JPPIPA 9(11) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Path Analysis in the Application of Occupational Health and Safety in the Ship Machinery Laboratory

Ningrum Astriawati[1]*, Waris Wibowo[1], Prasetya Sigit Santosa[1], Benny Hartanto[2], Yudhi Setiyantara[2]

[1] Ship Machinery Study Program, Yogyakarta Maritime College, Yogyakarta, Indonesia
[2] Nautical Studies Study Program, Yogyakarta Maritime College, Yogyakarta, Indonesia

Received: July 13, 2023
Revised: August 23, 2023
Accepted: November 25, 2023
Published: November 30, 2023

Corresponding Author:
Ningrum Astriawati
astriamath@gmail.com

DOI: 10.29303/jppipa.v9i11.4666

Abstract: This study aims to analyze the influence of learning attitudes, learning knowledge and learning motivation on the Application of Occupational Health and Safety using path analysis. The method used in this study is the quantitative method with a correlational research type. The population in this study is cadets of the Ship Machinery Study Program, at Yogyakarta Maritime High School. Sample The selection of research samples is carried out using the saturated sampling method or census method, which is all members of the sample population. The data analysis method uses path analysis with the Smartpls3 SEM model. Based on the results of the study, there was a significant positive direct influence of learning attitudes on the learning motivation of cadets. Learning attitudes have a positive and significant effect on the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory. Furthermore, there is a significant positive direct influence of learning knowledge on the learning motivation of cadets. Learning knowledge has a positive and significant effect on the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory. Learning motivation has a positive and significant effect on the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory.

Keywords: Attitudes; Knowledge; Motivation; Occupational Health and Safety; Path Analysis

Introduction

The implementation of Occupational Health and Safety in the workplace aims to ensure that workers and others in the workplace are always safe and healthy and ensure that all production sources can be used safely and efficiently (Adamopoulos & Syrou, 2022). Potential sources of hazards and risks of work accidents that can occur in the workplace include exposure to chemical radiation, infection, electric shock and falling or bumping. Other potential sources of hazards include all situations and conditions caused by errors and omissions due to human factors or human error and factors outside humans, such as materials, equipment, and the environment to Occupational Health and Safety. The results showed that 85% of work accidents were sourced from human factors (Stranks, 2007).

The application of Occupational Health and Safety must be trained in the educational process to run effectively to be able to obtain knowledge (Weinstock & Slatin, 2012). Knowledge is everything that is seen, known, or understood towards a certain object that is captured through the five senses, namely, the senses have a basis for learning knowledge (Zagzebski, 2017; Simanullang et al., 2023). Knowledge is obtained through cognitive processes, where a person must understand or first recognize science to know the knowledge (Blooma et al., 2013). Increased knowledge and understanding in mastering the material is the result of the learning process (Astriawati, 2020). In addition to increasing knowledge, the learning process will also make a person's thinking power even better (Wibowo & Astriawati, 2020; Putri et al., 2023). So that the person can think critically about a problem especially related to the

How to Cite:
Astriawati, N., Wibowo, W., Santosa, P. S., Hartanto, B., & Setiyantara, Y. (2023). Path Analysis in the Application of Occupational Health and Safety in the Ship Machinery Laboratory . *Jurnal Penelitian Pendidikan IPA*, *9*(11), 9713–9719. https://doi.org/10.29303/jppipa.v9i11.4666

Application of Occupational Health and Safety (Cameron & Hare, 2008).

According to Astriawati et al., (2020) the Ship Machinery Study Program, at Yogyakarta Maritime College as one of the study programs that prepares workers in the shipping sector, is required to be able to produce graduates expected by the world of work and industry, namely having technical abilities and good work attitudes, including in implementing Occupational Health and Safety. To be able to form a good work attitude, it is necessary to have a strategy to improve the quality of the application of Occupational Health and Safety through the learning process of Occupational Health and Safety in the school environment, especially when practising in the ship machinery laboratory(Ahad et al., 2021). Work attitude management was first planted from the learning attitude of a cadet, especially in the maritime field(Hartanto et al., 2023).

