



About the Journal

The journal "Physical Education of Students" (e-ISSN 2308-7250) publishes articles on different aspects of physical education, sports and health of adult young people - **Postsecondary Students** (undergraduate, graduate and postgraduate degrees).

Make a Submission

To submit your manuscript, you need the following files: 1. [Title page: title, authors, abstract, keywords](#); 2. [Information about the authors](#); 3. [A main document file](#); 4. [Author Agreement Form](#).

Article Processing Charges (APC) [more...](#)

Journal "Physical Education of Students" (Abbreviated key-title: Phys. educ. stud. [e-ISSN 2308-7250](#)).

Continues:

- [Fizičeskoe Vospitanie Studentov](#) (2009-2012);
- [Fiziceskoe Vospitanie Studentov Tvorcheskikh Special'nostej](#) (1996-2009)

Journal is published 6 times per year (bimonthly: February, April, June, August, October, December).

All articles have [DOI \(digital object identifier\)](#)

All authors have [ORCID](#)

INDEXING: Web of Science Core Collection (ESCI); DOAJ; [See more](#) ↗

Journal Impact Factor™

Journal 'Physical Education of Students' has a Journal Impact Factor™ of 0.8. Source: Journal Citation Reports™ from Clarivate 2023.



Make a Submission

HOME



ABOUT THE JOURNAL

ABOUT
FROM THE EDITORIAL BOARD
EDITORIAL BOARD
EDITORIAL ETHICS
JOURNAL INFORMATION
CONTACT INFORMATION

TO THE READER

SEARCH
CURRENT ISSUE
EARLY ACCESS
ARCHIVE

TO THE CONTRIBUTORS

SUBMISSION OF MANUSCRIPTS
REVIEW PROCEDURE FOR MANUSCRIPTS
TREATMENT OF MANUSCRIPTS
MANUSCRIPTS UNDER EVALUATION

INFORMATION

SUBSCRIPTION INFORMATION
OUR AUTHORS
Indexing
F.A.Q.

Workflow **Publication**

Submission **Review** Copyediting Production

Submission Files Q Search

▶	3707	Article Page Title.docx	May 12, 2023	Other
▶	3708	Information about the authors.docx	May 12, 2023	Other
▶	3709	A main document file.docx	May 12, 2023	Article Text
▶	3710	Author Agreement Form.pdf	May 12, 2023	Other

Reviewer's Attachments Q Search

No Files

Revisions Q Search Upload File

No Files

Review Discussions Add discussion

Name	From	Last Reply	Replies	Closed
recommendations	sergii2023-05-17 03:22 PM	-	0	<input type="checkbox"/>
▶ Revision completed	mashud2023-05- 18 05:31 AM	-	0	<input type="checkbox"/>

recommendations



Participants

prof. Sergii Iermakov (sergii)

Mashud (mashud)

Messages

Note	From
We would like to inform you that our editorial team has made some changes to the text of your article to ensure clarity and improve the overall readability. Additionally, we have incorporated the recommended revisions as footnotes placed in the right margin of the pages. These revisions and recommendations aim to enhance the quality of your article and make it more accessible to readers. We appreciate your understanding and cooperation in implementing these changes. If you have any questions or concerns regarding the revisions or the placement of the recommendations as footnotes, please don't hesitate to contact us. We value your contribution and look forward to the publication of your revised article.	sergii2023-05-17 03:22 PM

[1817-Mashud et al ed-2.docx](#)



Submissions

My Queue 1

Archives

Help

My Assigned

Filters

New Submission

1817 **Mashud et al.**

Integration of project based learning models with interactive multimedia: Innovative efforts to im...

Production

View



From: **Sergii Iermakov** <sportart@gmail.com>
Date: Thu, Jun 1, 2023 at 1:05 AM
Subject: APC
To: <mashud@uim.ac.id>

Dear Mashud,
Congratulations! Your article has been recommended for publication. You can find information about the article in the site section at MANUSCRIPTS UNDER EVALUATION:
NEXT ISSUE:

Physical Education of Students, 2023, 27(3), June
<https://sportedu.org.ua/index.php/PES/next>

4.	Mashud, Syamsul Arifin, Advendi Kristiyandaru, Y Touvan Juni Samodra, I Gusti Putu Ngurah Adi Santika, Didi Suryadi
----	---

To complete the editorial process for your article, the corresponding author must pay an Article Processing Charge (APC) of \$270. You can learn more about the APC payment process at
<https://sportedu.org.ua/index.php/PES/about/submissions#25>

We have sent a link to an invoice for APC payment to your email through our Fondy system:

<https://pay.fondy.eu/invoice/activate/?id=792193&sign=db9241709bd060fcdf84559c8732ef28099115fc>

Please note that our payment system has no commissions. Once the APC payment is successfully made, your article will be published and shown in the "EARLY ACCESS" section of the site. On the announced day of publication of the next issue of the journal, the article will be moved to the "CURRENT ISSUE" section, and the DOI of the article will be activated.

After making the payment, please send a copy of the payment document confirming the fact of payment for the services of the magazine to our email at sportart@gmail.com. We will also send you the layout of the article in PDF format. Please check the layout thoroughly and highlight any possible corrections using a color or a comment. If you find any errors or mistakes, please send us the corrected article layout, and we will make the necessary corrections.

