

## The Development of Integrated Virtual Project - Based Learning Model

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### Abstract

Learning innovation requires technology that can adapt, has features that are suitable to be integrated into the learning process, and easy to operate when the learning process takes place. Most of the studies in project-based learning do not integrate information technology elements. Therefore, this study aims to create a virtual class integration model in project-based learning process. This study employed ADDIE research and development design (R&D) based on Romiszowksi. The data were collected using unstructured interviews, expert validation sheets and tests consisting of pre-test and post-test. The results of expert validation indicated that the model developed can be used efficiently and the results of the Ttest showed that there is a significant difference between the students' pre-test and post-test scores when the integrated virtual project - based learning model is conducted.

**Keywords:** E-learning; Learning model; Project – based learning; Learning innovation.



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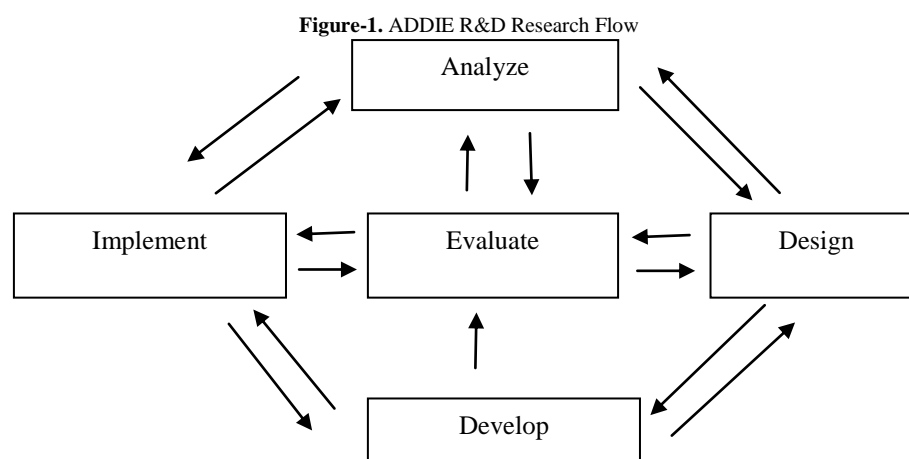
### 1. Introduction

Internationalization of institutions in 2018 conducted by Universitas Negeri Semarang is in synergy with the era of disruption. This requires an acceleration of innovation in the learning process to anticipate the rapid process of change in the field of education. Learning innovation requires technology that can adapt, has features that are suitable to be integrated into the learning process, and easy to operate when the learning process takes place. (Rogers and Shoemaker, 1971) define innovation as ideas - new ideas, new practices, or objects that can be perceived as something new by the individual or target society.

In the field of education, innovation is needed to solve the problems in the learning process. Lack of motivation and activeness of the role of students in the learning process is one of the main problems in the field of education. Project based learning is a teaching method that can make students motivated and actively participate in the learning process (Railsback, 2002). Project - based learning provides students with opportunities to learn how to apply the knowledge directly in real world activities so that students can understand the material in depth for having experienced it directly (Krajcik and Blumenfeld, 2006). Tan *et al.* (2016) found that shows that the use of project-based learning contributes to the development of students' professional identity. Most of the studies on project-based learning do not integrate information technology elements. Therefore, this study aims to create a virtual class integration model in the learning process that uses project-based learning.

### 2. Method

This study employed ADDIE research and development design (RnD) based. The flow of research and development based was illustrated in Figure 1:



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This study involved 16 students of Civil Engineering Education Program, Universitas Negeri Semarang. Because the population is too small, all students were sampled in the study. The data was collected using unstructured interviews, expert validation sheets and tests consisting of pre-test and post-test. Unstructured interviews were conducted to obtain qualitative data regarding the constraints and problems experienced by students during the learning process. Expert validation sheets were used to validate the model produced in this study. Test items were used as an evaluation tool for the application of learning models to students' abilities during the learning process.