According to Wahyuddin et al., (2022) and Fetiana et al., (2022), attitude is a tendency to approach or avoid, positive or negative towards various social circumstances, whether it is institutions, individuals, situations, ideas, concepts and so on. Psychologists have defined attitudes with many variations (Wilson et al., 2000). But basically, these opinions complement each other. According to Larashati & Khasanah, (2022) says that attitude is an internal state that influences individual action choices towards objects, individuals, and events. Meanwhile, according to Osborne et al., (2003)), that attitude is a general evaluation made by humans towards themselves, others, objects or issues. The tendency to react or one's attitude towards something, a person or thing can be classified into accepting (liking), rejecting (disliking), and indifferent (not caring) attitudes. Batra & Ray (1986) classify the form of learning attitudes into several classifications, including the following: feelings of pleasure or displeasure, feelings of agreement or disapproval, and feelings of like or dislike. According to Fatimah et al., (2023), attitudes consist of various levels, namely: receiving, responding, valuing, and responsible.

In a good learning process, there needs to be motivation so that the results are maximized (Akbariah et al., 2023). Motivation is the drive and strength in a person to achieve certain goals that he wants to achieve (Astriawati & Wibowo, 2019; Rizki et al., 2023). The intended goal is something that is outside of humans so that human activities are more directed because someone will try to be more enthusiastic and active in doing something (Susilawati et al., 2023). The function of motivation in learning includes motivation as encouraging the emergence of an action/activity, directing someone to do, and motivation will help someone achieve their goals (Pertiwi et al., 2021). In the process of learning-teaching interaction, motivation is needed to encourage students to learn diligently (Rizaldi et al., 2022). This research is important because in general later graduates of the Ship Machinery Study Program (Level III technical experts) will work as executors or supervisors of beginner forces, where the work is directly related to equipment, tools, machinery, materials that contain elements of danger. The purpose of this study is aims to analyze the influence of learning attitudes, learning knowledge and learning motivation on the Application of Occupational Safety and Health using pathway analysis.

Method

The method used in this study is a quantitative method with a correlational research type. Correlation research is a study that involves data collection actions to determine whether there is a relationship and the level of relationship between two or more variables (Fraenkel et al., 2012). The population in this study is cadets who used the ship machinery laboratory in 2023 in the ship machinery study program at Yogyakarta Maritime College with a total of 30 people. Sample The selection of research samples is carried out using the saturated sampling method or census method, which is all members of the sample population (Martínez-Mesa et al., 2016). Data Analysis Techniques in PLS with Smart PLS software version 4.0 with the following stages (Wong, 2013): Outer Model testing, Measurement of the Inner Model; and Hypothesis Test Results.

Outer Model testing specifies the relationship between latent variables and indicator indicators, or it can be said that the outer model defines how each indicator relates to its latent variables. The tests carried out on the outer model, are as follows: Convergent Validity, Discriminant Validity, Average Variance Extracted (AVE); and Composite Reliability (Niehaves & Ortbach, 2016). The convergent validity value is the value of the loading factor on the latent variable with its indicator indicator. The expected value is> 0.7. The value of discriminant validity is a cross-loading factor value that is useful for determining whether the construct has adequate discrimination, namely by comparing the loading value on the intended construct must be greater than the loading value with other constructs. The expected AVE value is> 0.5. Data that has a composite reliability of > 0.7 has high reliability. Cronbach Alpha. Reliability test reinforced with Cronbach Alpha. The expected value is > 0.7 for all constructs.

Measurement of the Inner Model consists of the Inner Model and t values. Testing of the structural model (Inner Model) is carried out by looking at the R-Square value which is a goodness-fit test of the model. The second test is to look at significance by looking at the value of parameter coefficients and statistical significance t values in the Algorithm Boostrapping report - Path Coefficients. The t-statistic value is greater than the t-table and significance (t-table significance 5% = 1.96) (Pering, 2020). While Hypothesis Test Results consist of data in .csv format (comma, separated, value); design of the model and input data; analysis with PLS algorithm and results. The framework of empirical causal relationships between paths can be created through path diagrams as follows in Figure 1.