We wanted to take a moment to thank you for submitting such a valuable and informative research article to our publication. Your contribution is highly appreciated and we believe that it will make a significant impact on the scientific community.

We wish you all the best in your future research endeavors and hope that you will continue to produce such high-quality work. Please know that we will do our best to present your article to a wide range of scientific community, and we are confident that it will be well-received.

Yours sincerely,
prof. Sergii Iermakov
Editor-in-chief
Kharkiv, Ukraine ([Al Jazeera](#))
Kharkiv, Ukraine([The Economist](#))

Integration of project based learning models with interactive multimedia: Innovative efforts to improve student breaststroke swimming skills

Mashud^{1ABCDE}, Syamsul Arifin^{1ABCD}, Advendi Kristiyandaru^{2ABDE}, Y Touvan Juni Samodra^{3BCDE}, I Gusti Putu Ngurah Adi Santika^{4BDE}, Didi Suryadi^{3,5ACDE}

¹Departement Physical Education, Sport and Health, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

²Departement Physical Education, Sport and Health, Universitas Negeri Surabaya, Surabaya, Indonesia

³Department of Sport Coaching Education, Faculty of Teacher Training and Education, Universitas Tanjungpura, Pontianak, Indonesia

⁴Department of Physical Education Health and Recreation, Faculty of Teacher Training and Education, Universitas PGRI Mahadewa, Bali, Indonesia

⁵Department of Sport Science, Faculty of Sport Science and Health, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia

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

Abstract

Background and Study Aim Breaststroke swimming is one of the compulsory subjects for students majoring in sports education at Lambung Mangkurat University. Thus, it is important to have good breaststroke swimming skills so that later it will become the basis for creating experienced and potential teachers. Therefore, there is a need for special treatment to improve breaststroke swimming skills. This study aims to provide evidence of the integration of project based learning models with interactive multimedia on improving students' breaststroke swimming skills.

Material and Methods This research is a quasi-experimental type with a pretest posttest non-equivalent control group design. The sampling technique used purposive sampling so that as many as 90 sports education students were sampled, namely 45 experimental groups and 45 control groups. The instrument resulting from breaststroke swimming skills was designed by the researcher, based on the theory of swimming experts, all descriptors for the breaststroke swimming instrument totalled 35 items. Furthermore, the analysis of the data in this study through the stages of normality test, homogeneity test, and hypothesis testing.

Results The hypothesis test on the experimental group indicator with the PBL-Multimedia Interactive treatment showed a significance value of $0.000 < 0.05$ which means it is significant. Furthermore, the results on the control group indicator showed a significance value of $0.000 < 0.05$, so there was a significant increase. The results also show a difference with a significance of $0.001 < 0.05$, which means that the PBL- Multimedia Interactive experimental group and the control group (Conventional) have a significant difference in the effect on the posttest score.

Conclusions This study shows that the PBL-Multimedia Interactive model integration treatment has a significant effect on improving students' breaststroke swimming skills. Where the integration of the PBL-Multimedia Interactive model is proven to be more effective than the conventional model. That way, the integration of the PBL-Multimedia Interactive model is effective and can be applied in swimming learning, especially in improving breaststroke swimming.

Keywords: learning model, project based learning, interactive multimedia, swimming breaststroke

Introduction

Sport is a physical activity that can be carried out by various groups [1]. Along with its development, technological advances in sports coaching are needed [2]. Where technological advances are increasingly sophisticated and modern, so that they are very close to digital devices both online and offline [3]. Therefore, the rapid development of various technologies gives hope for the modernization of new technologies in the world

of education [4], including reforms in the world of sports [5]. In addition, models and media that are currently developing rapidly cause various demands and lifestyle changes, including sports, especially swimming [6].

Swimming is a sport that is done in water [7], and all levels of society can do this sport regardless of age and gender [8], and it is one of the most popular sports in the world [9]. Swimming activity is an important resource so as not to drown [10], besides that it also requires good and prime physical condition. Thus, physical fitness is also maintained [11, 12, 13, 14, 15], which is related to physical

© Mashud, Syamsul Arifin, Advendi Kristiyandaru, Y Touvan Juni Samodra, I Gusti Putu Ngurah Adi Santika, Didi Suryadi, 2023
doi:10.15561/20755279.2023.0304

health [16, 17, 18]. A study based on the results of clinical trials showed that swimmers found specific improvements in lung function [19]. The results of this review have provided an illustration that swimming is a very important water sport, both for physical abilities and health-related fitness. However, special attention is needed as said by Pharr et al that few studies have an understanding of predictors of swimming ability. There are various styles in swimming, one of which is the breaststroke [10].

Breaststroke swimming or what is often known as frog style is a swimming style facing the surface of the water, where the legs are moved outwards like kicking backwards. The movement starts from the first arm swing after sliding and the body must remain face down and both shoulders parallel to the surface of the water [20]. In addition, the breaststroke becomes the only competitive stroke [21], and the complex is also characterized by an intermittent propulsion phase [22]. A study by Strzala says that success in breaststroke swimming turns out that most of the power is reinforced by the kicking motion of the breaststroke and is considered the most responsible [23]. Therefore, it is very important to coordinate limb movements optimally for swimmers, this aims to maintain the best possible speed [21]. In addition, breaststroke swimming is a compulsory subject for students majoring in sports education at the Teaching and Education Faculty (FKIP) of Lambung Mangkurat University. Where the existence of swimming practice courses is the basis for the creation of experienced and potential teachers, thus providing an important role in the community environment.

