsive teaching: Theory, research, and practice* (3rd ed.). Teachers College Press.
- Winataputra, U. S. (2017). Local wisdom as a base for character education development. *Journal of Education and Practice*, 8(7), 183-189.
- Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education*, 70, 29-40. <https://doi.org/10.1016/j.compedu.2013.07.033>
- Makransky, G., & Mayer, R. E. (2022). Benefits of taking a virtual field trip in immersive virtual reality: Evidence for the immersion principle in multimedia learning. *Educational Psychology Review*, 34(4), 1771-1792.
- Kolb, D. A. (2015). *Experiential learning: Experience as the source of learning and development* (2nd ed.). Pearson Education.
- van Alten, D. C. D., Phielix, C., Janssen, J., & Kester, L. (2019). Effects of flipping the classroom on learning outcomes and satisfaction: A meta-analysis. *Educational Research Review*, 28, 100281. <https://doi.org/10.1016/j.edurev.2019.05.003>
- Thomas, J. W. (2000). *A review of research on project-based learning*. Buck Institute for Education.
- Tuhiwai Smith, L. (2012). *Decolonizing methodologies: Research and indigenous peoples* (2nd ed.). Zed Books.

Sarathchandra, D., & Dhand, A. (2021). Cultural humility and epistemic pluralism in global education. *Teaching in Higher Education*, 26(5), 705-721.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227-268.

## Інтеграція віртуальної реальності та проектно-орієнтованого перевернутого навчання в галузі освіти зі спортивного масажу: Інновація на основі трьох праман (джерела пізнання істини)

Ґеде Додді Тісна М.С.<sup>1ABCD</sup>, Анак Агунґ Нгурах Путра Лаксана<sup>1CD</sup>,  
Команґ Аю Трі Відгіянті<sup>2CDE</sup>, І Ґеде Дхарма Утамаґса<sup>3CDE</sup>

<sup>1</sup>Університет освіти Ґанеша

<sup>2</sup>Університет PGRI Махадева

<sup>3</sup>Університет PGRI Аді Буана

Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 6 с., 3 табл., 20 джерел.

**Історія питання.** Освіта в галузі спортивного масажу часто стикається з труднощами в наданні ефективних практичних досвідів через обмежені можливості практики в реальних умовах та застарілі методи навчання.

**Мета дослідження.** Мета цього дослідження полягала у розробленні та оцінці інноваційної моделі навчання, що поєднує віртуальну реальність (VR), проектно-орієнтоване перевернуте навчання (PBFL) та філософію трьох праман, для підвищення компетентності студентів у галузі спортивного масажу.

**Матеріали та методи.** Використовуючи підхід науково-дослідних та дослідно-конструкторських робіт (R&D) із застосуванням моделі ADDIE, до проведення дослідження було залучено 80 студентів бакалаврату, які навчалися на курсі спортивного масажу. Учасників було розділено на експериментальну групу, яка проходила навчання за методикою VR-PBFL, та контрольну групу, в якій використовувались традиційні методи. Збір даних здійснювався шляхом проведення пре- та пост-тестів, обсерваційних контрольних списків та опитувальників.

**Результати.** Статистичний аналіз із застосуванням t-критеріїв для парних і незалежних вибірок показав значне поліпшення моторики та теоретичного розуміння в експериментальній групі, порівнюючи з контрольною групою ( $p < 0.05$ ). Студенти також повідомили про підвищення рівня задоволеності та залученості до навчального середовища, що базується на використанні технології віртуальної реальності. Інтеграція трьох праман — пратяґша (безпосередній досвід), анумана (логічне міркування) та сабда (достовірні джерела) — забезпечила філософську та культурну основу для цілісного навчання. Це дослідження підтверджує, що застосування технології віртуальної реальності та методу проектно-орієнтованого перевернутого навчання, ґрунтуючись на місцевій філософії освіти, може значно підвищити якість освіти в галузі спортивного масажу.

**Висновки.** Результати дослідження підтверджують доцільність впровадження імерсивних та культурно-адаптивних технологій у програми фізичного виховання, відкриваючи шляхи для майбутніх інновацій у галузі здоров'я та спортивної наукової освіти.

**Ключові слова:** віртуальна реальність, проектно-орієнтоване перевернуте навчання, освіта в галузі спортивного масажу, три прамани, імерсивне навчання.

### Information about the authors:

**Doddy Tisna MS, Gede:** gd.doddy@undiksha.ac.id; <https://orcid.org/0000-0003-1138-9579>; Department of Sports Science, Universitas Pendidikan Ganesha, Jl. Udayana No.11, Singaraja, Bali 81116, Indonesia.

**Putra Laksana, Anak Agung Ngurah:** p.laksana@undiksha.ac.id; <https://orcid.org/0000-0003-3758-6191>; Department of Sports Coaching Education, Universitas Pendidikan Ganesha, Jl. Udayana No.11, Singaraja, Bali 81116, Indonesia.

**Widhiyanti, Komang Ayu Tri:** komangayutriwidhiyanti@gmail.com; <https://orcid.org/0009-0006-2821-0917>; Department of Health, Physical Education, and Recreation, Universitas PGRI Mahadewa, Jl. Seroja No.57, Tonja, Denpasar Utara, Kota Denpasar, Bali, Indonesia.

**Utamayasa, I Gede Dharma:** dharmautamayasa@unipasby.ac.id; <https://orcid.org/0000-0002-5307-7285>; Department of Physical Education, Universitas PGRI Adi Buana Surabaya, Jl. Dukuh Menanggal XII, Surabaya 60234, East Java, Indonesia.

**Cite this article as:** Doddy Tisna MS, G., Putra Laksana, A. A. N., Widhiyanti, K. A. T., & Utamayasa, I. G. D. (2025). Integrating Virtual Reality and Project Based Flipped Learning in Sport Massage Education: A Tri Pramana Based Innovation. *Physical Education Theory and Methodology*, 25(5), 1140-1145. <https://doi.org/10.17309/tmfv.2025.5.13>

Received: 22.07.2025. Accepted: 05.09.2025. Published: 30.09.2025

This work is licensed under a Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0>)