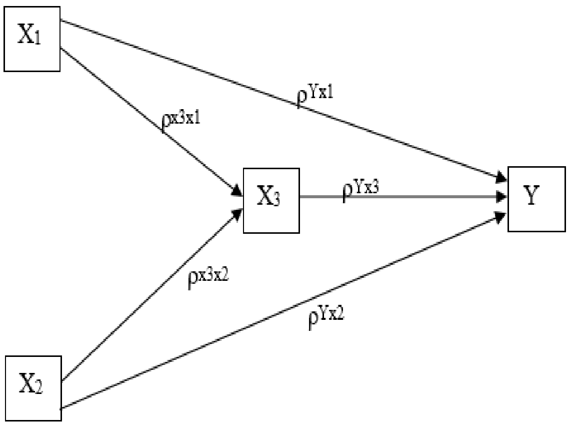

Figure 1. Research Path

Description:

X_1 : learning attitudes
X_2 : learning knowledge
X_3 : learning motivation
Y : Application of Occupational Health and Safety (OHS)
$\rho x3x1$: X_1 (learning attitudes) -> X_3 (learning motivation)
$\rho Yx1$: X_1 (learning attitudes) -> Y (Application of OHS)
$\rho x3x2$: X_2 (learning knowledge) -> X_3 (learning motivation)
$\rho Yx2$: X_2 (learning knowledge) -> Y (Application of OHS)
$\rho Yx3$: X_3 (learning motivation) -> Y (Application of OHS)

Result and Discussion

The results of the model design and input data as well as the results of the PLS Algorithm in Figure 2 of the model on Figure 2. Based on Figure 2, validity testing uses convergent validity and discriminant validity. Based on the rule of thumb, to assess convergent validity seen from the value of loading fact greater than 0.7. Figure 2 shows that all indicators of each variable have a loading factor value greater than 0.7, hence the indicators in the model are declared valid. In addition to the loading factor value, the AVE value in each construct must also be considered to meet the convergent validity requirements. Figure 2 shows that the AVE value of each variable has a value greater than 0.5, learning attitude gets a score of 0.80, learning knowledge gets a score of 0.79, learning motivation gets a score of 0.75 and application of OHS gets a score of 0.72 and then the convergent validity requirement has been met.

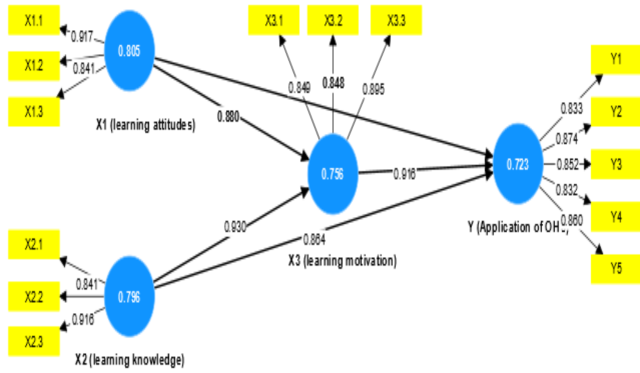

Figure 2. Model design and input data and PLS Algorithm results

Table 1. Correlation Value Between Constructs

Variable	X1	X2	X3	Y
X1	0.897			
X2	0.845	0.892		
X3	0.878	0.860	0.870	
Y	0.887	0.742	0.860	0.851

Discriminant validity testing is carried out by comparing the square root of each construct in the model with correlations between other constructs. Table 1 shows that the AVE square root value of a construct is greater than the correlation between constructs, so the forner larcker criterion discriminant validity test has been satisfied. In Table 1 the discriminant value of validity, is seen from the AVE (averaged variance extracted) value and AVE root value >0.5. The AVE root value of each variable is greater than the AVE root, and its correlation with other variables so that the validity discriminant is met. The Model Collinearity Test is used in evaluating by looking at the Variance Inflation Factor (VIF) value. If the VIF value > 5 there is a collinearity problem but if the VIF value is < 5 there is no collinearity problem. In Table 2 the following is a test of model collinearity.

From Table 2 it can be seen that the VIF values of all variable indicators <5, so there is no collinearity of each variable indicator measured. Reliability tests can be seen from the value of Cronbach's alpha>0.7, composite reliability (rho-a) >0.7 and composite reliability (rho-c) >0.6. Table 3 shows the test results of the following reliability tests.

Table 2. Model Collinearity Test

Correlation	VIF
X1 -> X3	3.506
X1 -> Y	3.736
X2 -> X3	3.506
X2 -> Y	3.836
X3 -> Y	3.636

Table 3. Reliability test

Variable	Cronbach's alpha	Composite Reliability (rho_a)	Composite reliability (rho_c)	The average variance extracted (AVE)
X1	0.878	0.88	0.93	0.80
X2	0.87	0.90	0.92	0.79
X3	0.84	0.85	0.90	0.75
Y	0.90	0.91	0.93	0.72

Table 3 shows each variable value of Cronbach's alpha>0.7, composite reliability (rho-a) >0.7 and composite reliability (rho-c) >0.6 so that it can be concluded that the reliability requirements have been met by all variables. R-Square is the root proportion of variation in the value of an affected variable (endogenous) that can be explained by the variable that directs it (exogenous). The criterion is if the value of R2=0.75 has a substantial influence (large strong) if the value of R2=0.50 has a moderate influence (moderate) and if the value of R2=0.25- then the influence is weak (small). SmartPLS indicates the R-Square of the colour of the graph if green indicates a good effect, or red indicates a bad effect, as seen in Figure 3.