Implementation of breaststroke swimming practice lectures to students by providing basic technical practice materials and swimming skills based on contracts and lecture teaching materials. Thus students are required to be able to do and practice breaststroke swimming, this is intended for preparation after graduating from university later. Therefore, to obtain maximum results, it is necessary to have a learning design so that it is not monotonous [24–28]. Where sports teachers are also a consideration in seeing student success [29]. Furthermore, harnessing the advancement of technology in a few decades may be an option to replace the traditional way [3]. The solutions offered use a project-based learning model with interactive multimedia, this is also considered in line with technological advances and their use in the world of sports. As is the case with what was said Jumaat & Tasir that sports science and technology needs appreciation, especially for coaches in Indonesia [2]. The results are the same as research conducted by Widiastuti & Mashud interactive multimedia developed will facilitate swimming training and is feasible to implement [3, 30].

Although previously Sugiyanto research had been carried out on the integration of mobile learning and project-based learning [31], and Haryanto innovation media learning, online project-based learning (O-PBL) [32]. However, researchers have not found research on the integration of project-based learning models with interactive multimedia in physical education, especially those that discuss breaststroke swimming. So that this can be a research update and strengthen the importance of this research to be carried out. That way, this research will be able to contribute to the strategies and learning models used. In his research Saeed applying multimedia provides an advantage in the learning process [33]. Based on these problems, this study aims to provide evidence of the integration of project-based learning models with interactive multimedia to improve students' breaststroke swimming skills.

Materials and Methods

Participants

This research will be conducted in a swimming pool located on the main campus of the Department of Sports and Health Education, Teaching and Education Faculty, Lambung Mangkurat University from September 2022 to November 2022. The researchers determined the sample in this study using purposive sampling with a total sample of 90 students, namely 45 experimental groups and 45 control groups.

Research Design

The effectiveness model used in this study is experimental. The method used is a quasi-experimental design with pretest posttest non-equivalent control group design. In this method given different treatment in the experimental group and the control group. In this study the experimental class will be treated with a project based learning model with interactive multimedia while the control class will be treated with a conventional learning model. This study was initiated by administering a pretest to the experimental and control groups, then the experimental group was given a project based learning model treatment with interactive multimedia for 8 meetings. Then a posttest was given to the experimental and control groups to see the effect of the treatment on the experimental group.

The instrument for the results of breaststroke swimming skills was designed by researchers, based on the theory of swimming experts. Especially for the breaststroke swimming instrument, it is divided into: 1) concept; 2) breaststroke swimming indicator; and 3) descriptors (description of indicators). The concept is breaststroke swimming which is divided into 7 (seven) indicators, such as: 1) start; 2) body position; 3) leg movements; 4) arm movement and

recovery; 5) breath movement; 6) coordination movement; and 7) reversal movement. Of the 7 (seven) indicators, each is further divided into 5 descriptors. So the total number of descriptors for the breaststroke swimming instrument is 35 items. It is from these 35 descriptor items that the tests scores are obtained.

In order to find out whether the instrument used was feasible, testers 1 and 2 were first tested with a sample of 15 students of the Physical Education Study Program. Where the results show for $n = 15$ and an error rate of 5%, it is obtained $r_{table} = 0.514$ and an error level of 1% $r_{table} = 0.641$, because r_{count} is greater than r_{table} ($0.966 > 0.641 > 0.514$), it can be concluded that the swimming ability instrument reliable.

Statistical Analysis

The research data was analyzed in a quantitative descriptive manner to provide a summary of research data and to facilitate the presentation of research data. Data showing normal distribution were analyzed using the t test to test the difference in the average pretest and posttest results in the

experimental group and the control group, as well as the significance assisted using the SPSS 26 application.

Results

Quasi-experimental research, such as the existence of different treatments in the experimental group and the control group. In this study the experimental group was treated with a project based learning model with interactive multimedia (PBL-interactive multimedia) and the control group (Conventional). Before being given the effect test and the different test, first carry out the normality prerequisite test, if the data is normal, it will use the t-test and if it is not normal, it will proceed with the nonparametric test.

Based on the results of the normality test with the Kolmogorov-Smirnov formula, it shows that the significance value is $p > 0.05$, so in conclusion the data shows normal, then the t-test will be continued. The results of the normality test can be seen in table 1.

The results in table 2 of the hypothesis test on the indicators of the experimental group

