The Impact of Project Based Learning on the Critical Thinking Ability and Digital Literacy of fifth-graders in Gubeng 1 Elementary School, Surabaya

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Abstract. This study was to determine the effect of project-based learning on critical thinking skills and digital literacy of 5th grade students in social studies learning. This study uses an experiment with the design of "The Non Equivalent Pretest-Postest Control Group Design". Based on the least significant difference further test shows that PjBL can affect 34% critical thinking skills and 28.9% digital literacy skills through project-based learning. Project-based learning influences students to use their critical thinking skills on the problems faced in relation to social studies material. Project-based learning forms students find solutions in solving problems by producing products. PjBL affects students' ability to find information, data, and content that is in accordance with the material at various sources on the internet independently. So that they can understand, process, and communicate effectively with others through various available media, and students are able to analyze, evaluate, and create information, data, content that is correct

Keywords: *Project-based Learning Model; Digital Literacy Skills; Critical Thinking skills*

Introduction

Does primary school with facilities that support learning using some internet-connected electronic media prove that students in the school understand how to use the media? Do students need to master the skills to use computers to find learning resources on the internet?

We often see digital technology in everyday life in recent years. Children are prepared for their future through the introduction, understanding and application of digital technology to the school, community and family environment. This refers to 21st century skills in which there is the ability to think critically, creativity, communication, cooperation, and information literacy and ICT.[1] In fact, the government has given orders to all levels of schools to master the six basic literacy, one of which is digital literacy. We interpret broadly digital literacy as a skill in using, understanding technology, and also understanding the principles and strategies of technology in achieving specific goals that have been determined by developing solutions that have been chosen.[2][3]

Information in this era of globalization has experienced very rapid updates. Information develops continuously and can be accessed in various media. This information is found in print, electronic and online media in various forms. A complex and broad form of literacy is needed to deal with the complexity of the current information environment.[4] In addition, skills-based skills need to be developed to coat literacy skills. Especially the skills to use electronic media devices online and offline. The technology always develops continuously so that it encourages changes in the form of literacy.[5] One of them is digital literacy.

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[1] Nasrullah, R. et.al., Materi Pendukung Literasi Digital, Kementerian Pendidikan dan Kebudayaan, Jakarta, 2017

[2] J. Voogt, N. Pareja Roblin, 21st Century Skills. Een Discussienota, Universiteit Twente, Hengelo, 2010.

[3] L. Boswinkel, E. Schram, de toekomst telt, Report by Dutch National Centre of Curriculum development (SLO) and Ververs Foundation, 2011.

[4] Bawden, David. "Information and digital literacies: a review based concepts." Journal of documentation 57.2 (2001): 218-259.

[5] UNESCO. Education for All: Literacy for Life. 2005 Accessed at http://www.uis.unesco.org/Library/Documents/gmr06-en.pdf

Digital literacy as the ability to use, understand evaluation technology, and also to understand the technological principles and strategies needed to develop solutions and realize specific goals.[6] Specific goals at the elementary school level are the learning objectives to be achieved.

The need to be able to participate in this modern world, every student needs to understand digital literacy. The mindset formed by the current generation is different from the previous generation, because currently access to digital technology is easier to master. Students need to master digital literacy skills. So that they can understand, process, and communicate effectively with others through various available media. In fact, awareness and critical thinking about various positive and negative impacts need to be developed, which students may face as a result of the use of technology.[7] Students can use technology to access the internet network available at school. So that the activities carried out by the teacher provide stimuli for students to actively process the competencies needed in learning.

Although elementary school students are familiar with smarthphone technology, it cannot provide a solution to their problems in processing information related to learning material. Using technology for online games and conversing on social media online, is their daily activity in utilizing technology.

