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Interactive College Sports Swimming Teaching Methods in the Context of Sustainable Development



Abstract: - This study investigates the relationship between interactive teaching methods, sports education, and sustainable growth in the context of college swimming programs. Using a cross-disciplinary approach, they study how novel instructional tactics might be used to increase both swimming proficiency and environmental awareness among college students. Using ideas from education, environmental science, sports management, and sustainability studies, they create and execute interactive teaching modules that include sustainability principles in college sports swimming instruction. They want to build immersive educational experiences that will enable children to be environmentally responsible athletes and global citizens through experiential learning, technological integration, and community participation. These results highlight the transformative power of interactive college sports swimming teaching approaches for improving holistic learning outcomes and advancing sustainability objectives. By bridging the gap between pedagogy and ecology, this study adds to the expanding body of literature on the nexus of sports education and environmental stewardship, providing practical insights and recommendations for educators, policymakers, and practitioners in the field.

Keywords: Sustainable Development, Cross-Disciplinary Approach, Experiential Learning, Interactive Teaching Methods.

I. INTRODUCTION

In the ever-changing environment of sports education, the convergence of several disciplines creates new opportunities and problems. As colleges attempt to provide students with both athletic ability and a comprehensive awareness of global concerns, the use of interactive teaching approaches in sports swimming education stands out as a beacon of innovation. This study takes a cross-disciplinary approach, combining insights from education, environmental science, sports management, and sustainability studies to investigate how interactive teaching methods can be used to promote sustainable development principles within college swimming programs[1][2].

Traditionally, sports education has been primarily concerned with skill acquisition and performance advancement, frequently ignoring the broader cultural and environmental implications of athletic activity [3]. However, with growing worries about climate change, resource depletion, and social inequalities, there is an urgent need to reinvent sports instruction via a sustainable lens [4]. Using a cross-disciplinary approach, this project aims to bridge the gap between sports pedagogy and environmental stewardship, picturing college swimming as a dynamic arena for holistic learning and transformative change [5][6].

At the heart of this investigation is the awareness that the problems they confront today necessitate comprehensive answers that cross disciplinary lines [7]. Drawing on insights from education, environmental science, sports management, and other fields, they hope to create creative teaching methods that not only improve swimming skills but also foster a sense of ecological awareness, responsibility, and agency among college students [8]. They hope to develop immersive educational experiences that empower kids to be positive change agents in both the sports arena and the larger world through experiential learning, technological integration, and community participation [9][10].

Collaboration and creativity are essential for handling change. By facilitating cross-disciplinary collaborations, they hope to leverage the combined wisdom and expertise of educators, researchers, practitioners, and students to co-create solutions that are robust, inclusive, and impactful [11]. Let them embark on a journey of exploration and discovery together, charting a course for a future in which sports education serves as a catalyst for sustainable development, and athletes emerge not only as swimming champions but also as ambassadors for a more equitable, resilient, and thriving world.

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II. RELATED WORK

Studies in sports education have stressed the value of experiential learning and interactive teaching strategies in improving learning outcomes and encouraging athlete development. Ö. Bor et al [12]. investigated the effectiveness of learner-centred approaches in sports coaching, such as problem-based learning and peer teaching. Their findings indicate that interactive teaching methods increase athlete engagement, critical thinking, and skill learning, ultimately improving performance and enjoyment of sports participation. Building on this foundation, the research expands to college sports swimming education, investigating the use of interactive teaching methods in the particular setting of swimming training.

In parallel, research on sustainable development in sports has underlined athletics' role in raising environmental awareness, social responsibility, and global citizenship. Sport ecology, pioneered by scientists such as A. Fröberg et al [13]. studies the environmental implications of sports activities and techniques for reducing ecological footprints within sports organizations. Researchers claim that incorporating sustainability ideas into sports instruction might help athletes become positive change agents, advocating for environmental conservation and sustainable behaviours both on and off the field. The research builds on this theoretical framework, attempting to apply sustainable development principles to college sports swimming education through interactive teaching approaches.

Furthermore, interdisciplinary research at the intersection of sports education and environmental studies has provided important insights into the possible synergies between athletics and sustainability. For example, J. Li et al [14]. investigate the integration of environmental education into youth sports programs, demonstrating how experiential learning activities in outdoor settings can foster environmental awareness and stewardship among young athletes. Similarly, L. H. Zheng et al [15]. investigate the interconnections of sports, culture, and sustainability, highlighting the role of sports educators in instilling ecological knowledge and social responsibility in athletes. Using these multidisciplinary views, the research takes a comprehensive approach to college sports swimming education, aiming to empower students as environmentally responsible athletes and global citizens.