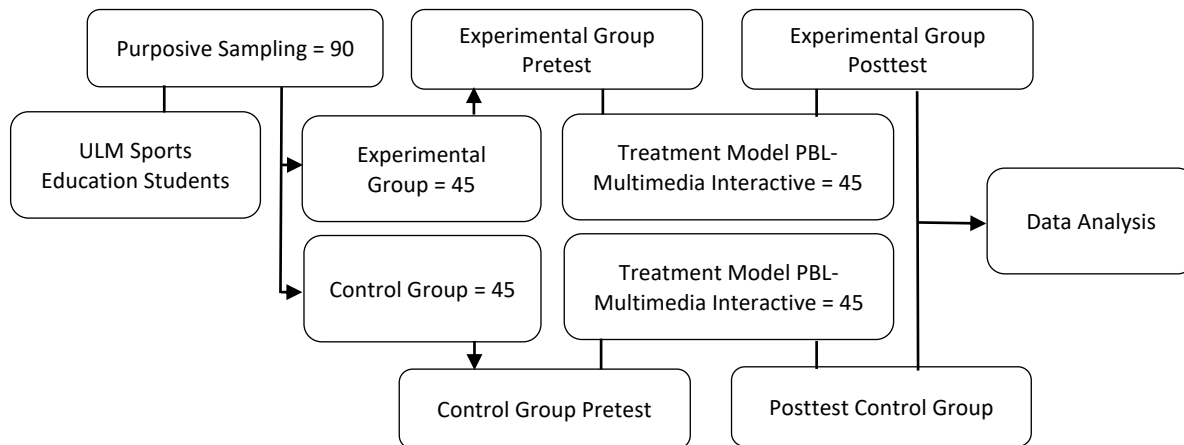


Figure 1. Chart of research procedures

Table 1. Kolmogorov-Smirnov normality prerequisite test

Result	Statistics	df	Sig.
Experiment Pretest	0.097	45	.200 *
Posttest Experiment	0.117	45	.144
Pretest Control	0.107	45	.200 *
Posttest Control	0.118	45	.129

Table 2. Paired samples test results of the t-test

Pairs	Result	Means	std. Deviation	t	df	Sig. (2-tailed)
Pair 1	Experimental Pretest - Experimental Posttest	-6.467	3.653	-11.875	44	0.000
Pair 2	Pretest Control - Posttest Control	-3.089	3.502	-5.917	44	0.000

with the PBL-Multimedia Interactive treatment show a significance value of $0.000 < 0.05$, so these results provide evidence that the PBL-multimedia interactive model provides a significant increase in the results of breaststroke swimming skills.

Furthermore, the control group showed a significance value of $0.000 < 0.05$, so these results also provide evidence that the conventional model actually provides a significant increase in the results of breaststroke swimming skills. Based on the results of the analysis of hypothesis testing, it can be concluded that the PBL-interactive multimedia model and the conventional model can be applied to improve breaststroke swimming skills. Seeing these results, the researcher wants to see the difference in the effect given, so that the model can be proven more effective to use.

Based on the results of the homogeneity test, it shows a significance value of $0.085 > 0.05$, so the result is homogeneous, then it will be followed by a different test with the Independent Samples t Test formula. The normality test results can be seen in table 3.

The results in table 4 to find out the difference in the pre-test scores of the experimental group and

the pre-test of the control group, the results show a significance value of $0.912 > 0.05$ so there is no significant difference in the pre-test of the PBL-Multimedia Interactive experimental group with the pre-test control group (Conventional).

The results in table 4 to find out the difference in the pre-test values of the experimental group and the pre-test of the control group, the results show a significance value of $0.001 < 0.05$, so the post-test of the PBL-Multimedia Interactive experimental group and the post-test of the control group (Conventional) there is a difference significant influence. Based on these results, it proves that the PBL-Multimedia Interactive model is more effective than the conventional learning model (tabl.5). So the PBL-Multimedia Interactive model is more recommended to improve breaststroke swimming skills.

Based on table 6 it can be seen that the minimum, maximum, mean, and standard deviation on pretest and posttest data with PBL-Multimedia Interactive model treatment proves that the posttest scores are better, but the difference is not too big. For more details can be seen in Figure 2.

Table 3. Test of homogeneity of variances

Learning	Result	Levene Statistics	df1	df2	Sig.
Breaststroke Swimming	Based on Means	2.240	3	176	0.085

Table 4. Difference test of experimental pre-test (PBL-multimedia interactive) and control pre-test

Results	Group	F	Sig.	t	df	Sig. (2-tailed)
Swimming breaststroke	Experimental Pre-test and Control Pre-test	0.282	0.596	0.111	88	0.912

Table 5. Difference test of experimental post-test (PBL-multimedia interactive) and control post-test

Result	Group	F	Sig.	t	df	Sig. (2-tailed)
Swimming breaststroke	Experimental Post-test and Control Post-test	0.266	0.607	3.408	88	0.001

Table 6. Descriptive analysis of pre-test and post-test data on breaststroke swimming ability results

Group	N	Minimum	Maximum	Means	std. Deviation
Pre-test Experiment	45	4	35	20.04	6.759
Post-test Experimental	45	15	35	26.51	4.888
Pre-test Control	45	6	29	19.89	6.516
Post-test Control	45	10	32	22.98	4.947