Efforts to overcome these problems need to be done in classroom learning in forming students to be able to use information, data, and content on the internet in accordance with the objectives of classroom learning, namely through project-based learning. This learning is based on constructivist learning that focuses on developing projects to find knowledge.[8] PjBL besides finding information also develops the ability to interact through groups in processing information. Students interact in solving real problems to obtain information when constructing students' understanding and competence.[9] So that students as learners can play as active actors in learning activities, choose information to be learned, and construct meaning based on information.[10]

Based on the problems that occur related to internet use by children, this study was conducted to determine the effect of PjBL on the critical thinking skills and digital literacy of 5th graders in Gubeng 1 SDN Surabaya in relation to their active role in using the internet using the "DigComp 2.1" Digital Competency Framework . This is done to find out the literacy capabilities of data and information, communicate and collaborate, create digital content, secure internet, and solve problems in compiling sources of information obtained for certain purposes.[11]

Indentify, Research, and Collect Idea

This research is a quasi experiment with the design of "The Non Equivalent Pretest-Postest Control Group Design. The population of this study was fifth grade students of SDN Gubeng 1 Surabaya Academic Year 2018-2019. Sampling was done with a simple random sampling technique, taken 2 classes, consisting of experimental and control classes. The experimental class (5th Grade C) consisted of 27 students who were treated with project-based learning, while the control class (5th Grade A) consisted of 28 students given conventional learning. The sample used was 55 students.

The independent variable of this study is project-based learning. The dependent variable of this study is critical thinking skills and digital literacy skills. The control variable in this study is the fifth grade Social Studies learning material in the second semester with basic competencies analyzing the role of the economy in an effort to improve people's lives in the social and cultural fields to strengthen national unity and unity.

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[6] Bekker, Tilde, et al. "Teaching children digital literacy through design-based learning with digital toolkits in schools." International Journal of Child-Computer Interaction 5 (2015): 29-38.

[7] Nasrullah, R. et.al., Materi Pendukung Literasi Digital, Kementerian Pendidikan dan Kebudayaan, Jakarta, 2017, p. 4

[8] Arcidiacono, Gabriele, et al. "Application of axiomatic design for project-based learning methodology." Procedia CIRP 53 (2016): 166-172.

[9] Lilge, Frederic. "John Dewey, 1859–1959: Reflections on His Educational and Social Thought." The Educational Forum. Vol. 24. No. 3. Taylor & Francis Group, 1960.

[10] Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., ... & Wittrock, M. C. "Kerangka Landasan untuk Pembelajaran, Pengajaran dan Asesmen (Revisi Taksonomi Pendidikan Bloom)." (Prihantoro, Translator). Yogyakarta: Pustaka Pelajar (2017).

[11] Carretero, Stephanie, Riina Vuorikari, and Yves Punie. DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use. No. JRC106281. Joint Research Centre (Seville site), 2017.

The research instrument used consisted of learning devices, the instrument for implementing PjBL learning to control the learning process was carried out by observation and for students given self-assessment questionnaires, tests critical thinking skills and digital literacy skills, and evaluated products as a result of the project.

The research data used covariant analysis (Anacova) statistical analysis and continued with the Least Significance Difference (LSD) difference test. Before the hypothesis test, a normality pre-test test was carried out using the Kolmogorof-Smirnov one-sample test, while the homogeneity test used Leven's Test of Equality of Error Variances which was assisted by SPSS 16 for Windows. Statistical tests were carried out at 0.5% significance level.

Results and Discussion

Based on the results of hypothesis testing shows there is the effect of project-based learning on critical thinking skills and digital literacy skills in 5th grade students of elementary school. The results of the calculation of statistical analysis of anacova briefly dependent variable on critical thinking are presented in table 1 below.

Table 1. Anacova Test Results Effect of PjBL on Critical Thinking Ability

Source	Type III Sum of Squares	df	Mean square	F	Sig.
Corrected Model	3432.895(a)	2	1716.448	33.059	.000
Intercept	7133.772	1	7133.772	137.396	.000
XCRITICAL	476.095	1	476.095	9.170	.004
CLASS	3206.892	1	3206.892	61.765	.000
Error	2699.905	52	51.921		
Total	325487.000	55			
Corrected Total	6132.800	54			

a R Squared= .560 (Adjusted R Square= .543)

In the PjBL variable, the calculated Fcount is 61.765 with a significance value of 0.000 (less than 0.05). Thus the null hypothesis which states there is no influence of PjBL on critical thinking skills is rejected and the research hypothesis is accepted, which means that there is an influence of PjBL on critical thinking skills. The results of further testing with LSD are listed in table 2.

