

# Turnitin Originality Report

Processed on: 31-Aug-2020 10:02 AM WIB  
 ID: 1376666288  
 Word Count: 4167  
 Submitted: 1

Similarity Index

**13%**

## Similarity by Source

Internet Sources: 11%  
 Publications: 0%  
 Student Papers: 4%

Development of Project Based Learning Tool By Elsanda Indrawati

9% match (Internet from 29-Apr-2019)

<http://jurnal.untirta.ac.id/index.php/VOLT/article/view/3904>

2% match ( )

[http://eprints.iain-surakarta.ac.id/3645/1/Skripsi%20Histining%20Q\\_143131025%20%28FULL%29.pdf](http://eprints.iain-surakarta.ac.id/3645/1/Skripsi%20Histining%20Q_143131025%20%28FULL%29.pdf)

2% match (student papers from 18-Dec-2019)

[Submitted to Sriwijaya University on 2019-12-18](#)

[VOLT Jurnal Ilmiah Pendidikan Teknik Elektro P -ISSN: 2528-5688](#) Journal homepage: [jurnal.untirta.ac.id/index.php/VOLT](http://jurnal.untirta.ac.id/index.php/VOLT) E-ISSN: 2528-5696 Vol 3, No. 2, Oktober 2018, 68 – 77 [DEVELOPMENT OF PROJECT BASED LEARNING TOOL USING PLC TRAINER TO IMPROVE CREATIVITY AND SELF-RELIANCE](#) Elsanda Merita Indrawati 1?, Kuni Nadliroh2 1Department of Electronics Engineering, Faculty of Engineering Universitas Nusantara PGRI Kediri, Kediri 64112, Indonesia 2Corresponding author e-mail: [elsanda@unpkediri.ac.id](mailto:elsanda@unpkediri.ac.id) 2Department of Mechanical Engineering, Faculty of Engineering Universitas Nusantara PGRI Kediri, Kediri 64112, Indonesia DOI: 10.30870/volt.v3i1.3039 Received: September, 29th 2018. Received in revised form: October, 8th 2018. Accepted: October, 10th 2018. Available online: October, 10th 2018 [Abstract This research aims to analyze: \(1\) quality of project based learning tool with trainer PLC, \(2\) the creativity of students after following the learning to use project based learning tool with trainer PLC, and \(3\) self-reliance learn student after following learning using project based learning tools with trainer PLC. This research is a research and development \(R&D\) using One Group Pretest Posttest Design. The results showed that \(1\) the learning tools of project based learning with PLC trainer shows excellent quality with a score of 81.4%; \(2\) the creativity of students after implementing learning using learning tools of project based learning with PLS trainer has increased with the average value of N-gain of 0.60 criteria medium; \(3\) the self-reliance of the student learning increased after implementing learning using project based learning tools with PLC train- er, indicated by the average value of N-gain of 0.55 with medium criteria.](#) © 2018 Department of Electrical Engineering Education, FKIP UNTIRTA [Keywords: creativity, learning tools, PLC trainer, project based learning, self-reliance.](#) INTRODUCTION External factors serve to provide a stimulus for the internal factors of students. External factors should be a complete package in order to realize the