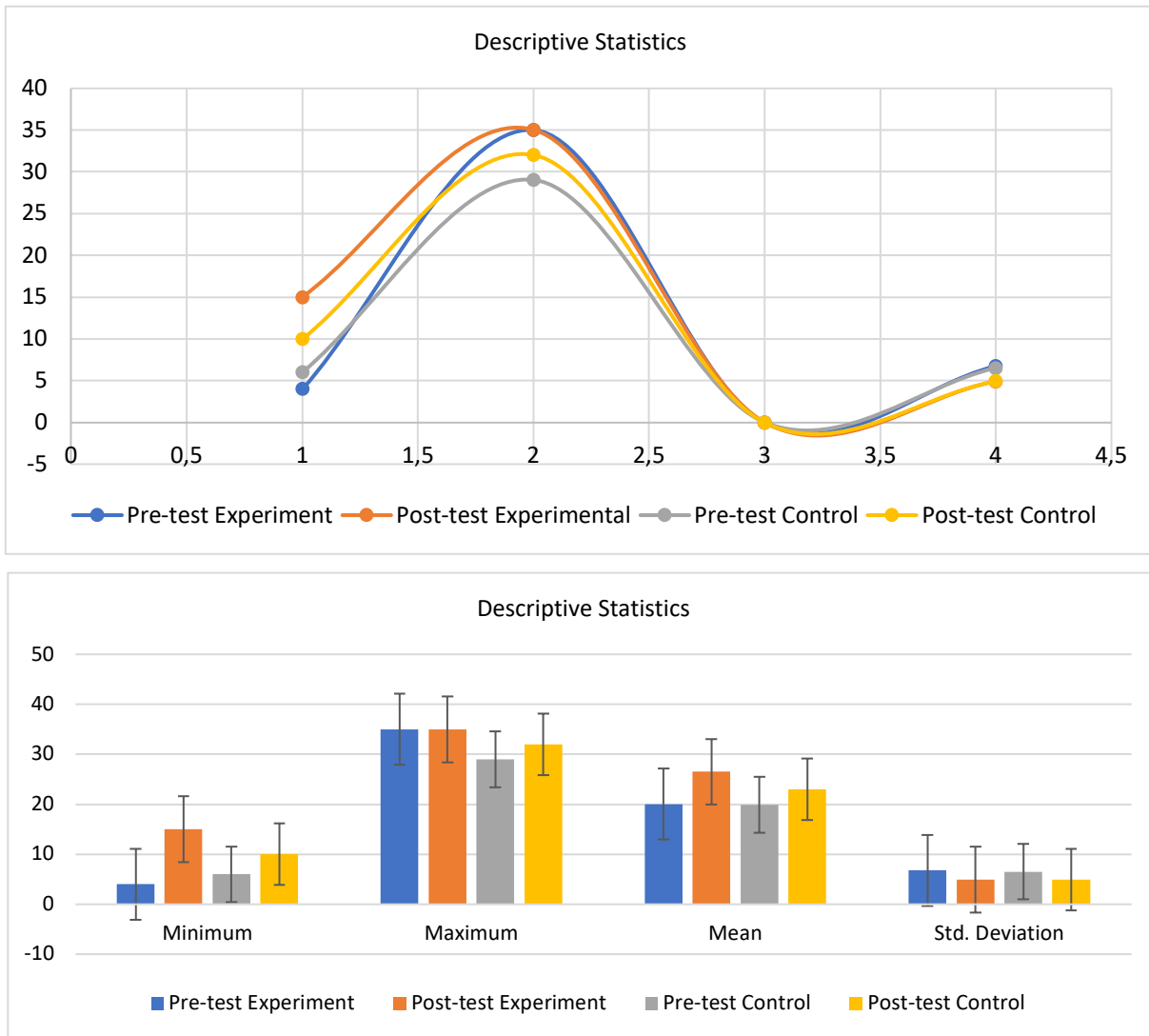


Figure 2. Descriptive data of pre-test and post-test of breaststroke swimming ability

Discussion

This study aims to provide evidence of the effect of integrating project-based learning models with interactive multimedia on improving students' breaststroke swimming skills. The results showed that the average value of the posttest experimental group (26.51) and the control group (22.98) was greater than the pretest value of the experimental group (20.04) and the control group (19.89). Furthermore, the result of the calculated t value is greater than t table, and the results also show significant. From these results it can be concluded that the PBL-Multimedia Interactive model and the conventional model show a significant increase in the learning outcomes of breaststroke swimming. Previous research by Sugiyanto provides evidence that the Integration of Mobile Learning and Project Based Learning has an increasing effect on the competency of vocational high schools [31]. Furthermore, it has been proven that media-based online project-based learning is appropriate for use

in automotive engineering drawing subjects [32].

Other studies have found that swimming skills can also be improved by doing swimming exercises for 33 weeks, and have a positive effect on health [33, 34]. In addition, providing special training to swimmers can improve performance during competitions [35]. Research by Gülbin that the performance of male swimmers is also influenced by using core training, where this exercise has a positive effect [36]. Several studies have shown that playing approaches, authoritarian teaching styles, and democratic influences affect students' swimming abilities [37, 38]. To improve safety skills in swimming, you can apply traditional swimming teaching, but do not reduce student drowning injuries [39]. Subsequent studies, to improve performance in swimming do more strength training [40].

The results of the study also show the difference in the influence of the PBL-Multimedia Interactive model and the conventional model, where the PBL-Multimedia Interactive model is more effective. These results are reinforced by Susena proving

that swimming based on interactive multimedia applications shows very good criteria [7]. A study has proven that multimedia-based swimming learning provides an increase in backstroke swimming [33], and multimedia learning proves its superiority compared to learning without multimedia. The results of this study are reinforced by Widiastuti that with the existence of a learning model with interactive multimedia that is being developed [3], it is hoped that it can be an alternative to conventional methods. Based on this review, it reaffirms the application of interactive multimedia-based learning, where this is done following increasingly advanced technological developments. In this way, the results of research on the integration of project-based learning models with interactive multimedia can also be considered as a learning model that utilizes technological advances in the field of sports.