Figure 3. Graph of R^2 value Figure 3 shows that the R-square value of line 1 is 0.960, meaning that based on the criteria, the ability of X1 and X2 to explain X3 by 96% so that the model is a strong model that has a substantial influence (large strong) so that cadet learning motivation (X3) can be explained by: learning attitudes and learning knowledge 96%, the remaining 4% is explained by variables outside the model. The R-square value of line II is 0.788, meaning that based on the criteria, the ability of X1 and X2 through X3 to explain Y is 78.8% so the model is a strong model that has a substantial influence (large strong) so that the Application of OHS can be explained by: learning attitudes and learning knowledge through learning motivation of 78.8%, the remaining 21.2% is explained by variables outside the model. F^2 effect size (F-Square): is a measure used to assess the relative impact of an influencing variable (required) on the affected variable (endogenous). The criteria according to Cohen (1988) If the value of F^2 = 0.02 is classified as small, if the value of F2 = 0.15 is classified as medium and if F^2 = 0.35 is classified as large. As seen in Table 4.

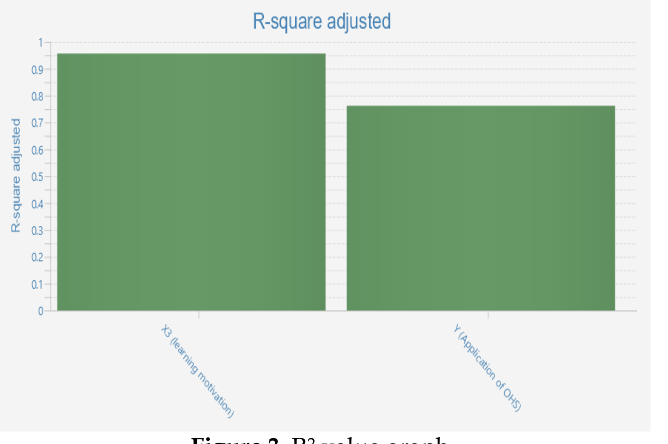

Figure 3. R^2 value graph

Table 4. F^2 value

Correlation	f-square
X1 -> X3	5.50
X1 -> Y	0.15
X2 -> X3	0.09
X2 -> Y	0.002
X3 -> Y	0.001

From Table 4, the results of the influence of X1 (learning attitudes) to X3 (learning motivation) obtained 5.50 are classified as large, X1 (learning attitudes) to Y (Application of OHS) obtained 0.149 classified as medium, X2 (learning knowledge) to X3 (learning motivation) of 0.09 is classified as medium while X2 (learning knowledge) to Y (Application of OHS) of 0.002 is relatively small and X3 (learning motivation) -> Y (Application of OHS) is classified as small. The path coefficient value indicates the direction of influence of the exogenous variable on its endogenous variable. The significance level used is 5% with a T-table value of 2,042. A T-statistic value of > 2.042 indicates an accepted hypothesis, whereas a T-statistic value < 2.042 indicates the hypothesis is rejected, as seen in the following Table 5.

Table 5. Bootstrapping Value

Correlation	Path Coefficient	T-Statistics	Probability Value
X1 -> X3	0.88	12.81	0.000
X1 -> Y	0.84	2.69	0.001
X2 -> X3	0.12	2.43	0.000
X2 -> Y	0.03	2.23	0.000
X3 -> Y	0.07	3.15	0.001

Based on Table 5, the results of the study show that X1 (learning attitudes) has a positive influence with a

Path Coefficient value of 0.88 and significant with a T-statistic value of 12.81 against X3 (learning motivation). X1 (learning attitudes) has a positive influence with a Path Coefficient value of 0.84 and is significant with a T-statistic value of 2.69 against Y (Application of OHS). X2 (learning knowledge) has a positive influence with a Path Coefficient value of 0.12 and is significant with a T-statistic value of 2.4 against X3 (learning motivation). X2 (learning knowledge) has a positive influence with a Path Coefficient value of 0.03 and significant with a T-statistic value of 2.23 against Y (Application of OHS). X3 (learning motivation) has a positive influence with a Path Coefficient value of 0.07 and is significant with a T-statistic value of 3.15 against X3 Y (Application of OHS).