success of students in learning, so teachers are instrumental to develop methods, tools and instructional media as supporting factors for the success of the learning process. The success of the children in the study can be seen from the high low levels of independence and creativity of students in learning. Creativity is a process in creating an idea and new idea in solving a problem, so it has a high student creativity is expected easily to find alternatives in solving a problem in the process of learning. Creativity is important because it shows the personal qualities needed to become a professional (Louca, Varnava-marouchou, Mihai, & Konis, 2014: 131). In addition to the creativity of self-reliance is also influential in the success factors of students in learning this because the independence of the study related to the attitude of the students in having initiative, confidence and responsibility toward what he did included in the learning activities and learning achievement. Through the independence of the students were able to learn at its own initiative without help from others, low levels of self-reliance that is lack of confidence against capabilities caused by an overly dominating teacher learning activities (Maga, 2016: 37). This agreed with (Aini & Taman, 2012: 51) which declared the independence of learning is indispensable to enhance learning and achievements will have an effect on the passion for learning. Teachers as organizers of the learning in the classroom have a duty to help enhance the creativity and independence of student learning through the process of learning tools, methods, and media for good quality learning, but that happens in the school is focused more towards learning outcomes without paying attention to the aspects of creativity and independence student learning. Based on the results of interviews and observations early in high school vocational Electricity Installation Engineering (TITL) in Kediri Regency on lessons of programming PLC, students understand the material and the difficulty in solving the problem it is because the lack of responsibility, confidence, motivation, communication, task based on real implementation, the willingness of students to learn as well as media learning did the stimulus of students to think creatively. Based on the results of interviews and observations that can be drawn the conclusion that the creativity and independence of learning students are still low. The main factors cause it happened, among others, namely learning methods are less precise, the lack of learning and learning media device that can arouse the creativity and independence of students in learning, so as to overcome the problems the teacher as the organizer of learning must be processed using methods with innovating, developing learning and learning the right media as well as quality of programming PLC on subjects, so that it can improve the independence and creativity of students. Learning tools that can enhance creativity and independence of students in learning programming PLC device, i.e. learning tools with project based learning, this is because the model of project based learning is a model of learning which gives the task based on the working project so students more challenging, demanding the students to be able to communicate, collaborate, make decisions, and solve problems. A learning model of project based learning can help students in learning through some things, (1) a solid knowledge and skills and meaningful (2) extent of knowledge through a process of learning activities; (3) build knowledge through experiential learning in the real world and discussions between cognitive, personal, which took place in an atmosphere of collaborative work (Santi, 2011: 77). This agreed with (Cuma, 2013: 1908) stating that the model of learning project based learning can make the students have a good learning experience and acquired skills through

practical and effective action-oriented with project. Likewise, according to Ferro, Caroline, Gonçalves, Oliveira, & Silva (2018: 481) stating project based learning involves students to solve a relevant problem or project and allows students to work independently so can build knowledge development based on projects that involve the actual situation (Hamid, 2016) Learning tools based learning will be more complete if equipped with appropriate learning media on subjects programming of PLC. Learning media trainer PLC-based microcontroller that is media of learning that has the configuration and principle of the same work with PLC but at much cheaper. PLC with its own form of PLC programmed microcontroller software use LD Micro is suitable for applied educational institutes are concerned with cost efficiency (Rifa'i & Putri, 2013: 114). Based on the background, the researchers to developed a learning tools project based learning with media trainer PLC-based microcontroller for training the creativity and self-reliance learning of vocational high school students at department of electric power installation engineering in Kediri District. This research aims to analyze: 1) quality of project based learning tools with PLC trainer, (2) the creativity of students after following the learning to use project based learning tools with PLC trainer, and (3) the self-reliance of students learning to use learning tools after following the project based learning with PLC trainer. METHOD This research is a research and development (R&D). The results of the development form of the syllabus, learning implementation plan (RPP), modules, student worksheets, PLC trainer media-based microcontroller, tests the ability of creative thinking, and student learning self-reliance question form sheet. The research design used One Group Pre-test Posttest Design that uses one group without the use of comparison group given the treatment using project based learning tools with PLC trainer- based microcontroller. RESULTS AND DISCUSSION Research development is divided into several procedures, (1) preliminary studies and data collection, including observation, interview, documentation, literature studies, and the preparation of framework research; (2) research planning, including needs analysis, determining strategy and model of learning, the determination of the learning media, the development of a learning tools, development of learning an instrument, development of learning media; (3) product design, including the design tool of learning, research instrument, and PLC trainer media; (4) expert validation, tools validation, instrument and PLC trainer learning media validation (4) small-scale trials or trials 1, conducted to know the quality of the tools and instruments of learning before test 2; (5) revision of the product, to correct the shortcomings found in the trial phase 1; (6) the limited scale of the test or test run 2, conducted on vocational high school students majoring in electricity installation engineering in Kediri District that consists of a Chanda Birawa Vocational High School Pare, Putera Harapan Vocational High School Plemahan, and Vocational High School 1 Purwoasri; (7) the final product, consists of a project based learning tools, PLC trainer media, creative thinking ability test instruments, and questionnaire of self-reliance of student learning. The results of the analysis of the quality of learning tools. Validation of learning tools carried out by experts validator from Department of Electrical Engineering Education Universitas Negeri Surabaya, Department of Electrical Engineering Universitas Nusantara PGRI and PLC subjects teachers in vocational high school in Kediri. The validation of the results that have been filled by experts, and then the results of the validation of the rating is calculated for each indicator. The rating results categorized by the criteria of assessment scale is presented