Conclusions

The results of the research and discussion have a strong foundation related to the Interactive PBL-Multimedia model, on the basis of references from the research listed previously in the discussion of results and discussion. Where these findings have resulted in several conclusions. The results of the study prove that the PBL-Multimedia Interactive model and the conventional model have a significant effect on improving students' breaststroke

swimming skills. These findings also show a significant difference between the Interactive PBL-Multimedia model and the conventional model, namely the Interactive PBL-Multimedia model is more effective for improving breaststroke swimming skills. The results of this study have provided a new reference related to breaststroke swimming practice learning, and added evidence that the integration of project-based learning models with interactive multimedia is more advisable to improve swimming skills, especially breaststroke. The weakness of the research lies in the activities and warm-up carried out by students before the final test is carried out. In addition, the physical condition of students who are not fully monitored is also one of the research weaknesses. Recommendations for further research can apply the PBL-Multimedia Interactive model to other swimming skills, it is known that swimming is popular with 4 styles namely freestyle, butterfly, backstroke and breaststroke.

Acknowledgement

Sincere gratitude to all participants for their unwavering desire to join in and contribute to the research, revealing closeness while also granting us entire trust.

Conflict of interest

There is no conflict of interest.

References

- Suryadi D, Gustian U, Fauziah E. The Somatotype of Martial Athletes in the Fighter Category Against Achievement. *JUARA J Olahraga*. 2022;7(1):116–25. <https://doi.org/10.33222/juara.v7i1.1484>
- Jumaat NF, Tasir Z. Integrating Project Based Learning Environment into the Design and Development of Mobile Apps for Learning 2D-Animation. *Procedia - Soc Behav Sci*. 2013;103(26):526–33. <https://doi.org/10.1016/j.sbspro.2013.10.369>
- Widiastuti W, Sulaiman I, Susilo S, Hernawan H, Mashud M, Solahuddin S, et al. Interactive multimedia development for swimming learning and training. *IOP Conf Ser Mater Sci Eng*. 2021;1098:1–6. <https://doi.org/10.1088/1757-899x/1098/3/032038>
- Zeng Q. Research on Multimedia Swimming Teaching under Informatization. In: *Proceedings - 2020 International Conference on Computers, Information Processing and Advanced Education, CIPAE 2020*. 2020. P. 60–63. <https://doi.org/10.1109/CIPAE51077.2020.00023>
- Félix ER, da Silva HP, Olstad BH, Cabri J, Correia PL. Swimbit: A novel approach to stroke analysis during swim training based on attitude and heading reference system (ahrs). *Sports*. 2019;7(11):238. <https://doi.org/10.3390/sports7110238>
- de Zeeuw M, Smolianov P, Dion S, Schoen C. Comparing the practices of Dutch swimming against a global model for integrated development of mass and high performance sport. *Manag Sport Leis*. 2017;22(2):91–112. <https://doi.org/10.1080/23750472.2017.1394797>
- Susena SJ, Sugiharto S, Kusuma DWY. Development of Swimming Learning Media Based on Interactive Multimedia Applications Through Computers and Smartphones. *J Phys Educ Sport*. 2021;10(2):156–64. <https://doi.org/10.15294/JPES.V10I2.46269>
- Usra M. Swimming Learning Model Using Rope As Aid For Beginners. In: *Proceedings of the First Indonesian Communication Forum of Teacher Training and Education Faculty Leaders International Conference on Education 2017 (ICE 2017)*. 2018. P. 388–93. <https://doi.org/10.2991/ice-17.2018.83>
- Khodae M, Edelman GT, Spittler J, Wilber R, Krabak BJ, Solomon D, et al. Medical Care for Swimmers. *Sports Medicine - Open*. 2016;2(1): 27. <https://doi.org/10.1186/s40798-016-0051-2>
- Pharr J, Irwin C, Layne T, Irwin R. Predictors of swimming ability among children and adolescents in the United States. *Sports*. 2018;6(1):1–11. <https://doi.org/10.3390/sports6010017>
- Baek KW, Lee MC, Jeon TB, Yoo J II, Park JS, Moon HY, et al. Effects of exercise on physical fitness and strength according to the frailty level of female elderly with hypertension. *Exerc Sci*. 2020;29(4):368–76. <https://doi.org/10.15857/ksep.2020.29.4.368>
- González-Fernández FT, González-Villora S,

