

## ANALYSIS OF PROJECT-BASED BLENDED LEARNING IN STATISTICS LEARNING IN HIGHER EDUCATION

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**Abstract.** The purpose of this study is to analyze the results of the application of Blended Learning which refers to the Project-Based Learning (PjBL) model. Blended Learning and PjBL can be packaged as a learning model, namely Project-Based Blended Learning (PjB2L). The design of learning activities with the help of Bina Sarana Informatika University elearning online media (MyBest) is used to measure its impact on student learning outcomes in Statistics courses. The focus of this study describes two main things, namely the description of the application of statistics lectures with the PjB2L model and the results of statistical tests regarding differences in learning outcomes obtained. Quasi-experimental research was designed to measure the comparison of student learning outcomes in experimental classes (with the PjB2L model) and control classes (conventional/blended direct learning). The 100 students involved in this study were divided into two classes, namely the control class which included 50 students and the experimental class which involved 50 students. In addition, in the data analysis technique, analysis of covariance (ANACOVA) was used to compare the results of the control group and the experimental group, with the covariance variable being the pre-test result (initial knowledge). The results showed significant differences. The difference shown in this study leads to the support of better learning outcomes of the experimental group.

**Keywords:** Project-Based Blended Learning, Learning Outcomes, Statistics

**Abstrak.** Tujuan penelitian ini adalah menganalisis hasil penerapan Blended Learning yang mengacu pada model Project-Based Learning (PjBL). Blended Learning dan PjBL dapat dikemas menjadi sebuah model pembelajaran yaitu Project-Based Blended Learning (PjB2L). Rancangan kegiatan pembelajaran dengan bantuan media online elearning Universitas Bina Sarana Informatika (MyBest) digunakan untuk mengukur dampaknya terhadap hasil belajar mahasiswa pada mata kuliah Statistika. Fokus penelitian ini menguraikan dua hal utama yaitu deskripsi penerapan perkuliahan statistika dengan model PjB2L dan hasil uji statistik mengenai perbedaan hasil belajar yang diperoleh. Penelitian kuasi eksperimen dirancang untuk mengukur perbandingan hasil belajar siswa pada kelas eksperimen (dengan model PjB2L) dan kelas kontrol (pembelajaran langsung konvensional/blended). Siswa yang terlibat dalam penelitian ini berjumlah 100 orang, dibagi menjadi dua kelas, yaitu kelas kontrol yang berjumlah 50 siswa dan kelas eksperimen yang berjumlah 50 siswa. Selain itu, dalam teknik analisis datanya digunakan analisis kovarians (ANACOVA) untuk membandingkan hasil kelompok kontrol dan kelompok eksperimen, dengan variabel kovarians sebagai hasil pre-test (pengetahuan awal). Hasilnya menunjukkan perbedaan yang signifikan. Perbedaan yang ditunjukkan pada penelitian ini mengarah pada dukungan hasil belajar kelompok eksperimen yang lebih baik.

**Kata Kunci:** Project-Based Blended Learning, Hasil Belajar, Statistika

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## INTRODUCTION

Learning in the digital era is different from previous eras. In the digital era, human life cannot be separated from electronic devices. The use of electronics extends to all aspects of humanity, including education. Education must be the most important medium for understanding, mastering, and using technology appropriately and correctly. Learning can now be done without always having to meet face to face. This allows students to learn without knowing the limits of time and place. Students are expected to be competent, creative and independent, in accordance with the goals of higher education. The goals of higher education include developing the potential of students to become competent, creative and independent humans, mastering the fields of science and technology. These four possibilities form the unity that students must have (Rohaeti, T., & Lusiyana, 2020). Lecturers are no longer the only source of learning. The limitations of conventional systems should no longer be found. The most prominent educational innovation is the teacher-centered concept which becomes student-centered in learning (Fadul, 2022). The student-centered concept is seen as the foundation of constructive education (Li, 2021). There are many learning models that are in accordance with this concept, one of which is the emphasis on collaborative activities (Lu & Smiles, 2022).