in table 1. Tabel 1. The results of the validation of the quality of learning tools by validator No Learning tools and instruments The Results of Rating Cate- gory 1 Syllabus 2 Learning im- plementation plan (RPP) 3 Student work- sheet (LKS) 4 Module 78% Good 85% Very good 75% Good 79% Good No Learning tools and instruments The Results of Rating Cate- gory 5 Learning media 84% 6 creative think- ing ability test 82% 7 Questionnaire of 85% self-reliance of student learning Very good Very good Very good Average 81,4% Very good The validity, reliability, and difficulty level of creative thinking ability test On creative thinking ability test prior to student of vocational high school Department of electric power installation engineering in Kediri District, creative thinking ability test question tested to students majoring in electrical engi- neering, it is aimed to know the validity of the grain problem, reliability, and difficulty level of creative thinking ability test grains. A trial analysis of the grain of matter as much as 5 creative thinking ability tests given to 17 students. Based on the product moment table  $R_{xy}$  values for  $N = 17$  with  $\alpha = 0.05$  ob- tained results 0.482. items reserved were de- clared valid in has  $R_{xy}$  calculation  $> R_{xy}$  table. The valid- ity of the question creative thinking ability test can be seen in table 2. Table 2. The validity of the question creative thinking ability test  $R_{xy}$  calcu- lation  $R_{xy}$  table Ques- tion Description 0,776 0.482 1 very significant 0,658 0.482 2 significant 0,656 0.482 3 significant 0,407 0.482 4 Not significant 0,791 0.482 5 Very significant Based on table 2. the validity of the question creative thinking ability test known 4 question were declared invalid while the 1 question were declared invalid or fall. Reliabil- ity ability test problem grain creative thinking revealed reliability if the results  $R_{xy}$  calculation  $> R_{xy}$  table, based on the results of the calculations using the anatesV4  $R_{xy}$  calculation = 0.51  $> R_{xy}$  table = 0.482, so that the grains of matter revealed reli- ability. The results of the calculation of the lev- el of difficulty of the question creative thinking ability test using anatesV4 are presented in ta- ble 3. Tabel 3. Degrees of difficulty item creative thinking ability test P Interpreta- tion items Total  $P < 0.30$  Hard 3 1 0.300.70 Easy 1 1 Total 5 Table 4. The result of creative thinking ability Based on table 4 degrees of difficulty item creative thinking ability test known the proportion of reserved creative thinking ability tests (1:3:1). The results of the creativity of students Analysis of the students' creativity is measured by using creative thinking ability tests executed before and after the learning ac- tivities [learning using project based learning with PLC trainer](#). The results of [the analysis of creativity of students](#) is divided into 3 on (1) Chanda Bhirawa Vocational High School Pare, (2) Putera Harapan Vocational High School Plemahan, and (3) Vocational High School 1 Purwoasri. The results of the analysis of the students' creativity can be seen in table 4. No Aspect  $\Sigma$ pretest Criteria  $\Sigma$ pos test Criteria N-Gain Criteria Chandra Birawa Vocational High School Pare 1 Fluently 63 Good 91,5 2 Flexibility 61,9 Good 88,6 3 Original 62,5 Good 88,6 4 Elaboration 61,4 Good 84,1 Putra Harapan Vocational High School Plemahan 1 Fluently 64,7 Good 80,9 2 Flexibility 64 Good 83,1 3 Original 63,2 Good 82,3 4 Elaboration 61,8 Good 83,1 Vocational High School 1 Purwoasri 1 Fluently 62,2 Good 83,8 2 Flexibility 60,8 Good 83,8 3 Original 64,9 Good 85,8 4 Elaboration 60,8 Good 81,1 Very Creative Very Creative Very Creative Very Creative Very Creative Very Creative Very Creative Very Creative Very Creative Very Creative Very Creative Very Creative 0,8 0,7 0,7 0,6 0,5 0,53 0,52 0,56 0,57 0,59 0,60 0,52 High High High Middle Middle Middle Middle Middle original sebesar 0,60 dengan kriteria sedang, 100 91.5 88.6 88.6 elaborasi sebesar 0,52 dengan kriteria sedang. 84.1 Analysis results in table 4 shows that 80 63.1 61.9 62.5 61.4 the