Table 2. LSD Advanced Project Learning Test Against Critical Thinking Ability

Class	Critical Pretest	Critical Postest	Difference	The average value is corrected	Notation
1 = control	54.2	69.0	14.8	68.6	a
2 = project	51.7	83.7	32.0	84.0	B

From the data above the mean corrected critical thinking ability is different from the control class, namely the corrected average of the experimental class 84.0 and the control class of 68.6. The percentage of increase in conventional learning in the control class experienced an increase in critical thinking skills by 27.4%, while an increase in critical thinking skills in project learning in the experimental class was 61.8%. This means that based on the corrected mean ratio, the experimental class has critical thinking skills 34.4% higher than the control class. This, proves that project activities can affect critical thinking skills through perception and creative thinking in the

classroom.[12] Project-based learning also influences students' ability to understand lesson concepts with critical thinking skills rather than using conventional learning models.[13]

Anacova test results influence PjBL on digital literacy skills, on the learning variables in the project class obtained Fcount value of 52.116 with a significance value of 0.000 (less than 0.05), briefly can be seen in table 3 below.

Table 3. Anacova Test Results Effect of PjBL on Digital Literacy Capabilities

Source	Type III Sum of Squares	df	Mean square	F	Sig.
Corrected Model	2796.663(a)	2	1398.331	29.100	.000
Intercept	7370.155	1	7370.155	153.375	.000
XKRITIS	403.191	1	403.191	8.391	.006
KELAS	2504.361	1	2504.361	52.116	.000
Error	2498.764	52	48.053		
Total	329391.500	55			
Corrected Total	5295.427	54			

a R Squared= .560 (Adjusted R Square= .543)

Based on the data above the null hypothesis which states there is no influence PjBL on digital literacy abilities is rejected and the research hypothesis is accepted which means that there is an influence of PjBL on digital literacy capabilities. The results of further testing with LSD are presented in table 4 below.

Table 4. LSD Advanced Test Project Learning on digital literacy capabilities

Class	Digital Pretest	Digital Postest	Difference	The average value is corrected	Notation
1 = control	52.27	70.29	18.02	70.13	A
2 = project	51.09	83.48	32.39	83.65	b

The results of this study indicate an increase in digital literacy skills, the average score of digital literacy abilities of students taught with project-based learning is 83.65. While the average score of students' digital literacy skills taught by conventional learning is 70.13. The experimental class has 28.9% higher cognitive abilities than the control class. These results prove that a project-based learning model that trains students to communicate and collaborate in solving problems influences students' information literacy abilities.[1415]

In the implementation of this learning the achievement of implementation appears at each stage of learning. In the planning phase, students work together with all group members starting from compiling proposals to making project

[12] Ku, Kelly YL, Venus SL Lee, and James W. Ellis. "Using artwork as problem context in generic critical thinking instruction: A strategy for thoughts." Thinking Skills and Creativity 25 (2017): 53-59. http://dx.doi.org/doi:10.1016/j.tsc.2017.07.001
[13] Sastrika, Ida Ayu Kade, Wayan Sadia, and I. Wayan Muderawan. "Pengaruh Model Pembelajaran Berbasis Proyek Terhadap Pemahaman Konsep Kimia dan Keterampilan Berpikir Kritis." Jurnal Pendidikan dan Pembelajaran IPA Indonesia 3.1 (2013).
[14] Chu, Samuel Kai Wah, S. K. Tse, and Ken Chow. "Using collaborative teaching and inquiry project-based learning to help primary school students develop information literacy and information skills." Library & Information Science Research 33.2 (2011): 132-143.
[15] Han, Sunyoung, Robert M. Capraro, and Mary M. Capraro. "How science, technology, engineering, and mathematics project based learning affects high-need students in the US." Learning and Individual Differences 51 (2016): 157-166.

procedures, seeking information in various sources and making reports. Students' critical thinking is also very apparent at the implementation stage, including making project design until the final product is presented. The products they produce include posters, wall magazines, and kliping. From the projects they are working on they get direct learning experience especially in the creating stage. The ability to analyze and evaluate problems that exist around students is critically awakened can be seen in the results of the projects they make in the form of research reports.

