

The Influence of an Integrated STEM Project-Based Learning toward Science Literacy Abilities Students in Elementary School'

Oleh:

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Background of The Problem

- The low level of scientific literacy skills of fifth-grade students at Boro State Elementary School, Tanggulangin.
- Based on the pre-research results, the average score of fifth-grade students' literacy skills is 45.2.
- The low level of scientific literacy skills is caused by the learning process that has not been oriented towards scientific literacy.

Formulation of The Problem

- Is there any influence of STEM-based Project-Based Learning (PBL) model on the scientific literacy skills of elementary school students?
- How significant is the influence of STEM-based Project-Based Learning (PBL) model on the scientific literacy skills of elementary school students?

Research Purposes

- To determine whether there is an influence of STEM-based Project-Based Learning (PBL) model on the scientific literacy skills of elementary school students.
- To determine how significant is the influence of STEM-based Project-Based Learning (PBL) model on the scientific literacy skills of elementary school students.

Previous Research

- Prasetyo dan Banowati (2019), “ Science Literacy Ability and Student Learning Outcomes on Project Based Learning”.
- Tati, Firman, dan Riandi (2017), “ Pengaruh Pembelajaran STEM Melalui Proyek merancang model Perahu Terhadap Literasi sains”.
- Dywan dan Airlanda (2022), “ Efektifitas Model Pembelajaran Project Based Learning Berbasis STEM dan Tidak Berbasis STEM Terhadap Keterampilan berfikir kritis”.

Theoretical review

Scientific Literacy:

- Efendi, Nelvianti, et al. (2021) Literally, literacy means being literate, while science refers to knowledge.
- Rusilowati (2018) Scientific literacy is the ability of students to use scientific concepts to be applied in their daily lives, explain scientific phenomena, and describe those phenomena based on scientific evidence.

Indikator Science Literacy

PISA 2018 assesses students' scientific literacy based on their ability to explain scientific phenomena, evaluate and design scientific investigations, and interpret scientific evidence. The assessment is divided into three aspects:

1. Context
2. Knowledge
3. Competencies.

PjBL-STEM Models

- Model PjBL merupakan pembelajaran berbasis proyek (Giwanti 2020).
- Pendekatan STEM adalah pengintegrasian dari 4 ilmu (Rohma 2018)
- Model PjBL-STEM dapat mengembangkan literasi sains siswa (Tati 2017).

Sintaks

The George Lucas Educational Foundation suggests the following steps for implementing Project-Based Learning (PBL):

1. Begin with an essential question
2. Establish project guidelines and rules
3. Develop a project schedule and timeline
4. Monitor student progress during the project
5. Assess student work and provide feedback
6. Evaluate the project upon completion.

Experimental Design

Kelompok	Pretest	Treatment	Posttest
Eksperimen	O1	X1	O3
Kontrol	O2	X2	O4

Sugiyono,2013

Keterangan :

O1 : Hasil Pretest Kelompok Eksperimen

O2 : Hasil Pretest Kelompok Kontrol

X1 : Model PjBL-STEM

X2 : Model Konvensional

O3 : Hasil Posttest Kelompok Eksperimen

O4 : Hasil Posttest Kelompok Kontrol

Population and Sample

- The population used in this study is all students of Boro State Elementary School, Tanggulangin.
- The sample used consists of students in grades Va and Vb.
- The sampling technique used is probability random sampling, which involved randomly selecting samples from grades Va and Vb.

Data collection techniques and research instruments

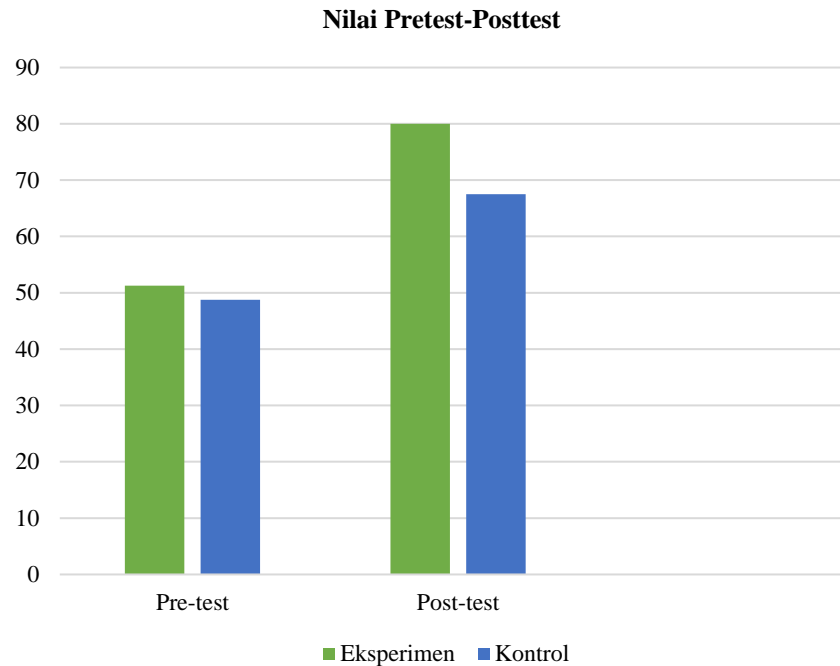
- The data collection technique used in this study is a science literacy skills test.
- The test was administered to students in grades Va (experimental group) and Vb (control group) in two rounds, consisting of a pretest and a posttest.
- The instrument used is a science literacy skills test sheet. The test contains 10 multiple-choice questions that have been adjusted to match the science literacy indicators.