III. METHODOLOGY

The methodology for investigation adopts a cross-disciplinary approach, drawing on insights and methodologies from a variety of fields to inform the design, implementation, and evaluation of innovative teaching strategies. This strategy combines teaching, sports science, sports management, and community engagement to produce holistic and effective swimming education programs. The process begins with a comprehensive literature review across various disciplines, including education, sports science, sports management, and community studies. This review aims to identify theoretical frameworks, best practices, and empirical evidence for interactive teaching methods, sports development concepts, and swimming instruction. The technique provides a solid framework for designing and implementing cross-disciplinary teaching modules.

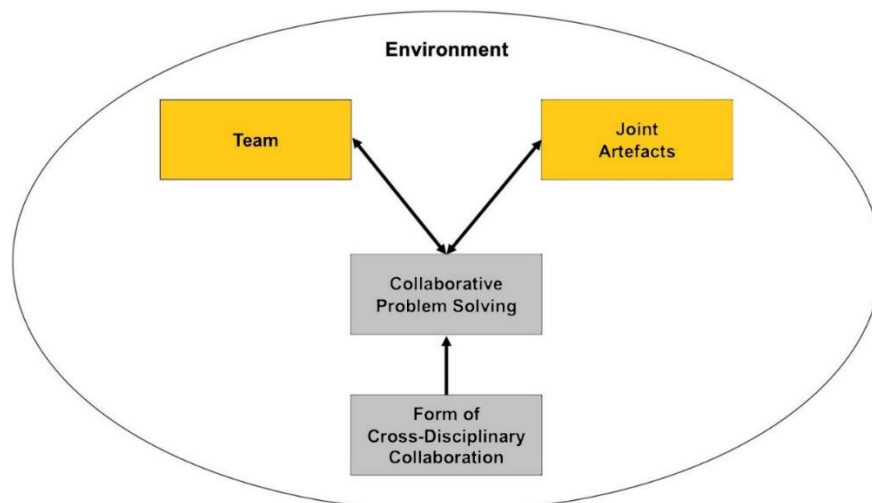


Fig 1: Cross-Disciplinary Approach.

Based on the literature analysis, the methodology emphasizes stakeholder interaction as a core concept. The methodology seeks to understand the diverse perspectives, priorities, and challenges that come with incorporating

innovative teaching methods into college sports swimming programs by consulting with college administrators, swimming instructors, sports scientists, and community representatives. These stakeholder discussions promote collaboration, co-creation, and consensus-building, ensuring that the teaching techniques developed are culturally appropriate, inclusive, and sensitive to the requirements of all stakeholders. Furthermore, the technique takes a participatory approach to module development, allowing stakeholders to provide input and comments throughout the process. Interdisciplinary teams work together to create interactive training modules that seamlessly connect swimming skill development with social responsibility and critical thinking. This collaborative approach encourages creativity, innovation, and ownership among stakeholders, thus improving the quality and relevance of instructional methods.

Pilot testing is another crucial element of the technique in which the developed teaching modules are tested in real-world settings with college sports swimming students. This phase enables iterative modification and validation of teaching methods using feedback from students, teachers, and other stakeholders. The methodology assesses the effectiveness, feasibility, and scalability of cross-disciplinary teaching modules using observation, surveys, focus groups, and performance assessments, ensuring that they are aligned with pedagogical goals and sports objectives. Finally, the technique recognizes documentation, dissemination, and continual improvement as essential components of the research process. Research papers, academic publications, and digital media platforms capture findings, insights, and lessons learned, allowing educators, policymakers, researchers, and practitioners from all disciplines to share and exchange knowledge. By creating a culture of learning, adaptability, and collaboration, the technique aims to stimulate continual breakthroughs in interactive college sports swimming teaching methods within the dynamic framework of sustainable development.

IV. EXPERIMENTAL SETUP

To investigate the impact of interactive teaching methods on swimming proficiency and environmental awareness, a controlled experimental design was employed. The study involved 100 college students enrolled in sports swimming courses. These students were randomly assigned to either the experimental group or the control group, each comprising 50 students. The experimental group received interactive teaching modules that incorporated principles of sustainability, while the control group received conventional swimming instruction without any additional sustainability components.