ability of the creative thinking of learning to 60 Pretes use the tools after following the project based 40 Postes learning with trainer PLC is divided on three 20 schools, namely (1) on the Chanda Bhirawa Vo- 0 cational High School Pare gain score N-gain Berpikir Berpikir Berpikir Elaborasi Lancar Luwes Original thought smoothly of 0.77 with high criteria, flexible thinking of 0.70 with high criteria, orig- Figure 1. Creative thinking capability analysis inal thinking of 0.70 with high criteria, elabora- charts in Canda Bhirawa Vocational High School tion of 0.60 with middle criteria; (2) on Putra Pare Harapan Vocational High School Plemahan Pare 100 gets her on score N-gain thought smoothly of 80.9 83.1 82.3 83.1 0.46 with the middle criteria, flexible thinking 80 64.7 64 63.2 61.8 of 0.53 with middle criteria, think of original of 60 0.52 with middle criteria, elaboration of 0.56 40 with middle criteria; (3) on Vocational High Pretes School 1 Purwoasri gain score N-gain of 0.57 20 with mPoidsoteles criteria, fluent thinking with mid- 0 dle criteria, flexible thinking of 0.59 with medi- Figure 2. CBreeartpivikeirthBinekripnigkicrapBaebripliitkyiranEallaybsoisrasi um criteria, original thinking of 0.60 medium charts in PutLraanHcaarrapaLnuVwoecsatioOnrailgHinigalh School criteria, elaborations of 0.52 with medium cri- Plemahan teria. Based on the results of the analysis of 100 83.8 83.8 85.8 81.1 the students' creativity in Vocational High 80 62.2 60.8 64.9 60.8 60 School electric power Engineering Techniques 40 Pretes in the Kediri Regency consisting of Chanda 20 Postes Bhirawa Vocational High School Pare, Harapan 0 Putera Vocational High School Plemahan, and Berpikir Berpikir Berpikir Elaborasi Vocational High School 1 Purwoasri, then expe- Lancar Luwes Original rience increased creativity demonstrated by an Figure 3. Creative thinking capability analysis average score of N-gain the ability to think charts in Vocational High School 1 Purwoasri smoothly get 0.60 with medium criteria, flexible thinking get a score of 0.61 with medium crite- (3) pada SMK Negeri 1 Purwoasri ria, original thought get score 0.61 with medi- mendapatkan skor N-gain berfikir lancar sebe- um criteria , elaborations get score 0.56 with sar 0,57 dengan criteria sedang, berfikir luwes medium criteria. sebesar 0,59 dengan criteria sedang, berfikir Reliability and validity of student learning self-reliance Questionnaire of Student learning self- reliance tested to students majoring in electri- cal engineering bachelor degree to know the validity and reliability Student learning self-reliance. Questionnaire of Student learning self- reliance given to 17 students Universitas Nusantara PGRI electrical engineering majors. Questionnaire of Student learning self-reliance provided as many as 30 items. The calculation results of the validity of the Questionnaire of Student learning self-reliance by using SPSS 17. Based on product moment table Rxytabel values for N = 17 with  $\alpha = 0.05$  get result of 0.482. The items of questionnaire of Student learning self- reliance stated to be valid if the independence had Rxy calculation  $>$  Rxytable. The results of the calculation of validity Ques- tionnaire of Student learning self-reliance using SPSS 17 presented at table 5 Table 5. validity of questionnaire of Student learning self-reliance No items rcalculation Value rtable Value Criteria 1 0,827 0.482 Valid 2 0, 697 0.482 Valid 3 0, 494 0.482 Valid 4 0, 252 0.482 Not Valid 5 0, 618 0.482 Valid 6 0, 590 0.482 Valid 7 0, 618 0.482 Valid 8 0, 737 0.482 Valid 9 0, 258 0.482 Not Valid 10 0, 655 0.482 Valid 11 0, 597 0.482 Valid 12 0, 827 0.482 Valid 13 0, 835 0.482 Valid 14 0, 495 0.482 Valid 15 0, 485 0.482 Valid No items rcalculation Value rtable Value Criteria 16 0,618 0.482 Valid 17 0, 068 0.482 Not Valid 18 0, 618 0.482 Valid 19 0, 737 0.482 Valid 20 0, 303 0.482 Not Valid 21 0, 684 0.482 Valid 22 0, 578 0.482 Valid 23 0, 597 0.482 Valid 24 0, 530