Data Analysis Technique

- Prior prerequisite tests were conducted, which included normality and homogeneity tests using the SPSS version 26 application for Windows.
- Inferential data analysis techniques used include the independent samples t-test and paired samples t-test, with the assistance of the SPSS version 26 application for Windows.

Results

Results of the pretest and posttest for the experimental and control groups



Results

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Hasil Belajar	Based on Mean	.808	1	30	.376
	Based on Median	.789	1	30	.381
	Based on Median and with adjusted df	.789	1	29.917	.381
	Based on trimmed mean	.808	1	30	.376

Tests of Normality				
		Shapiro-Wilk		
Kelas		Statistic	df	Sig.
Hasil Belajar Siswa	Pretest Eksperimen	.922	16	.184
	Posttest Eksperimen	.911	16	.122
	Pretest Kontrol	.922	16	.182
	Posttest Kontrol	.921	16	.176

The homogeneity test resulted in both the control and experimental groups being homogenous.

The normality test on the pretest and posttest results showed that the distribution of the learning outcomes was normal.

Results

		Independent Samples Test									
		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
								Lower	Upper		
Hasil Belajar Pretest	Equal variances assumed	.808	.376	.587	30	.561	2.500	4.257	-6.195	11.195	
	Equal variances not assumed			.587	29.019	.562	2.500	4.257	-6.207	11.207	

		Independent Samples Test									
		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
								Lower	Upper		
Hasil Belajar Posttest	Equal variances assumed	1.596	.216	3.273	30	.003	12.500	3.819	4.701	20.299	
	Equal variances not assumed			3.273	28.846	.003	12.500	3.819	4.688	20.312	

Results

Paired Samples Test										
		Paired Differences					t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
					Lower	Upper				
Pair 1	Pretest - Posttest	-28.750	15.000	3.750	-36.743	-20.757	-7.667	15	.000	

Discussion

Based on the research results, it can be concluded that the implementation of the Project based learning integrated with STEM model has a significant effect on the science literacy skills of students in VA and VB classes at Boro Elementary School. This was confirmed by the hypothesis test using independent sample t-test, where the significance value obtained was 0.03, which is < 0.05 , indicating that H_a was accepted and H_0 was rejected.

Moreover, the paired sample t-test showed a significance value of 0.00, which is < 0.05 , indicating that there was a significant effect of the Project based learning integrated with STEM model on science literacy skills after it was implemented. Therefore, it can be concluded that the implementation of the Project based learning integrated with STEM model has a positive impact on the science literacy skills of elementary school students at Boro Elementary School.

Referensi

U. N. Rohmah, Y. Zakaria Ansori, and D. S. Nahdi, "Pendekatan Pembelajaran Stem Dalam Meningkatkan Kemampuan Literasi Sains Siswa Sekolah Dasar," *Pendekatan Pembelajaran Stem Dalam Meningkatkan Kemampuan Literasi Sains Siswa Sekolah Dasar*, vol. 5, no. 3, pp. 152–162, 2018, [Online]. Available: google scholar

D. Salim Nahdi, D. A. Yonanda, and N. F. Agustin, "Upaya Meningkatkan Pemahaman Konsep Siswa Melalui Penerapan Metode Demonstrasi Pada Mata Pelajaran Ipa," *J. Cakrawala Pendas*, vol. 4, no. 2, p. 9, 2018, doi: 10.31949/jcp.v4i2.1050

N. Efendi, N. Nelvianti, and R. S. Barkara, "Studi literatur literasi sains di sekolah dasar," *J. Dharma PGSD*, vol. 1, no. 2, pp. 57–64, 2021, [Online]. Available: <http://ejournal.undhari.ac.id/index.php/judha/article/view/193>

A. Rusilowati, "Asesmen Literasi Sains: Analisis Karakteristik Instrumen dan Kemampuan Siswa Menggunakan Teori Tes Modern Rasch Model," *Pros. Semin. Nas. Fis. Univ. Riau ke-3*, no. September, pp. 2–15, 2018, [Online]. Available: <https://snf.fmipa.unri.ac.id/wp-content/uploads/2019/03/0.-300B-2-15NI.pdf>