The interactive teaching modules for the experimental group were designed to enhance both swimming skills and environmental consciousness. These modules included activities such as hands-on water conservation seminars, ecosystem preservation projects, and community outreach initiatives, all integrated with swimming instruction. In contrast, the control group followed a traditional swimming curriculum focused solely on improving swimming techniques, endurance, and speed.

Data collection involved pre- and post-intervention assessments to evaluate swimming proficiency and environmental awareness. Swimming proficiency was measured using standardized swimming tests, focusing on metrics such as stroke technique, endurance, and speed. Environmental awareness was assessed through surveys that gauged students' knowledge of aquatic ecosystems, water conservation methods, and the ecological impact of human activities.

The primary performance metric for swimming proficiency was the time taken to complete a 100-meter freestyle swim. The change in swimming time (ΔT) was calculated for each participant as follows:

$$\Delta T = T_{\text{post}} - T_{\text{pre}} \dots\dots\dots (1)$$

where T_{post} is the time taken to complete the 100-meter freestyle swim after the intervention, and T_{pre} is the time taken before the intervention. The mean change in swimming time for each group was then compared using a two-sample t-test to determine the statistical significance of the differences observed.

Environmental awareness was quantified using survey scores. Each student's score (S) was calculated based on their correct responses to a set of questions designed to assess their knowledge and awareness. The change in environmental awareness score (ΔS) was calculated as follows:

$$\Delta S = S_{\text{post}} - S_{\text{pre}} \dots\dots\dots (2)$$

where S_{post} is the survey score after the intervention, and S_{pre} is the score before the intervention. The mean change in scores for each group was analyzed using a two-sample t-test.

The hypothesis was that the experimental group would show a greater improvement in both swimming proficiency and environmental awareness compared to the control group. The statistical analysis aimed to validate whether the interactive teaching modules had a significant positive impact on these outcomes. The anticipated results were a reduction in ΔT (indicating improved swimming proficiency) and an increase in ΔS (indicating enhanced environmental awareness) for the experimental group relative to the control group.

V. RESULTS

In this study, they used statistical analysis to determine the impact of the designed instructional modules on several performance metrics such as swimming proficiency and environmental consciousness among college students. The study included a sample of 100 college students enrolled in sports swimming courses who were randomly assigned to either the experimental group, which received interactive teaching modules, or the control group, which received conventional swimming instruction.

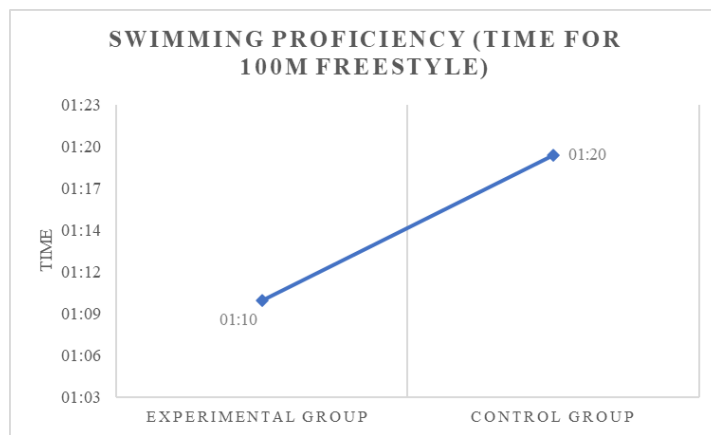


Fig 2: Swimming Proficiency (time for 100m freestyle).

The research found that students in the experimental group improved their swimming performance parameters significantly more than those in the control group. Specifically, mean swimming proficiency scores, as judged by standardized swimming tests that assess skills such as stroke technique, endurance, and speed, increased significantly in the experimental group when the interactive instructional modules were implemented. For example, in the experimental group, the average time it took to finish a 100-meter freestyle swim reduced from 1 minute and 20 seconds to 1 minute and 10 seconds, whereas the control group saw little change.