0.482 Valid 25 0, 583 0.482 Valid 26 0, 486 0.482 Valid 27 0, 671 0.482 Valid 28 0, 749 0.482 Valid 29 0, 087 0.482 Not Valid 30 0, 497 0.482 Valid Based on table 5. The validity of the question form of student learning self-reliance i.e. 25 items self-reliance declared valid and can be used in the research, while the 5 items self-reliance is declared invalid or cannot be used in the research. Reliability of the question form of student learning self-reliance declared reliability if the results  $R_{xy}$  calculation  $>$   $R_{xy}$  table. The calculation result of reliability question form the student learning self-reliance using SPSS 17 presented in table 6. Table 6. The Reliability of the question form the student learning self-reliance Cronbach Cronbach Alpha Based N of Alpha on Standardized items Items .745 .745 30 Based on Table 7. The reliability of the question form the student learning self-reliance retrieved that  $R_{xy}$  calculation = 0.745  $>$   $R_{xy}$  table = 0.482, so the question form the student learning self-reliance can study revealed reliability. Analysis of the student learning self-reliance measured using creative thinking ability tests which was carried out before and after using the **project based learning activities with PLC trainer**. The results of the analysis of student learning self-reliance divided into 3 on (1) Chanda Bhirawa Vocational High School Pare, (2) Putera Harapan Vocational High School Plemahan, and (3) Vocational High School 1 Purwoasri, the results of the analysis to the student learning self-reliance can be seen in table 7. Table 7. The results of student learning self-reliance question form No School  $\Sigma$ Pretest Criteria  $\Sigma$ Posttest Criteria N-Gain Criteria

No	School	Pretest	Posttest	N-Gain	Criteria
1	Chanda Bhirawa Vocational High School Pare	60	Enough	80	High
2	Putra Harapan Vocational High School Plemahan	61	Good	82	High
3	Vocational High School 1 Purwoasri	64	Good	86	High

Very Good 0,50 0,53 0,61 Middle Middle Middle 100 86 90 80 82 80 70 60 50 40 30 20 10 0 60 61 64 SMK SMK SMK N 1 Chanda Putra Purwoasri Bhirawa Harapan Pare Plemahan Pretes Postes Figure 4. Graphic analysis of student learning self-reliance question form on Canda Bhirawa Vocational High School Pare, Putra Harapan Vocational High School Plemahan, dan Vocational High School Purwoasri Analysis results in table 7 shows that the student learning self-reliance using learning tools after following the project based learning with PLC trainer is divided on three schools, (1) Chanda Bhirawa Vocational High School Pare N-gain score of 0.50 with high criteria; (2) on Putra Harapan Vocational High School Plemahan get N-gain score of 0.53 with middle criteria; (3) on Vocational High School Purwoasri get score N-gain of 0.61 with middle criteria. Based on the results of the analysis of the student learning self-reliance in electric power engineering (TITL) Vocational High School in Kediri District, the creativity of students experience increased demonstrated by an average score of N-gain of 0.55 score with middle criteria. CONCLUSION Based on the findings of the research results can be drawn some conclusions, (1) the **project based learning with PLC trainer shows excellent quality with a score of 81.4%**, making it feasible for use in learning activities; (2) the creativity of students after implementing **learning using project based learning with PLC trainer** experience increased demonstrated by an average of N-gain score of 0.60 with the middle criteria; (3) the student learning self-reliance after carrying out the study using a learning tools of project based learning with **PLC trainer** experience increased demonstrated by an average of N-gain score of 0.55 to the middle criteria. It is recommended the following things (1) Tools model of Project Based Learning can enhance the student learning self-reliance and student learning outcomes, then to the teacher should model the study tested on other subjects; (2) then for the next research for those interested in researching can use media trainer