Educational innovation through learning based on collaboration is also carried out in Indonesia. The Ministry of Education has proposed a curriculum concept that can answer the challenges of the need for collaboration through an independent curriculum (Hasanah & Haryadi, 2022). The independent curriculum emphasizes the use of learning models that can liberate students through student-centered learning activities (Pertiwi et al., 2022; Fahlevi, 2022). The learning model in question is a project-based learning model or known as Project-Based Learning (PjBL). With developments over time and the acceleration of digitalization due to the pandemic, currently the implementation of PjBL can be combined with Blended Learning. PjBL and Blended Learning can be packaged as a learning model, namely Project-Based Blended Learning (PjB2L).

The aim of combining face-to-face learning with online-based learning in the PjBL learning model is to increase student activity. Educators and students can communicate and interact directly anytime and anywhere. Students can also search for project materials from various sources without any restrictions. Research Objectives: To see the application of the PjB2L model to learning statistics in the FEB Management study program at BSI University?, to determine the effectiveness of the PjB2L model and the effect of using control variables (covariance), namely a test of students' initial understanding of the statistics learning outcomes of those studied through the PjB2L model.

**METHOD**

This study uses a quantitative approach. The research design applied is a quasi-experimental design with a pre-test to reveal students' initial knowledge and a post-test to reveal statistics learning outcomes through learning methods which are applied to the experimental class and control class respectively. Hypothesis testing uses covariate analysis of variance (Ancova). All hypothesis tests were carried out using a statistical application, namely IBM SPSS Statistics 27 at a significance level of 5 percent. The application of the PjB2L model and prior knowledge of statistics are the two main factors considered in this research. It is believed that the inclusion of these two factors can influence student learning outcomes in statistics courses.

**Table 1.** Treatment design view (ANCOVA)

	<b>Group</b>	<b>Pretest</b>	<b>Treatment</b>	<b>Posttest</b>
(R)	Experimental	Y1	X	Y2
(R)	Control	Y1		Yx

The population of this study was 112 students spread across four classes in the Management study program, Faculty of Economics and Business, Bina Sarana Informatika University in the Odd Semester 2022-2023 and were recorded as having programmed statistics courses in their study plans. The sample in this study consisted of two parallel classes (100 students) selected using group random sampling techniques. Management Class 3A, which consists of 50 students and studies by applying the PjB2L model, is designated as an experimental class. Meanwhile, the Management 3B class consisting of 50 students was designated as the control class.

**RESULTS AND DISCUSSION**

**Effectiveness of the PjB2L Model and Effect of Initial Test of Understanding (Covariance)**

First, the results of descriptive statistics from learning in the experimental class (with the PjB2L model) and the control class will be presented. A description of each class is presented in Table 1 below.

**Table 2.** Description of pre-test and post-test in Statistics learning

<b>Class</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>N</b>
Control Class	78.68	14,138	50
Experiment Class	90.16	9,392	50
Total	84.42	13,262	100

Descriptive Statistics

Dependent Variable: Posttest Value

Based on Table 1, it appears that the results of learning statistics between before and after treatment in the experimental class and control class have both increased. This can be investigated from the average pre-test and post-test scores in both classes. Even though both have increased, the average in the experimental class (with the PjB2L model) has a higher value. This can be used as a reference that the results of learning statistics in the experimental class are superior to those in the control class.

**Normality test**

The normality test was carried out according to theory using the Kolmogorov-Smirnov test (Santoso, 2018) with a significance level of 0.05.

H0: Residual student statistical scores are normally distributed

H1: Student statistical score results are not normally distributed

The decision criteria is if the significance level is  $> 0.05$  then H0 is accepted, if the significance level is  $< 0.05$  then H0 is rejected.

**Table 3.** Test of Normality

		Kolmogorov-Smirnova			Shapiro-Wilk		
		Statist ics	df	Sig.	Statist ics	df	Sig.
Residual	for	.106	100	,007	,974	100	,047
POSTTEST							

a. Lilliefors Significance Correction

Source: SPSS data processing, 2023

It can be seen in the table that the significance value is  $0.07 > 0.05$ , so accept H0, meaning The residual student statistical scores are normally distributed.