Based on the results of the study, there was a significant positive direct influence of learning attitudes on the learning motivation of cadets of the Ship Machinery Study Program, at Yogyakarta Maritime College. Learning attitudes have a positive and significant effect on the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory, meaning that if there is a change in learning attitudes it will have a direct effect on changes in the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory. In other words, if Learning attitudes increase, it increases the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory and statistically has a significant effect.

Furthermore, there is a significant positive direct influence of learning knowledge on the learning motivation of cadets of the Ship Machinery Study Program, at Yogyakarta Maritime College. Learning knowledge has a positive and significant effect on the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory, meaning that if there is a change in learning knowledge it will have a direct effect on changes in the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory. In other words, if learning knowledge increases, it increases the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory and statistically has a significant effect.

Learning motivation has a positive and significant effect on the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory, meaning that changes in learning motivation have a unidirectional influence on changes in the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory. If learning motivation increases, there will be an increase in the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory and statistically have a significant effect. According to Ndoa & Jumadi (2022) and Dini et al., (2023) that Learning motivation is one of the essential aspects that are must-have by cadets to achieve optimal competence. These competencies as standards for creating individuals who are capable of competing in the workplace (Bahtiar et al., 2023).

Conclusion

Based on the results of the study, there was a significant positive direct influence of learning attitudes on the learning motivation of cadets of the Ship Machinery Study Program, at Yogyakarta Maritime College. Learning attitudes have a positive and significant effect on the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory. Furthermore, there is a significant positive direct influence of learning knowledge on the learning motivation of cadets of the Ship Machinery Study Program, at Yogyakarta Maritime College. Learning knowledge has a positive and significant effect on the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory. Learning motivation has a positive and significant effect on the Application of Occupational Health and Safety (OHS) in the Ship Machinery Laboratory.

Acknowledgements
The author would like to thank the Yogyakarta Maritime College for providing the opportunity to conduct this research.

Author Contributions
Conceptualization: Ningrum Astriawati, data curation: Waris Wibowo, funding acquisition: Prasetya Sigit Santosa, Yudhi Setiyantara, methodology: Ningrum Astriawati, Benny Hartanto; visualization: Ningrum Astriawati, writing–original draft: Benny Hartanto, writing–review & editing: Waris Wibowo, Yudhi Setiyantara

Funding
This research was independently funded by researchers.

Conflicts of Interest
No Conflicts of interest.

References

Adamopoulos, I. P., & Syrou, N. F. (2022). Workplace safety and occupational health job risk hazards in the public health sector in Greece. *European Journal of Environment and Public Health*, *6*(2), em0118. https://doi.org/10.21601/ejeph/12229

Ahad, R., Mustafa, M. Z., Mohamad, S., Abdullah, N. H. S., & Nordin, M. N. (2021). Work attitude, organizational commitment and emotional intelligence of Malaysian vocational college teachers. *Journal of Technical Education and Training*, *13*(1), 15–21. Retrieved from https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/7898

Akbariah, N., Artika, W., Pada, A. U. T., Safrida, S., & Abdullah, A. (2023). A Stem-Based Learning Process Analysis Of Students' Process Skills. *Jurnal Penelitian Pendidikan IPA*, *9*(2), 943–951. https://doi.org/10.29303/jppipa.v9i2.2912

Astriawati, N. (2020). Development of interactive media based on video scribe with a realistic mathematics education approach to navigation. *Math Didactic: Jurnal Pendidikan Matematika*, *6*(3), 321–333. https://doi.org/10.33654/math.v6i3.1063

Astriawati, N., & Wibowo, W. (2019). Peningkatan Motivasi Dan Hasil Belajar Taruna Melalui Media Berbasis "Whiteboard Animation" Bidang Navigasi Pelayaran. *Prosiding Konferensi Nasional Penelitian Dan Pembelajarannya IV*, p-28. Retrieved from https://publikasiilmiah.ums.ac.id/handle/11617/11047