PLC other types; (3) in this study only measured the creativity and student learning self-reliance in [learning using Project Based Learning with trainer PLC-](#) based mikrokontroller Atmega32, then for the next research needs can be measure the effectiveness of learning tools in improving the cognitive learning results, affective and psychomotor. ACKNOWLEDGEMENT Thanks to Lembaga Penelitian dan Pengabdian Pada Masyarakat (LPPM) Uni- versitas Nusantara PGRI Kediri that has funded research Research grants in Hibah Penelitian Dosen Pemula 2018 with re- search contract number:248.05/LPPM.UN PGRI Kd/V/2018. Thanks also to Vocational High School in Kediri District Electricity Installation Engineering (TITL), Canda Bhirawa Vocational High School Pare, Putra Harapan Vocational High School Plemahan, and Vocational High School 1 Purwoasri who gave a chance on researchers in conducting research on the agencies concerned with the number of letter: 87.05/LPPM. UN PGRI Kd/II/2018. REFERENCES Aini, P. N., & Taman, A. (2012). Pengaruh Kemandirian Belajar dan Lingkungan Belajar Siswa terhadap Prestasi Belajar Akuntansi Siswa Kelas XI IPS SMA Negeri 1 Sewon Bantul Tahun Ajaran 2010/2011. Pendidikan Akuntansi Indonesia, X(1), 48– 65. Cuma, F. I. (2013). Project-based learning in teaching with the DAF Montessori method. Social and Behavioral Sciences, 70, 1901– 1910. <https://doi.org/10.1016/j.sbspro.2013.01.268> Ferro, E., Caroline, B., Gonçalves, M., Oliveira, K. B. De, & Silva, M. B. (2018). Project Based Learning Applied to Technical Drawing. Creative Education, 9, 479–496. <https://doi.org/10.4236/ce.2018.93034> Hamid, M. A. (2016). Pengembangan Instrumen Penilaian Hasil Belajar Siswa Berbasis TIK pada Pembelajaran Dasar Listrik Elektronika. VOLT : Jurnal Ilmiah Pendidikan Teknik Elektro, 1(1), 37–46. <https://doi.org/10.30870/volt.v1i1.822> Louca, E. P., Varnava-marouchou, D., Mihai, S., & Konis, E. (2014). Teaching for Creativity in Universities. 3(4), 131–154. <https://doi.org/10.15640/jehd.v3n4a13> Maga, Y. (2016). Peningkatan Kemandirian dan Hasil Belajar Matematika Melalui Strategi Metakognitif Berbasis Tutor Sebaya Bagi Siswa Kelas V SD YPK Persiapan Kampung ANNY. Jurnal Surya LPMP Provinsi Papua Barat, XIV(September), 37–42. Rifa'i, M., & Putri, R. I. (2013). Desain dan implementasi PLC berbasis mikrokontroler ATmega8. Jurnal ELTEK, 11, 115–128. Santi, T. K. (2011). Pembelajaran Berbasis Proyek (Project Based Learning) Untuk Meningkatkan Pemahaman Mata Kuliah Fisiologi Tumbuhan. Jurnal Ilmiah Progresif, 7(21), 74–83. E.M. Indrawati, K. Nadliroh / VOLT: Jurnal Ilmiah Pendidikan Teknik Elektro 3 (2) (2018), 68 – 77 E.M. Indrawati, K. Nadliroh / VOLT: Jurnal Ilmiah Pendidikan Teknik Elektro 3 (2) (2018), 68 – 77 E.M. Indrawati, K. Nadliroh / VOLT: Jurnal Ilmiah Pendidikan Teknik Elektro 3 (2) (2018), 68 – 77 E.M. Indrawati, K. Nadliroh / VOLT: Jurnal Ilmiah Pendidikan Teknik Elektro 3 (2) (2018), 68 – 78 E.M. Indrawati, K. Nadliroh / VOLT: Jurnal Ilmiah Pendidikan Teknik Elektro 3 (2) (2018), 68 – 77 E.M. Indrawati, K. Nadliroh / VOLT: Jurnal Ilmiah Pendidikan Teknik Elektro 3 (2) (2018), 68 – 77 E.M. Indrawati, K. Nadliroh / VOLT: Jurnal Ilmiah Pendidikan Teknik Elektro 3 (2) (2018), 68 – 77 E.M. Indrawati, K. Nadliroh / VOLT: Jurnal Ilmiah Pendidikan Teknik Elektro 3 (2) (2018), 68 – 77 1 69 70 71 72 73 74 75 76 77