Direct learning can improve students' digital literacy skills so that social studies learning that is considered difficult can be absorbed directly by the brain as important information that is not easily forgotten. While the ability to argue is seen at the processing stage which consists of presentation of project results and evaluation. At the presentation of each group, there was a sense of confidence in the results they got as if they were true researchers and shared information in the form of learning material about the superiority of the products of the area of origin..

Conclusion and Sugestion

This study shows that based on LSD's further test project based learning learning can influence students 'critical thinking skills to increase 34% and students' digital literacy abilities increase by 28.9% compared to learning provided without going through projects.

Project learning can be done on social studies materials which have been considered difficult by students, so that other research needs to be done from materials that are considered difficult on social studies subjects. Project learning requires a long time so that time management and preparation are needed enough for teachers to implement PjBL.

Acknowledgment

References

[1] Nasrullah, R. et.al., Materi Pendukung Literasi Digital, Kementerian Pendidikan dan Kebudayaan, Jakarta, 2017

[2] J. Voogt, N. Pareja Roblin, 21st Century Skills. Een Discussienota, Universiteit Twente, Hengelo, 2010.

[3] L. Boswinkel, E. Schram, de toekomst telt, Report by Dutch National Centre of Curriculum development (SLO) and Ververs Foundation, 2011.

[4] Bawden, David. "Information and digital literacies: a review of concepts." Journal of documentation 57.2 (2001): 218-259.

[5] UNESCO. Education for All: Literacy for Life. 2005 Accessed at http://www.uis.unesco.org/Library/Documents/gmr06-en.pdf

[6] Bekker, Tilde, et al. "Teaching children digital literacy through design-based learning with digital toolkits in schools." International Journal of Child-Computer Interaction 5 (2015): 29-38.

[7] Nasrullah, R. et.al., Materi Pendukung Literasi Digital, Kementerian Pendidikan dan Kebudayaan, Jakarta, 2017, p. 4

[8] Arcidiacono, Gabriele, et al. "Application of axiomatic design for project-based learning methodology." Procedia CIRP 53 (2016): 166-172.

[9] Lilge, Frederic. "John Dewey, 1859–1959: Reflections on His Educational and Social Thought." The Educational Forum. Vol. 24. No. 3. Taylor & Francis Group, 1960.

[10] Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., ... & Wittrock, M. C. "Kerangka Landasan untuk Pembelajaran, Pengajaran dan Asesmen (Revisi Taksonomi Pendidikan Bloom)." (Prihantoro, Translator). Yogyakarta: Pustaka Pelajar (2017).

[11] Carretero, Stephanie, Riina Vuorikari, and Yves Punie. DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use. No. JRC106281. Joint Research Centre (Seville site), 2017.

[12] Ku, Kelly YL, Venus SL Lee, and James W. Ellis. "Using artwork as problem context in generic critical thinking instruction: A strategy for thoughts." Thinking Skills and Creativity 25 (2017): 53-59. http://dx.doi.org/doi:10.1016/j.tsc.2017.07.001

[13] Sastrika, Ida Ayu Kade, Wayan Sadia, and I. Wayan Muderawan. "Pengaruh Model Pembelajaran Berbasis Proyek Terhadap Pemahaman Konsep Kimia dan Keterampilan Berpikir Kritis." Jurnal Pendidikan dan Pembelajaran IPA Indonesia 3.1 (2013).

[14] Chu, Samuel Kai Wah, S. K. Tse, and Ken Chow. "Using collaborative teaching and inquiry project-based learning to help primary school students develop information literacy and information skills." Library & Information Science Research 33.2 (2011): 132-143.

[15] Han, Sunyoung, Robert M. Capraro, and Mary M. Capraro. "How science, technology, engineering, and mathematics project based learning affects high-need students in the US." Learning and Individual Differences 51 (2016): 157-166.