Astriawati, N., Wibowo, W., & Widyanto, H. (2020). Designing Android-Based Augmented Reality Application on Three Dimension Space Geometry. *Journal of Physics: Conference Series*. https://doi.org/10.1088/1742-6596/1477/2/022006

Bahtiar, B., Yusuf, Y., Doyan, A., & Ibrahim, I. (2023). The Trend of Technology Pedagogical Content Knowledge (TPACK) Research in 2012-2022: Contribution to Science Learning of 21st Century. *Jurnal Penelitian Pendidikan IPA*, *9*(5), 39–47. https://doi.org/10.29303/jppipa.v9i5.3685

Batra, R., & Ray, M. L. (1986). Affective responses mediating acceptance of advertising. *Journal of Consumer Research*, *13*(2), 234–249. https://psycnet.apa.org/doi/10.1086/209063

Blooma, M. J., Kurian, J. C., Chua, A. Y. K., Goh, D. H. L., & Lien, N. H. (2013). Social Question Answering: Analyzing Knowledge, Cognitive Processes And Social Dimensions Of Micro-Collaborations. *Computers & Education*, *69*, 109–120. http://dx.doi.org/10.1016/j.compedu.2013.07.006

Cameron, I., & Hare, B. (2008). Planning tools for integrating health and safety in construction. *Construction Management and Economics*, *26*(9), 899–909. https://doi.org/10.1080/01446190802175660

Cohen, J. (1988). Set correlation and contingency tables. *Applied Psychological Measurement*, *12*(4), 425–434. https://doi.org/10.1177/014662168801200410

Dini, A., Rahmatan, H., & Nurmaliah, C. (2023). Application of the E-module combined with the Guided Inquiry Learning Model to Increase Student Motivation and Learning Outcomes on the Structure and Function of Plant Tissues. *Jurnal Penelitian Pendidikan IPA*, *9*(6), 4768–4776. https://doi.org/10.29303/jppipa.v9i6.3857

Fatimah, F. S., Asy'ari, H., Sandria, A., & Nasucha, J. A. (2023). Learning Fiqh Based on the TAPPS (Think Aloud Pair Problem Solving) Method in Improving Student Learning Outcomes. *At-Tadzkir: Islamic Education Journal*, *2*(1), 1–15. https://doi.org/10.59373/attadzkir.v2i1.13

Fetiana, N., Permanasari, A., & Permana, I. (2022). Environmental Literacy of Junior High School Students in Bogor: Contribution of Knowledge to Environmental Attitudes and Behaviors. *Jurnal Penelitian Pendidikan IPA*, *8*(5), 2423–2429. https://doi.org/10.29303/jppipa.v8i5.1794

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How To Design And Evaluate Education Research* (Vol. 7). New York: Mcgraw-Hill. Retrieved from https://saochhengpheng.files.wordpress.com/2017/03/jack_fraenkel_norman_wallen_helen_hyun-how_to_design_and_evaluate_research_in_education_8th_edition_-mcgraw-hill_humanities_social_sciences_languages2011.pdf

Hartanto, B., Astriawati, N., Wibowo, W., Santosa, P. S., & Widyanto, H. (2023). Development of maritime school management as a centre of excellence in supporting the learning process. *Journal of Community Service and Empowerment*, *4*(1), 104–110. https://doi.org/10.22219/jcse.v4i1.23366

Larashati, L., & Khasanah, A. N. (2022). Analysis of Attitudes towards the Environment in Students of Adiwiyata and Non-Adiwiyata Schools. *Jurnal Penelitian Pendidikan IPA*, *8*(5), 2247–2252. https://doi.org/10.29303/jppipa.v8i5.1534

Martínez-Mesa, J., González-Chica, D. A., Duquia, R. P., Bonamigo, R. R., & Bastos, J. L. (2016). Sampling: How To Select Participants In My Research Study? *Anais Brasileiros De Dermatologia*, 91, 326–330. https://doi.org/10.1590%2Fabd1806-4841.20165254

Ndoa, Y. A. A., & Jumadi, J. (2022). Increasing Learning Motivation Through the Application of Physics E-Module Based on Flipped Learning. *Jurnal Penelitian Pendidikan IPA*, *8*(3), 1223–1230. https://doi.org/10.29303/jppipa.v8i3.1556

Niehaves, B., & Ortbach, K. (2016). The Inner And The Outer Model In Explanatory Design Theory: The Case Of Designing Electronic Feedback Systems. *European Journal Of Information Systems*, *25*, 303–316. https://doi.org/10.1057/ejis.2016.3