Before the pre-test and post-test items were used to collect the data, content validity and empirical validity and reliability were carried out on the items so that the items were proved valid and reliable in collecting data from students reveals that a test is said to be valid if the test measures what is being measured. The content validity was determined by using expert validation which then the results were calculated to find the percentage level of validity of the contents of the item. Empirical validity was carried out on items by trying out the items involving 16 students. The empirical validity of the test instrument was then determined by using Pearson's product moment. The reliability test of the items was carried out using *Cronbach's Alpha*. Results *Pearson's product moment* is presented in Table 1

**Table-1.** Results of Empirical Validity Question Items

Question item	$r_{stats}$	$r_{table}$	Information
Item_1	.564	0.497	Valid
Item_2	.974	0.497	Valid
Item_3	.747	0.497	Valid
Item_4	.486	0.497	Valid
Item_5	.657	0.497	Valid
Item_6	.472	0.497	invalid
Item_7	.496	0.497	invalid
Item_8	.524	0.497	Valid
Item_9	.594	0.497	Valid
Item_10	.864	0.497	Valid

An item was considered valid if its  $r_{stats} > r_{table}$ , only two items of the ten items were categorized as invalid. The  $r_{stats}$  of the item no. 6 and no. 7 were .472 and .496 respectively, which were less than the  $r_{table}$ .

Results reliability analysis of the test items using *Cronbach's Alpha* is shown in the Table 2:

**Table-2.** Reliability Test Results

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.467	.353	10

Based on the Table 2, the reliability coefficient of this research instrument is 0.367. Based on, the reliability coefficient was considered as moderate.

### 3. Results and Discussion

The results of this study were presented following each stage of ADDIE research and development design which consisted of: analyzing, designing, developing, implementing, and evaluation.

#### 3.1. Analyzing Phase

At this stage, the researchers analyzed the needs of students who took a learning evaluation course in Building Engineering Education Program by conducting observations and conducting interviews with them. The results of the interview showed that:

1. Learning evaluation courses are carried out theoretically in the classroom in a classical way
2. Students have difficulty accessing lecture material because they only rely on one book suggested by the lecturer of the learning evaluation course
3. Students want flexibility in learning the subject matter of learning evaluation and assignment
4. Students want a portion of practice in more groups in the lecture process

#### 3.2. Design Phase

At the design stage, researchers designed an integrated virtual project - based learning model based on the results of interviews with students. This learning model design involved analyzing competencies that students want to achieve and analyzing relevant materials to facilitate students in achieving these competencies. In accordance with the semester learning plan for learning evaluation course, the sub-achievement of courses is able to design a competency based assessment format in accordance with the basic competencies chosen as the competencies to be achieved by students. The material chosen to achieve the sub-achievement of courses included the preparation of the

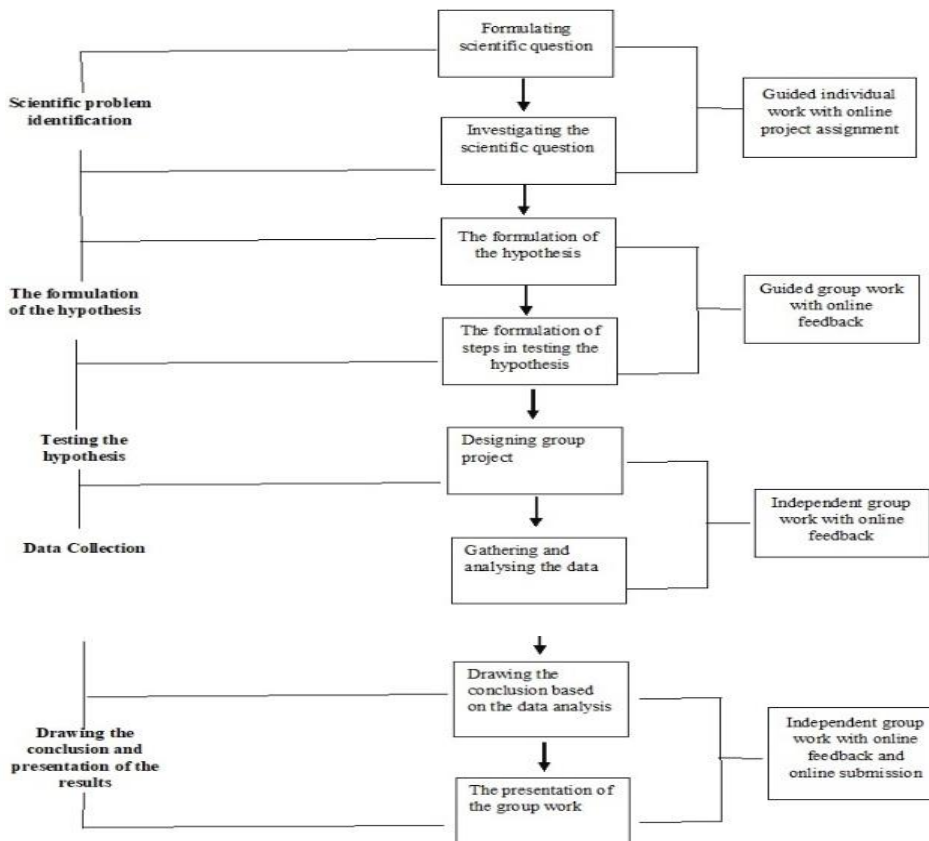
test item design, content validity analysis, empirical validity analysis, reliability analysis, difficulty level analysis, and reliability analysis.