**Homogeneity Test**

H0: Group variances are not different (same or homogeneous)

H1: Different group variances (not the same or not homogeneous)

Significance level 0.05

Decision criteria if the significance value is  $> 0.05$  then accept H0 (homogeneous). If the significance value is  $< 0.05$  then reject H0 or accept H1 (not homogeneous)

**Table 4.** Levene's test of equality of error variances

F	df1	df2	Sig.
14,162	1	98	.0052

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + CLASS

It can be seen in the table above, the data variance is stated to come from a homogeneous population, with a sig value. the Levene's Test output is 0.052 and this value is more than 0.05 (Rothwell, 2022). The final prerequisite is that linearity between the dependent variable and the control variable (covariance) can be tolerated, this is tracked through the sig value. 0.241 in the Deviation from Linearity output which also has a value of more than 0.05 (Matondang & Nasution, 2021).

### Covariate Linearity Test

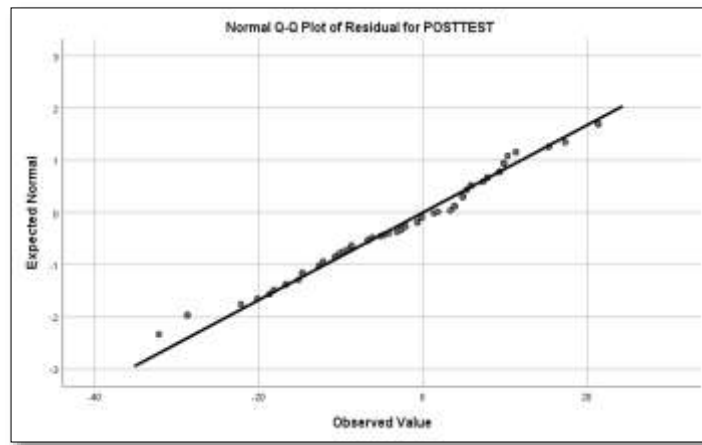


Figure 3.6. Q Plot of residuals

After the prerequisite tests are fulfilled, the Ancova statistical test is then carried out. Through the Ancova test, there are three hypotheses that can be answered as stated in the introduction. The statistical analysis carried out to answer the three hypotheses can be traced through three output results, namely the tests of between-subjects effects table, Anova table, and correlation table. Based on the Ancova test results, interpretations can be drawn by referring to statistical values in the form of sig values. interaction between learning methods and initial understanding tests, then the sig value. on the learning method (without looking at the interaction with the covariance variable), as well as the sig value. in the correlation table between learning methods and initial understanding tests.

### Interaction of Learning Method and Initial Test (as Covariance Variable)

The interaction between the learning approach used and the results of the statistical understanding test is discussed in the first section.

**Table 5.** Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3294.760a	1	3294.760	22,871	,000	,189
Intercept	712673.640	1	712673.640	4947.159	,000	,981
CLASS	3294.760	1	3294.760	22,871	,000	,189
Error	14117.600	98	144,057			
Total	730086,000	100				
Corrected Total	17412.360	99				

a. R Squared = .189 (Adjusted R Squared = .181)

Source: SPSS 2023 data processing

According to the results, the calculated F value is 22.87, and the sig. the interaction between learning method and initial comprehension test is 0.558. Therefore, the initial ability test results were not significantly affected by the learning method ( $p > 0.05$ ), indicating that the regression homogeneity assumption was met. The conclusion that there is no interaction in this test is very important because it can show that the Ancova test has been used correctly because it suits the characteristics of the data collected and that the research conclusions will not be biased. The theory that data variables from students' initial comprehension test results are considered as covariance variables also makes sense (Sari & Prihatnani, 2021).

**Effect of Pretest as Covariance in Implementing the PjB2L Model**

In the second part, differences in average student learning outcomes are reviewed from the application of the PjB2L learning model, which controls and controls the results of students' initial knowledge tests on statistical material. The correlation table shows the results of the analysis to reach a conclusion. The significance value is 0.000 ( $p < 0.05$ ), which indicates that the student's prior knowledge test is positioned as a covariance variable which has had a significant influence on the differences in student learning outcomes in the two research classes.