Osborne, J., Simon, S., & Collins, S. (2003). Attitudes towards science: A review of the literature and its implications. *International Journal of Science Education*, *25*(9), 1049–1079. https://doi.org/10.1080/0950069032000032199

Pering, I. M. A. A. (2020). Kajian Analisis Jalur Dengan Structural Equation Modeling (Sem) Smart-Pls 3.0. *Jurnal Ilmiah Satyagraha*, *3*(2), 28–48. https://doi.org/10.47532/jis.v3i2.177

Pertiwi, Y., Astriawati, N., Wibowo, W., & Kristianto, L. (2021). Moodle Virtual Class Effectivity toward Cadets' Learning Motivation and Speaking Ability. *Ethical Lingua: Journal of Language Teaching and Literature*, *8*(2), 378–383. https://doi.org/10.30605/25409190.317

Putri, M. E., Ahda, Y., Anhar, A., & Putri, D. H. (2023). The Effect of Problem-Based Learning Models and Prior Knowledge toward Critical Thinking Skills on Human Digestive and Circulatory System. *Jurnal Penelitian Pendidikan IPA*, *9*(5), 3905–3914. https://doi.org/10.29303/jppipa.v9i5.3697

Rizaldi, D. R., Zaenudin, M., Fatimah, Z., Ahmad, A. L. H., Setiawan, H., Doyan, A., & Makhrus, M. (2022). Efforts to Revitalize Student Learning Motivation After the COVID-19 Pandemic. *Southeast Asian Journal of Islamic Educati on Management*, *3*(1), 89–102. https://doi.org/10.21154/sajiem.v3i1.87

Rizki, M. W., Evendi, E., Syukri, M., Saminan, S., & Mursal, M. (2023). The Impact of Changes in the Learning System on Students' Learning Motivation. *Jurnal Penelitian Pendidikan IPA*, *9*(3), 1059–1063. https://doi.org/10.29303/jppipa.v9i3.2941

Simanullang, P., Sitopu, S. D., Girsang, E. M. F., & Gultom, F. (2023). Implementation of Community Education and Knowledge Development in the Utilization of Digital Literacy. *Jurnal Penelitian Pendidikan IPA*, *9*(2), 991–997. https://doi.org/10.29303/jppipa.v9i2.3800

Stranks, J. W. (2007). *Human factors and behavioural safety*. London: Routledge. https://doi.org/10.4324/9780080489001

Susilawati, S., Doyan, A., Rokhmat, J., Gunawan, G., Gunada, I. W., & Hikmawati, H. (2023). Validation of PhET-Based Core Physics Teaching Materials to Improve Activities and Learning Outcomes of Physics Education Students. *Jurnal Penelitian Pendidikan IPA*, *9*(5), 2715–2719. https://doi.org/10.29303/jppipa.v9i5.3929

Wahyuddin, W., Nurdin, N., & Pettalongi, A. (2022). Strategy for Developing Honesty and Caring Attitude in Students. *Proceeding of International Conference on Islamic and Interdisciplinary Studies*, *1*, 455–460. Retrieved from https://jurnal.uindatokarama.ac.id/index.php/iciis/article/view/1303

Weinstock, D., & Slatin, C. (2012). Learning to take action: The goals of health and safety training. In *New Solutions: A Journal of Environmental and Occupational Health Policy*, 22 (3), 255–267. https://doi.org/10.2190/ns.22.3.b

Wibowo, W., & Astriawati, N. (2020). The Effectiveness Of Using Edmodo-Based E-Learning In The Applied Mechanics Course. *Journal Of Physics: Conference Series*. https://doi.org/10.1088/1742-6596/1511/1/012121

Wilson, T. D., Lindsey, S., & Schooler, T. Y. (2000). A model of dual attitudes. *Psychological Review*, *107*(1), 101. https://doi.org/10.1037/0033-295X.107.1.101

Wong, K. K.-K. (2013). Partial Least Squares Structural Equation Modelling (PLS-SEM) Techniques Using Smartpls. *Marketing Bulletin*, *24*(1), 1–32. Retrieved from https://www.researchgate.net/publication/268449353_Partial_least_square_structural_equation_modeling_PLS-SEM_techniques_using_SmartPLS

Zagzebski, L. (2017). What is knowledge?. *The Blackwell Guide to Epistemology*, 92–116. https://doi.org/10.1002/9781405164863