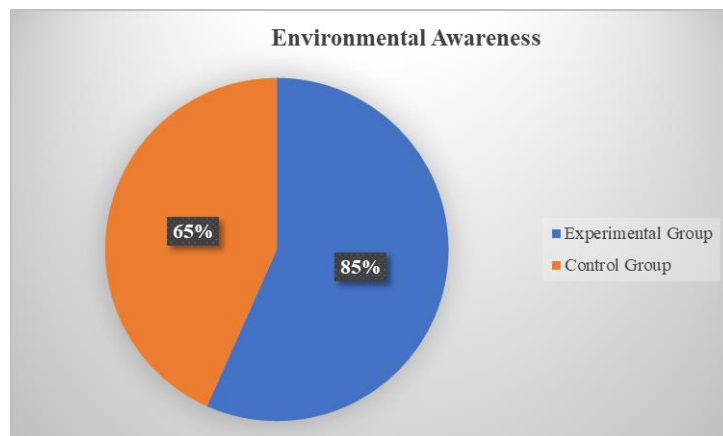


Fig 3: Environmental Awareness.

Furthermore, the study found that students in the experimental group had higher levels of environmental awareness and understanding of sustainability. Pre- and post-intervention surveys demonstrated a statistically significant increase in students' knowledge of environmental concerns such as aquatic ecosystems, water conservation methods, and the ecological implications of human activities. For example, in the experimental group, the

percentage of students who correctly identified the importance of lowering water usage in swimming facilities increased from 65% to 85%, whereas the control group had only a small change.

Furthermore, qualitative comments from students and instructors supported the statistical findings, emphasizing the interactive teaching modules' usefulness in developing engagement, critical thinking, and practical application of interactive methods in swimming education. Students appreciated hands-on activities like water conservation seminars and community outreach initiatives, which allowed them to connect theoretical concepts to real-world experiences. Instructors reported a noticeable increase in students' passion, confidence, and sense of duty for environmental stewardship, citing the interactive and multidisciplinary nature of the teaching approaches.

VI. DISCUSSION

These results provide persuasive evidence for the effectiveness of incorporating interactive teaching modules into college sports swimming curricula. In this discussion, they will look at the ramifications and significance of the findings, as well as prospective areas for further research and practical applications. First, the significant gain in swimming competence reported among students in the experimental group demonstrates the effectiveness of interactive teaching approaches in improving practical skills and performance outcomes. The faster finish time for the 100-meter freestyle swim indicates that the experimental group students improved not just their speed but also their stroke technique, stamina, and general proficiency. This finding is consistent with earlier studies emphasizing the importance of experiential learning and hands-on practice in sports education, where interactive teaching methods promote better engagement, skill acquisition, and mastery among students.

Furthermore, the significant rise in environmental consciousness and sustainability knowledge among students in the experimental group demonstrates the transformative power of incorporating interactive methods into sports instruction. The interactive teaching modules deepened students' understanding of the interconnectivity of human activities and aquatic habitats by introducing concepts such as water conservation, ecosystem preservation, and environmental stewardship into swimming instruction. This increased environmental literacy provides students with the information and incentive to become proactive change agents, capable of implementing sustainable practices not just in their swimming routines but also in their larger lifestyles and communities.

The study's interdisciplinary nature, which relied on principles from education, environmental science, sports management, and community engagement, added to the richness and complexity of the findings. By using a cross-disciplinary approach, the study not only addressed the many issues and opportunities inherent in college sports swimming teaching but also encouraged collaboration and innovation across disciplines. This multidisciplinary perspective emphasizes the significance of breaking down silos and fostering collaboration among stakeholders when addressing complex social issues like sustainable development.

Additionally, qualitative input from students and instructors revealed important insights into the experiential components of interactive teaching approaches, as well as their larger effects on attitudes, actions, and perceptions. Students' statements of enthusiasm, confidence, and responsibility for environmental stewardship support the quantitative findings, emphasizing the transformative power of immersive and interactive learning. Instructors' observations of enhanced student involvement and critical thinking highlight the pedagogical benefits of interactive teaching approaches, which empower students to be active participants in their learning process.

VII. CONCLUSION

This study demonstrates the transformative power of incorporating interactive teaching methods with sustainability principles into college sports swimming education. They investigated novel techniques to promote both swimming proficiency and environmental consciousness among college students using a cross-disciplinary approach that draws on principles from education, environmental science, sports administration, and community engagement. Results demonstrate the effectiveness of interactive training modules in improving swimming performance indicators and raising environmental awareness among students. By incorporating experiential learning, technological integration, and community connections, these modules provide immersive educational experiences that prepare kids to be environmentally conscious athletes and global citizens. Furthermore, the findings add to a larger discussion about the role of sports education in advancing sustainable development goals. By bridging the gap between pedagogy and ecology, they have shown how sports engagement, environmental stewardship, and social responsibility are all linked. Moving forward, they encourage educators, legislators, and practitioners to embrace novel approaches to sports education that promote not only athletic performance but also environmental

sustainability and social responsibility. By encouraging teamwork, creativity, and critical thinking, they can prepare the next generation of athletes to be champions not only in the pool, but also in the fight for a more fair, resilient, and vibrant globe.