The sub-achievement of courses were chosen because they required the students to create test items design, test items, and analyze those test items. Fulfillment of these materials required students to work in groups in the project based learning to prepare test items, test it out to the students and analyze those test items.

### 3.3. Development and Implementation Phase

At this stage, researchers developed a virtual class as a means to assist the project - based learning. The virtual class to assist the project - based learning was created using Edmodo as a student virtual learning platform that facilitated students in the implementation of project-based learning. The implementation of integrated virtual project - based learning is shown in the Figure 2:

Figure-2.The Flow Chart of the Integrated Virtual Project – based Learning Model



The results of the pre-test is presented in the Table 3:

Table-3. Pre-test results

Statistics		
pre		
N	Valid	16
	Missing	0
Mean		67.8125
Median		71.0000
Mode		80.00
Std. Deviation		11.43806
Variance		130,829
Range		31.00
Minimum		49.00
Maximum		80.00
Sum		1085.00

Based on the Table 3 the average pre-test score of students is 67.8125 , median = 71, mode = 80, standard deviation = 11 , 44 . After the treatment in the form of the implementation of the Integrated Virtual Project - Based Learning model implemented, the student learning outcomes are measured again using the post-test. The post-test results of students is shown in Table 4:

Table-4. Post-test results

Statistics		
post		
N	Valid	16
	Missing	0
Mean		75.5625
Median		78.0000
Mode		81.00
Std. Deviation		6.77219
Variance		45,863
Range		8:00 p.m.
Minimum		63.00
Maximum		83.00
Sum		1209.00

Table 4 shows that the average of the student's post-test results is 75.56, median = 78, mode = 81, standard deviation = 6.77. When compared with the results of the pre-test, there is a change in the average value of students, the mean value in the pre-test = 67.8125, while the mean value in the post-test = 75.56. Before analyzing the difference in student scores at pre-test and post-test, a prerequisite test was carried out on the student's value. The prerequisite test is the data normality test using one-sample Kolmogorov - Smirnov test carried out with the help of SPSS version 23. Test one-sample Kolmogorov - Smirnov test was conducted to determine whether the data is normally distributed.

The results of the data normality test are used to determine whether parametric or non-parametric statistics will be performed to analyze the data. The results of the data normality test using *one-sample Kolmogorov - Smirnov test* carried out with the help of SPSS version 23 software is illustrated in Table 5 below.

Table-5. Data Normality Test

One-Sample Kolmogorov-Smirnov Test			
		pre	post
N		16	16
Normal Parameters <sup>a, b</sup>	Mean	67.8125	75.5625
	Std. Deviation	11.43806	6.77219
Most Extreme Differences	Absolute	.173	.203
	Positive	.143	.136
	Negative	-.173	-.203
Statistical Test		.173	.203
Asymp. Sig. (2-tailed)		.200 <sup>c, d</sup>	.077 <sup>c</sup>

Table 5 shows that the probability value of the pre-test data is 0.200 and the probability value of the post-test data is 0.77. Both probability values are > 0.05 so the data in the pre-test and post-test groups can be categorized as normally distributed. Because the data in both groups were normally distributed, parametric statistics were used to analyze research data.