**Table 6.** Parameter Estimates

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Intercept	91,822	6,342	14,478	,000	79,235	104.410
PRETEST	-.022	,081	-.272	,786	-.184	,140
[CLASS=1]	-11,714	2,560	-4,575	,000	-16,795	-6,632
[CLASS=2]	0.1	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

Source: SPSS 2023 data processing

Based on the table above, the following regression equation is obtained:

$$Y = 91.822 + 0.1X - 0.022z_1 - 11.714z_2,$$

Indicating that the higher the initial comprehension test results (the higher the  $x$  value), the higher the student's statistics score ( $Y$  value). Initial knowledge can show the student's level of readiness in accepting the learning that will be provided. By knowing the student's initial abilities, the lecturer can determine where learning should start. Initial knowledge of statistics is very necessary to facilitate the subsequent learning process (Ririen, 2019). Initial knowledge is a bridge to final understanding of learning material. Each learning process has its own starting point or stems from the initial abilities of certain students to be developed into new abilities, each of which is the goal in the learning process (Suseno, 2017). The link between prior knowledge and the project-based learning model has been expressed by Bayer (2016) who found that once students have adequate prior knowledge, the use of guided problem-based learning can improve conceptual understanding of statistics and increase students' understanding of the value of statistical learning.

Project-based blended learning can improve student learning outcomes. Other research also supports this statement. Learning outcomes for knowledge aspects in the Network Design course can be improved by implementing project-based learning (Adinata, 2015). An additional study conducted by Tureni & Dhafir (2020) found that the pass rate for the experimental class reached 100%, while the pass rate for the control class was only 23.33%. In addition, learning outcomes were significantly different between the experimental class taught with a project-based learning model and the control class taught with a conventional learning model. The result is that student learning outcomes with the PjB2L model have increased significantly. This is because the implementation of the project shows that the PjB2L learning model fits the characteristics of students at the student level.

## CONCLUSION

Students who use the PjB2L model and those who use the conventional or blended learning model are very different in learning statistics. Despite the differences, student learning outcomes in both research classes improved. Student learning outcomes are also influenced by covariance variables through initial tests. Simultaneously, the research dependent variable will produce different results because there are differences in the learning models applied. These findings are very useful for improving the quality of statistics learning in higher education institutions. The PjB2L model can actually give students more opportunities to participate in education.

If students can connect what they know from the real world (such as field data from secondary sources) with what they learn in class, their learning will be more effective. Statistical results show that students in both research classes showed significant learning outcomes. Thus, it can be concluded that students who study statistics using the PjB2L model learn better than students who study using the conventional or direct blended model. The conclusion of this research shows that student learning outcomes in Statistics courses are better.

## RECOMMENDATIONS

Similar research needs to be carried out in other courses and in expanded classes, both in terms of study program and semester level.

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## REFERENCES

- Abdelaziz, H. A., & Zehmi, O. Al. (2021). E-cognitive scaffolding: does it have an impact on the English grammar competencies of middle school underachieving students? *Open Learning: The Journal of Open, Distance and e-Learning*, 36(1), 5–28. <https://doi.org/10.1080/02680513.2020.1774356>
- Aguilera-Hermida, A. P. (2020). College students' use and acceptance of emergency online learning due to Covid-19. *International Journal of Educational Research Open*, 1(July), 1–8. <https://doi.org/10.1016/j.ijedro.2020.100011>
- Ammann, D., Y., V., & Kaap-Fröhlich, S. (2019). How can problem-based learning be realised in blended learning format? Contribution to the HoGe conference 2018 "Digital learning and teaching". *International Journal of Health Professions*, 6(1), 90–96. <https://doi.org/10.2478/ijhp-2019-0010>
- Ariyati, P., Sukrawarpala, I. W., & Santyasa, I. W. (2021). Problem based e-learning dalam pembelajaran kimia di SMA. *Kwangsan: Jurnal Teknologi Pendidikan*, 9(1), 70. <https://doi.org/10.31800/jtp.kw.v9n1.p70--89>
- Bayer, T. J. (2016). Effects of guided project-based learning activities on students' attitudes toward statistics in an Introductory Statistics Course Timothy [Old Dominion University]. In *Old Dominion University* (Vol. 78). <https://doi.org/10.25777/9g35-yy29>
- Boss, S., & Krauss, J. (2007). Reinventing project-based learning. In L. Gansel (Ed.), *International Society for Technology in Education*. ISTE.
- Car, L. T., Myint Kyaw, B., Dunleavy, G., Smart, N. A., Semwal, M., Rotgans, J. I., Low-Beer, N., & Campbell, J. (2019). Digital problem-based learning in health professions: Systematic review and meta-analysis by the digital health education collaboration. *Journal of Medical Internet Research*, 21(2), 1–12. <https://doi.org/10.2196/12945>
- Dewanti, S. S. (2009). The combination of problem-centered learning and meta-cognitive training to increase students' ability to solve mathematics problems. *Jurnal Penelitian Dan Evaluasi Pendidikan*, 12(1), 21–39.