- Baena-Morales S, Pastor-Vicedo JC, Clemente FM, Badicu G, et al. Effect of Physical Exercise Program Based on Active Breaks on Physical Fitness and Vigilance Performance. *Biology*, 2021;10(11): 1151. <https://doi.org/10.3390/biology10111151>
13. Suryadi D, Samodra YTJ, Purnomo E. Efektivitas latihan weight training terhadap kebugaran jasmani [The effectiveness of weight training exercises on physical fitness]. *J RESPECS*. 2021;3(2):9–19. (In Indonesian). <https://doi.org/10.31949/respects.v3i2.1029>
 14. Rubiyatno, Perdana RP, Fallo IS, Arifin Z, Nusri A, Suryadi D, et al. Analysis of differences in physical fitness levels of extracurricular futsal students: Survey studies on urban and rural environments. *Pedagog Phys Cult Sport*. 2023;27(3):208–14. <https://doi.org/10.15561/26649837.2023.0304>
 15. Suryadi D, Suganda MA, Sacko M, Samodra YTJ, Rubiyatno R, Supriatna E, et al. Comparative Analysis of Soccer and Futsal Extracurriculars: A Survey Study of Physical Fitness Profiles. *Phys Educ Sport Stud Res*. 2023;2(1):59–71. <https://doi.org/10.56003/pessr.v2i1.182>
 16. Suryadi D. Analisis kebugaran jasmani siswa: Studi komparatif antara ekstrakurikuler bolabasket dan futsal [Analysis of students' physical fitness: Comparative study between basketball and futsal extracurriculars]. *Edu Sport Indones J Phys Educ*. 2022;3(2):100–10. (In Indonesian). [https://doi.org/10.25299/es:ijope.2022.vol3\(2\).9280](https://doi.org/10.25299/es:ijope.2022.vol3(2).9280)
 17. Suryadi D, Rubiyatno. Kebugaran jasmani pada siswa yang mengikuti ekstrakurikuler futsal [Physical fitness of students who take part in extracurricular futsal]. *J Ilmu Keolahragaan*. 2022;5(1):1–8. (In Indonesian). <https://doi.org/10.26418/jilo.v5i1.51718>
 18. Samodra YTJ, Suryadi D, Wati IDP, Supriatna E, Santika IGPNA, Suganda MA, et al. Analysis of gross motoric analysis of elementary school students: A comparative study of students in hill and coastal areas. *Pedagog Phys Cult Sport*. 2023;27(2):139–145. <https://doi.org/10.15561/26649837.2023.0206>
 19. Päivinen M, Keskinen K, Tikkanen H. Swimming-induced changes in pulmonary function: special observations for clinical testing. *BMC Sports Science, Medicine and Rehabilitation*, 2021;13(1): 55. <https://doi.org/10.1186/s13102-021-00277-1>
 20. Abdul Gani R, Setiawan E, Jumareng H, Unju Subandi O. Implementation Of Modification Game Methods To Improve Breaststroke Swimming Skills. *Hal Olahraga Nusant (Jurnal Ilmu Keolahragaan)*. 2021;4(2):255–70. <https://doi.org/10.31851/hon.v4i25404>
 21. Nicol E, Adani N, Lin B, Tor E. The temporal analysis of elite breaststroke swimming during competition. *Sports Biomechanics*, 2021; 1–13. <https://doi.org/10.1080/14763141.2021.1975810>
 22. Nicol E, Pearson S, Saxby D, Minahan C, Tor E. Stroke kinematics, temporal patterns, neuromuscular activity, pacing and kinetics in elite breaststroke swimming: A systematic review. *Sport Med - Open*. 2022;8(1):1–24. <https://doi.org/10.1186/s40798-022-00467-2>
 23. Strzała M, Kręzałek P, Kaca M, Głab G, Ostrowski A, Stanula A, et al. Swimming Speed of The Breaststroke Kick. *Journal of Human Kinetics*, 2012;35(1): 133–139. <https://doi.org/10.2478/v10078-012-0087-4>
 24. Suryadi D, Samodra YTJ, Gustian U, Yosika GF, B PS, Dewintha R, et al. Problem-based learning model: Can it improve learning outcomes for long serve in badminton. *Edu Sport Indones J Phys Educ*. 2023;4(1):29–36. [https://doi.org/10.25299/es:ijope.2023.vol4\(1\).10987](https://doi.org/10.25299/es:ijope.2023.vol4(1).10987)
 25. Suryadi D, Saputra E, Wahyudi I. Tinggi Badan dan Keseimbangan Dinamis dengan Kemampuan Lay Up Permainan Bola Basket: Apakah Saling Berhubungan? [Height and Dynamic Balance with Lay Up Ability in Basketball: Are They Related?]. *Indones J Phys Educ Sport Sci*. 2022;2(2):67–74. (In Indonesian). <https://doi.org/10.52188/ijpess.v2i2.276>
 26. Rubiyatno R, Suryadi D. Penerapan Media Audio Visual Dalam Meningkatkan Hasil Belajar Servis Bulutangkis di MTs Mujahidin Pontianak [Application of Audio Visual Media in Improving Badminton Service Learning Outcomes at MTs Mujahidin Pontianak]. *Musamus J Phys Educ Sport*. 2022;4(2):140–9. (In Indonesian). <https://doi.org/10.35724/mjpes.v4i02.4303>
 27. Hardinata R, Yosika GF, Haïdara Y, Perdana RP, Gustian U, Suryadi D, et al. Project Based Learning Model: Can It Improve Dribbling Skills In Soccer Games? *Indones J Phys Educ Sport Sci*. 2023;3(1):69–80. <https://doi.org/10.52188/ijpess.v3i1.387>
 28. Perdana RP, Supriatna E, Yanti N, Suryadi D. Team Game Tournament (TGT)-type cooperative learning model: How does it affect the learning outcomes of football shooting? *Edu Sport Indones J Phys Educ*. 2023;4(1):86–96. [https://doi.org/10.25299/es:ijope.2023.vol4\(1\).12130](https://doi.org/10.25299/es:ijope.2023.vol4(1).12130)
 29. Haïdara Y, Okilanda A, Dewintha R, Suryadi D. Analysis of students' basic basketball skills: A comparative study of male and female students. *Tanjungpura J Coach Res*. 2023;1(1):1–5. <https://doi.org/10.26418/tajor.v1i1.63796>
 30. Mashud M, Tangkudung J, Widiastuti W. Swimming Lesson Based on Interactive Multimedia. *Int J Sport Sci*. 2018;8(3):91–6. <https://doi.org/10.5923/j.sports.20180803.04>
 31. Sugiyanto, Setiawan A, Hamidah I, Ana A. Integration of mobile learning and project-based learning in improving vocational school competence. *J Tech Educ Train*. 2020;2. <https://doi.org/10.30880/jtet.2020.12.02.006>
 32. Haryanto, Kusuma WM, Mutohharri F, Nurtanto M, Suyitno S. Innovation Media Learning: Online Project-Based Learning (O-PBL) on Drawing Competence in Automotive Engineering Using Video on YouTube. *Journal of Physics: Conference Series*, 2021;2111(1): 012020. <https://doi.org/10.1088/1742-6596/2111/1/012020>
 33. Saeed OA. The impact and clarity of presentation using multimedia learning system in the learning of swimming of back among students Specialized