*Paired samples T-test* as one of the parametric statistics was used to analyze whether there is a difference between the average values in the pre-test and post-test groups. *Paired samples T-test* is carried out using the help of SPSS software version 23. The results of the *paired samples T-test* is presented in Table 6.

Table-6. Analysis results of the Paired samples T-test

Paired Samples Test		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Mean error	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	post - pre	7.75000	4.87852	1.21963	5.15042	10.34958	6,354	15	.000

Table-7. Analysis results of Paired samples Correlation

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	post & pre	16	.987	.000

Table 6 shows that the value of  $t_{stats} = 6.354$ . by looking at the degree of freedom = 15, and the alpha value = 0.05, then  $t_{table} = 2.131$ . Therefore, it can be concluded that  $t_{stats} = 6.354 > t_{table} = 2.131$ . These results mean that

there are differences in mean values in the pre-test and post-test groups. The probability value shows a value of 0.000, because the probability value = 0.000 < 0.05, then there is a significant difference in the average value in the pre-test and post-test groups with a difference in the average value of 7.75000. Table 7 also shows that both groups of data have a strong and significant correlation with a correlation coefficient = 0.987 and a probability value of 0.000 < 0.05. The conclusion of the different test using paired samples T-test is the implementation of the integrated virtual project - based learning model can improve student learning outcomes in learning evaluation course. Two media expert lecturers were involved to evaluate *Edmodo's* use in the integrated virtual project - based learning learning model. The results of *Edmodo's* efficiency analysis in the integrated virtual project - based learning learning model is presented on Table 8 below.

Table-8. Results of Efficiency Analysis

No.	Assessment Aspect	Assessment	
		Expert 1	Expert 2
<b><i>Edmodo</i> accessibility</b>			
1	Ease of accessing the site	3	4
2	The ease of downloading learning material	4	4
3	Ease in uploading learning material	3	4
4	Completeness of site features in supporting learning	4	4
<b><i>Edmodo</i> display</b>			
1	Layout of text and images	4	3
2	Suitability of background selection	4	4
3	Suitability for size and font selection	3	4
4	Color suitability	4	4
5	Interest in presenting learning support media	3	4
<b>Total score</b>		32	35
<b>Percentage</b>		89%	97%
<b>Percentage Total</b>		93%	
<b>Interpretation</b>		Very efficient	

Based on Table 8 above, the total percentage of the results of *Edmodo's* efficiency analysis in the integrated virtual project - based learning model is 93% which can be interpreted as very efficient.

#### 4. Conclusion

The conclusions of this study showed that the analyze phase in this research shows that some of the problems faced by students include: 1) the learning evaluation course was carried out theoretically in the classroom in a classical manner, 2) students experienced difficulties in accessing lecture material, 3) Students want flexibility in studying subject matter, 4) Students want more portions of practice in groups. During the design phase, researchers designed an integrated virtual project - based learning model to solve problems faced by these students. In the Develop and implementation phase, researchers developed and implemented an integrated virtual project - based learning model that integrates *Edmodo* as a virtual class.

Evaluation of the effectiveness of an integrated virtual project - based learning model was carried out with the implementation of the pre - test and post - test. The paired samples  $t_{test}$ . The paired samples  $t_{test}$  shows that  $t_{stat} = 6.354 > t_{table} = 2.131$ . These results mean that there are differences in mean values in the pre-test and post-test groups. The probability value shows a value of 0.000, because the probability value = 0.000 < 0.05, then there is a significant difference in the average value in the pre-test and post-test groups with a difference in the average value of 7.75000 . The conclusion of the paired samples T-test is the implementation of the integrated virtual project - based learning model can improve student learning outcomes in learning evaluation courses. The total percentage of the results of *Edmodo's* efficiency analysis in the integrated virtual project - based learning model is 93% which can be interpreted as very efficient

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