- Evans, B. (2007). Student attitudes, conceptions, and achievement in introductory undergraduate college statistics. *The Mathematics Educator*, 17(2), 24–30. Retrieved from <https://files.eric.ed.gov/fulltext/EJ841563.pdf>
- Fadul, F. M. (2022). *Teachers' transition from teacher-centered to learner-centered classrooms using the next generation science standards as a tool*. Columbia University.
- Fahlevi, M. R. (2022a). Kajian Project-Based Blended Learning sebagai model pembelajaran pascapandemi dan bentuk implementasi kurikulum merdeka. *Jurnal Sustainable*, 5(2), 230–249 <https://doi.org/10.32923/kjmp.v5i2.2714>
- Fahlevi, M. R. (2022b). Upaya pengembangan number sense siswa melalui kurikulum merdeka (2022). *Jurnal Sustainable*, 5(1), 11–27. <https://jurnal.lp2msasbabel.ac.id/index.php/sus/article/view/2308>
- Garfield, J. (2007). How students learn statistics revisited: A current review of research on teaching and learning statistics. *International Statistical Review*, 75(3), 372–396. <https://doi.org/10.1111/j.1751-5823.2007.00029.x>
- Hariyono, & Andriani, V. S. (2020a). Contribution of Project-Based Blended Learning (PjB2L) learning model to technopreneurship ability in higher education. *International Journal of Advanced Multidisciplinary Scientific Research*, 3(4), 1–15. <https://doi.org/10.31426/ijamsr.2020.3.4.3211>
- Hariyono, & Andriani, V. S. (2020b). Development of Project-Based Blended Learning (PjB2L) model to enhance the ability of technopreneur in higher education. *International Journal of Advanced Research and Publications*, 4(4), 86–91. Retrieved from: <http://www.ijarp.org/published-research-papers/apr2020/Development-Of-Project-based-Blended-Learning-pjb2l-Model-To-Enhance-The-Ability-Of-Technopreneur-In-Higher-Education.pdf>
- Hasanah, A., & Haryadi. (2022). Tinjauan kurikulum merdeka belajar dengan model pendidikan abad 21 dalam menghadapi era society 5.0. *Ghâncaran: Jurnal Pendidikan Bahasa dan Sastra Indonesia Special Edition: Lalonget III*, 266–285. <https://doi.org/10.19105/ghancaran.vi.7595>
- He, X., & Lin, X. (2020). Challenges and opportunities in statistics and data science: Ten research areas. *Harvard Data Science Review*, 2(3), 1–8. <https://doi.org/10.1162/99608f92.95388fcb>
- Hotelling, H. (1988). The place of statistics in the university. *Statistical Science*, 3(1), 72–83. <https://doi.org/10.1214/ss/1177013002>
- Hustia, A., Arifai, A., Afrilliana, N., & Novianty, M. (2021). Pelatihan pengolahan data statistik menggunakan SPSS bagi mahasiswa. *JMM: Jurnal Masyarakat Mandiri*, 5(4), 1–8. <http://journal.ummat.ac.id/index.php/jmm/article/view/5127>
- ISTE. (2016). *ISTE Standards Community*. Retrieved from: <http://connect.iste.org/communities/community-home?CommunityKey=cab064c9-11bd-4e9f-a89c-1cda5754da9a>
- Kemdikbud. (2016). *Peraturan menteri pendidikan dan kebudayaan Republik Indonesia tentang standar kompetensi lulusan pendidikan dasar dan menengah*. Jakarta: Kementerian Pendidikan dan Kebudayaan. Retrieved from: [https://repositori.kemdikbud.go.id/4791/1/Permendikbud\\_Tahun2016\\_Nomor021.pdf](https://repositori.kemdikbud.go.id/4791/1/Permendikbud_Tahun2016_Nomor021.pdf)
- Kemdikbud. (2020). *Keputusan menteri pendidikan dan kebudayaan Republik Indonesia tentang indikator kinerja utama perguruan tinggi negeri dan lembaga layanan pendidikan tinggi dilingkungan kementerian pendidikan dan kebudayaan*. Jakarta: Kementerian Pendidikan dan Kebudayaan. Retrieved from: <https://dikti.kemdikbud.go.id/wp-content/uploads/2020/11/Salinan-Kepmen-754.P.2020.pdf>