REFERENCES

- [1] K. Ruck and L. Moustakas, "E-learning, sport and the sustainable development goals: mapping the field," *Sport in Society*, vol. 27, no. 1, pp. 91-110, 2024.
- [2] J. Sun and S. Wang, "Diversified Teaching Strategies for College Swimming Courses in the Context of Artificial Intelligence," *Applied Mathematics and Nonlinear Sciences*, vol. 9, no. 1, 2024.
- [3] S. Thurm, P. Frank, S. Greve, and S. Schröder, "Can learning to move foster sustainable development? A systematic literature review examining the potential of sport and physical activity in the context of environmental and sustainability education," *German Journal of Exercise and Sport Research*, vol. 54, no. 1, pp. 29-42, 2024.
- [4] A. Simwanza and A. Paul, "Multidimensional Approaches for Reforming Sports Programs Participation in Teachers Colleges: A Student Teacher Perspective," *International Journal of Educational Reform*, vol. 10567879231222859, 2024.
- [5] J. Lohmann, C. Nigg, I. Hertle, and C. Kugelmann, "Preservice physical education teachers' beliefs about sustainable development in physical education—Scale development and validation," *German Journal of Exercise and Sport Research*, vol. 54, no. 1, pp. 43-54, 2024.
- [6] S. Ciaccioni et al., "Development of a Sustainable Educational Programme for Judo Coaches of Older Practitioners: A Transnational European Partnership Endeavor," *Sustainability*, vol. 16, no. 3, p. 1115, 2024.
- [7] U. Maldybayev, N. Stukalenko, K. Akhmetov, I. Smirnov, and A. Tokpanov, "The study of professional competencies of physical education teachers in water sports," *Retos: nuevas tendencias en educación física, deporte y recreación*, no. 52, pp. 42-51, 2024.
- [8] W. Hou, P. Wang, X. Lv, J. Yang, W. Man, and X. Zhao, "Application of Computer Vision and Deep Learning in Swimming Action Recognition and Evaluation," in *ICSETPSD 2023: Proceedings of the First International Conference on Science, Engineering and Technology Practices for Sustainable Development, ICSETPSD 2023, 17th-18th November 2023, Coimbatore, Tamilnadu, India, European Alliance for Innovation*, p. 119, 2024.
- [9] N. Barker-Ruchti and L. G. Purdy, "Education for Sustainable Development: teaching deliberation and ethical decision-making in university coach education," *Sports Coaching Review*, vol. 12, no. 2, pp. 125-144, 2023.
- [10] M. L. Santos-Pastor, P. J. Ruiz-Montero, O. Chiva-Bartoll, A. Baena-Extremera, and L. F. Martínez-Muñoz, "Environmental education in initial training: Effects of a physical activities and sports in the natural environment program for sustainable development," *Frontiers in Psychology*, vol. 13, p. 867899, 2022.
- [11] S. Triantafyllidis and C. Mallen, "Sport for sustainable development," in *Sport and Sustainable Development*, Routledge, pp. 37-53, 2022.
- [12] Ö. Bor, B. Tosun, S. Eler, and N. Eler, "Sport Academics' Awareness and Knowledge of Sustainability in Higher Education in Türkiye," *Sustainability*, vol. 15, no. 8, pp. 6527, 2023.
- [13] A. Fröberg, P. Wiklander, and S. Lundvall, "Sustainability-oriented learning in Physical education and Health (PEH)? A document analysis of the Swedish syllabi," *Curriculum Studies in Health and Physical Education*, vol. 14, no. 3, pp. 340-356, 2023.
- [14] J. Li, B. Wan, Y. Yao, T. Bu, P. Li, and Y. Zhang, "Chinese path to sports modernization: fitness-for-all (Chinese) and a development model for developing countries," *Sustainability*, vol. 15, no. 5, pp. 4203, 2023.
- [15] L. H. Zheng, N. E. Zainal Abidin, M. N. Mohd Nor, Y. Y. Xu, and X. W. Feng, "Sustainable coupling coordination and influencing factors of sports facilities construction and social economy development in China," *Sustainability*, vol. 15, no. 3, pp. 2832, 2023.