- schools. *Sci J Phys Educ.* 2016;9(3):1–16. <https://www.iasj.net/iasj/article/125482>
34. Naczk A, Gajewska E, Naczk M. Effectiveness of swimming program in adolescents with down syndrome. *Int J Environ Res Public Health.* 2021;18(14):7441. <https://doi.org/10.3390/ijerph18147441>
35. Pupiřová Z, Pupiř M, Sykora J, Brunn D, Giniřová J, Pavlović R. The impact of a specific training programme on the selected parameters of swimming turns. *Turkish J Kinesiol.* 2019;5(1):36–42. <https://doi.org/10.31459/turkjin.511533>
36. Gülbin C, Mardin E, Üniversitesi A, Gül M, Gül GK, Gülbin Eskiyecek C, et al. The Effect of 8-Week Core Exercises Applied to 10-12 Age Male Swimmers on Swimming Performance. *International J Appl Exerc Physiol.* 2020;9(3):213–20.
37. Nosko M, Arkhypov O, Khudolii O, Filatova Z, Yevtushok M. Pedagogical Conditions for Swimming Skills Development in Students of Pedagogical Educational Institutions. *Rev Rom pentru Educ Multidimens.* 2019;11(2):240. <https://doi.org/10.18662/rrem/127>
38. Lenneis V, Agergaard S, Evans AB. Women-only swimming as a space of belonging. *Qual Res Sport Exerc Heal.* 2022;14(1):37–52. <https://doi.org/10.1080/2159676X.2020.1844790>
39. Zhang S, Dai J, Nie Z. Can Swimming Teaching Prevent Drowning? An Experimental Study of Children in China. *Discret Dyn Nat Soc.* 2022;2022:1–8. <https://doi.org/10.1155/2022/6141342>
40. Fone L, Van Den Tillaar R. Effect of Different Types of Strength Training on Swimming Performance in Competitive Swimmers: A Systematic Review. *Sports Medicine - Open.* 2022;8(1):19. <https://doi.org/10.1186/s40798-022-00410-5>

Information about the authors:

Mashud; (Corresponding author); <https://orcid.org/0000-0003-3107-7134>; mashud@ulm.ac.id; Departement Physical Education, Sport and Health, Universitas Lambung Mangkurat; Banjarmasin, Indonesia.

Syamsul Arifin; <https://orcid.org/0009-0006-2330-2564>; syamsul_arifin@ulm.ac.id; Departement Physical Education, Sport and Health, Universitas Lambung Mangkurat; Banjarmasin, Indonesia.

Advendi Kristiyandaru; <https://orcid.org/0000-0003-0085-6063>; advendikristiyandaru@unesa.ac.id; Departement Physical Education, Sport and Health, Universitas Negeri Surabaya; Surabaya, Indonesia.

Y Touvan Juni Samodra; <https://orcid.org/0000-0003-4850-1990>; tovan@fkip.untan.ac.id; Department of Sport Coaching Education, Faculty of Teacher Training and Education, Universitas Tanjungpura; Pontianak, Indonesia.

I Gusti Putu Ngurah Adi Santika; <https://orcid.org/0000-0001-7873-0060>; ngurahadisantika@gmail.com; Department of Physical Education Health and Recreation, Faculty of Teacher Training and Education, Universitas PGRI Mahadewa; Bali, Indonesia.

Didi Suryadi; <https://orcid.org/0000-0002-0206-9197>; didisurya1902@gmail.com; Department of Sport Coaching Education, Faculty of Teacher Training and Education, Universitas Tanjungpura (Pontianak, Indonesia). Department of Sport Science, Faculty of Sport Science and Health, Universitas Negeri Yogyakarta (Yogyakarta, Indonesia).

Cite this article as:

Mashud, Arifin S, Kristiyandaru A, Samodra YTJ, Ngurah Adi Santika IGP, Suryadi D. Integration of project based learning models with interactive multimedia: Innovative efforts to improve student breaststroke swimming skills. *Physical Education of Students*, 2023;27(3):118–125. <https://doi.org/10.15561/20755279.2023.0304>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited <http://creativecommons.org/licenses/by/4.0/deed.en>

Received: 30.04.2023

Accepted: 31.05.2023; **Published:** 30.06.2023