- Li, J. (2021). Learner-centred learning tasks in higher education: A study on perception among students. *Education Sciences*, *11*(5). <https://doi.org/10.3390/educsci11050230>
- Lu, H. S., & Smiles, R. (2022). The role of collaborative learning in the online education. *International Journal of Economics, Business and Management Research*, *06*(06), 125–137. <https://doi.org/10.51505/ijebmr.2022.6608>
- Ma, H. (2016). A Study of Blended learning strategies for project-based studies. *Asia Pacific Journal of Contemporary Education and Communication Technology*, *2*(1), 50–57. Retrieved from: [https://apiar.org.au/wp-content/uploads/2016/03/5\\_APJCECT\\_APCCR\\_BRR737\\_EDU\\_50-57.pdf](https://apiar.org.au/wp-content/uploads/2016/03/5_APJCECT_APCCR_BRR737_EDU_50-57.pdf)
- Matondang, Z., & Nasution, H. F. (2021). *Praktik analisis data: Pengolahan ekonometrika dengan eviws & SPSS*. Medan: Merdeka Kreasi Group.
- Mursid, R., Saragih, A. H., & Hartono, R. (2022). The effect of the blended project-based learning model and creative thinking ability on engineering students' learning outcomes. *International Journal of Education in Mathematics, Science and Technology*, *10*(1), 218–235. <https://doi.org/10.46328/ijemst.2244>
- Pellegrino, J. W., & Hilton, M. L. (2013). Education for life and work: Developing transferable knowledge and skills in the 21st century. In *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century*. The National Academies Press. <https://doi.org/10.17226/13398>
- Pertiwi, A. D., Nurfatimah, S. A., & Hasna, S. (2022). Menerapkan metode pembelajaran berorientasi student centered menuju masa transisi kurikulum merdeka. *Jurnal Pendidikan Tambusai*, *6*(2), 8839–8848.
- Pituch, K. A., & Stevens, J. P. (2016). Applied multivariate statistics for the social sciences analyses with SAS and IBM's SPSS Sixth. In *Journal of Physics A: Mathematical and Theoretical*, *4*(8). Retrieved from: [https://www.cambridge.org/core/product/identifier/CBO9781107415324A009/type/book\\_part](https://www.cambridge.org/core/product/identifier/CBO9781107415324A009/type/book_part)
- Ririen, D. (2019). Pengaruh pengetahuan awal dan persepsi mahasiswa terhadap prestasi belajar statistika II di STIE Indragiri Rengat. *Jurnal Manajemen dan Bisnis*, *8*(1), 49–60. <https://doi.org/10.34006/jmbi.v8i1.67>
- Rohaeti, T., & Lusiyan, D. (2020). Implementasi blended learning pada era digital dan kemandirian belajar mahasiswa pendidikan matematika. *Hipotenusa Journal of Research Mathematics Education (HJRME)*, *3*(1), 44–51.
- Rothwell, J. (2022). Ancova (Analysis of covariance) in SPSS. *Stats Tutor*, 1–4. Retrieved from: [https://maths.shu.ac.uk/mathshelp/Stats\\_support\\_resources/Resources/Testing\\_means/Comparing\\_groups/ANOVA/SPSS/stcp-rothwell-ANCOVAS.pdf](https://maths.shu.ac.uk/mathshelp/Stats_support_resources/Resources/Testing_means/Comparing_groups/ANOVA/SPSS/stcp-rothwell-ANCOVAS.pdf)
- Santoso, S. (2018). *Menguasai statistik dengan SPSS 25*. Jakarta: Elex Media Komputindo.
- Sari, M. Y., & Prihatnani, E. (2021). Perbedaan kemampuan pemecahan masalah dari penerapan problem solving dan problem posing pada siswa SMA. *Mosharafa: Jurnal Pendidikan Matematika*, *10*(3), 471–482. <https://doi.org/10.31980/mosharafa.v10i3.948>
- Shadiev, R., Hwang, W. Y., Huang, Y. M., & Liu, T. Y. (2015). The impact of supported and annotated mobile learning on achievement and cognitive load article. *Educational Technology and Society*, *18*(4), 53–69. Retrieved from: <https://www.jstor.org/stable/jeductechsoci.18.4.53>
- Shimizu, I., Nakazawa, H., Sato, Y., Wolfhagen, I. H. A. P., & Könings, K. D. (2019). Does blended problem-based learning make Asian medical students active learners?: A prospective comparative study. *BMC Medical Education*, *19*(147), 1–9. <https://doi.org/10.1186/s12909-019-1575-1>