C. P. Rini, S. Dwi Hartantri, and A. Amaliyah, "Analisis Kemampuan Literasi Sains Pada Aspek Kompetensi Mahasiswa PGSD FKIP Universitas Muhammadiyah Tangerang," *J. Pendidik. Dasar Nusant.*, vol. 6, no. 2, pp. 166–179, 2021, doi: 10.29407/jpdn.v6i2.15320

R. Yuliasningrum, "Fakultas Keguruan dan Ilmu Pendidikan, Universitas Muhammadiyah Makassar," *Repository.Umsu.Ac.Id*, vol. 7, no. 1, pp. 1–15, 2018, [Online]. Available: <http://repository.umsu.ac.id/handle/123456789/2311>

Galuh Rahayuni, "Hubungan Keterampilan Berpikir Kritis Dan Literasi Sains Pada Pembelajaran Ipa Terpadu Dengan Model Pbm Dan Stm," *J. Penelit. dan Pembelajaran IPA*, vol. 2, no. 2, pp. 131–146, 2016.

C. E. Summaries, "What Students Know and Can Do," *PISA 2009 a Glance*, vol. I, 2019, doi: 10.1787/g222d18af-en

W. F. McComas, "Trends in International Mathematics and Science Study (TIMSS)," *Lang. Sci. Educ.*, pp. 108–108, 2014, doi: 10.1007/978-94-6209-497-0_97

M. Prasrihamni, Zulela, and Edwita, "Optimalisasi Penerapan Kegiatan Literasi Dalam Meningkatkan Minat Baca Siswa Sekolah Dasar Mega," *J. Cakrawala Pendas*, vol. 8, no. 1, pp. 128–134, 2022.

Referensi

- I. Saidaturrahmi, S. Susilo, and G. Amirullah, “Does STEM-project based learning improve students’ literacy as scientific competencies?,” *Biosfer*, vol. 14, no. 2, pp. 167–174, 2021, doi: 10.21009/biosferjpb.20354.
- O. PISA, *PISA 2018 Assessment and Analytical Framework*. 2019. [Online]. Available: <https://doi.org/10.1787/b25efab8-en>
- D. I. Kota, S. Penuh, and N. Sutrisna, “Jurnal Inovasi Penelitian,” vol. 1, no. 12, 2021.
- T. I. Giwanti, A. P. B. Prasetyo, and ..., “Science Literacy Ability and Student Learning Outcomes On Project Based Learning (PjBL),” *J. P rim. ...*, vol. 10, no. Query date: 2020-08-14 14:24:03, pp. 242–247, 2019, [Online]. Available: <https://journal.unnes.ac.id/sju/index.php/jpe/article/view/34897>
- A. A. Dywan, G. S. Airlanda, U. Kristen, S. Wacana, and J. Tengah, “Efektivitas Model Pembelajaran Project Based Learning Berbasis Stem Dan Tidak Berbasis Stem Terhadap Keterampilan Berpikir Kritis Siswa,” vol. 4, no. 2, pp. 344–354, 2020.
- R. Raehanah, H. Khatimah, and S. Suhirman, “Pengaruh Model Pembelajaran Project Based Learning Terhadap Kreatifitas Berpikir Dan Literasi Sains Siswa Sman 1 Gerung Tahun 2018/2019,” *Spin J. Kim. Pendidik. Kim.*, vol. 2, no. 1, pp. 13–26, 2020, doi: 10.20414/spin.v2i1.2000.
- R. M. Capraro, M. M. Capraro, and J. R. Morgan, *STEM Project-Based Learning: An Integrated Science, Technology, Engineering, and Mathematics (STEM) Approach, Second Edition*. 2013. doi: 10.1007/978-94-6209-143-6.
- T. Tati, H. Firman, and R. Riandi, “The Effect of STEM Learning through the Project of Designing Boat Model toward Student STEM Literacy,” *J. Phys. Conf. Ser.*, vol. 895, no. 1, 2017, doi: 10.1088/1742-6596/895/1/012157.
- J. Afriana, “Pengaruh PjBL STEM terhadap Literasi Sains dan Problem Solving Siswa SMP,” *J. Didakt. Pendidik. Dasar*, vol. 6, no. 2, pp. 627–638, 2022, doi: 10.26811/didaktika.v6i2.551.
- J. Afriana, A. Permanasari, and A. Fitriani, “Penerapan project based learning terintegrasi STEM untuk meningkatkan literasi sains siswa ditinjau dari gender,” *J. Inov. Pendidik. IPA*, vol. 2, no. 2, p. 202, 2016, doi: 10.21831/jipi.v2i2.8561.
- P. M. Abdullah, *Living in the world that is fit for habitation : CCI’s ecumenical and religious relationships*. 2015.
- D. Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif, dan Tindakan*. 2013.