- Skovsgaard, J., Costa, J., Dillon, S., Kim, M., & Suzuki, K. H. (2018). The future of education and skills: Education 2030. In *OECD Education Working Papers*. Retrieved from: [https://www.oecd.org/education/2030/E2030\\_Position\\_Paper\\_\(05.04.2018\).pdf](https://www.oecd.org/education/2030/E2030_Position_Paper_(05.04.2018).pdf)
- Sturges, H. A. (1926). The Choice of a Class Interval Author. *Journal of the American Statistical Association*, 21(153), 65–66. <https://www.jstor.org/stable/622195>
- Surahman, E., Kuswandi, D., Sulthoni, Wedi, A., & Thaariq, Z. Z. at. (2019). Students' perception of project-based learning model in blended learning mode using sipejar. *International Conference on Education Technology*, 372(ICoET), 183–188. Retrieved from: <https://www.atlantis-press.com/proceedings/icoet-19/125925078>
- Susanto, R., Rachmadtullah, R., & Rachbini, W. (2020). Technological and pedagogical models: Analysis of factors and measurement of learning outcomes in education. *Journal of Ethnic and Cultural Studies*, 7(2), 1–14. <https://doi.org/10.29333/ejecs/311>
- Suseno, I. (2017). Pengaruh the power of two terhadap prestasi perkuliahan pengantar statistika dengan mengontrol pengetahuan awal. *Emasains*, 6(2), 90–101. <https://doi.org/10.5281/zenodo.3528160>
- Tureni, D., & Dhafir, F. (2020). Pengaruh model pembelajaran project-based blended learning untuk meningkatkan hasil belajar mahasiswa program studi Pendidikan Biologi FKIP Universitas Tadulako. *Jurnal Kreatif Online*, 8(2), 89–95. Retrieved from: <https://www.jstor.org/stable/622195>
- Ulusoy, C. A., & Altay, M. K. (2017). Analyzing the statistical reasoning levels of pre-service elementary school teachers in the context of a model eliciting activity. *International Journal of Research in Education and Science*, 3(1), 20–30. <https://files.eric.ed.gov/fulltext/EJ1126697.pdf>
- Wahyudi, W., & Winanto, A. (2018). Development of Project-based Blended Learning (PjB2L) model to increase pre-service primary teacher creativity. *Jurnal Pendidikan dan Pengajaran*, 51(2), 93–109. <https://doi.org/10.26858/est.v4i2.5563>
- Yusuf, Y., Suyitno, H., Sukestiyarno, Y. L., & Isnarto. (2019). The influence of statistical anxiety on statistic reasoning of pre- service mathematics teachers. *Bolema - Mathematics Education Bulletin*, 33(64), 694–706. <https://doi.org/10.1590/1980-4415v33n64a12>