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Evaluation of Interaction Design of Virtual Laboratory of Open Source Programming in Virtual Classroom Based On Moodle Using DECIDE Framework Case Study: C programming

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Abstract---*Identifying usability and user experience goals is essential for making every product successful, and this requires understanding users' needs. The role of evaluation is to make sure that this understanding occurs during all the stages of the product's development. with evaluation playing a key role in facilitating understanding between designers and users. In this research, focus on a evaluation interaction design of virtual laboratory of open source programming in virtual classroom based in moodle using DECIDE framework. The approach and method is a usability testing. The data of result of the questionnaire is presented in tables. The testing result showed that respondents agree that the virtual laboratory is in accordance with the goals of usability and user experience that is effective, efficient, safe to use, good utility, easy to learn and to remember by users. Respondents also agree that the virtual laboratory will support them to get the objectives of learning of C programming*

Keywords---*Evaluation, DECIDE framework, Usability, User Experience;*

I. Research Question

How to know usability and User Experience from interaction Design of Virtual Laboratory of open source programming in virtual classroom based on moodle, case study of c programming?

Goal

To know usability and User Experience from interaction Design of Virtual Laboratory of open source programming in virtual classroom based on moodle, case study of c programming.

II. METHODOLOGY

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To discover if and how Virtual laboratory is being used in education, our study used Action Design Research (ADR). Decide of Action Design Reasearh is a problem formulation, Building intervention and evaluation, reflection and learning, formalization of learning.

BACKGROUND/ OBJECTIVES AND GOALS

Identifying usability and user experience goals is essential for making every product successful, and this requires understanding users' needs. The role of evaluation is to make sure that this understanding occurs during all the stages of the product's development. with evaluation playing a key role in facilitating understanding between designers and users.

Evaluation is driven by questions about how well the design or particular aspects of it satisfy users' needs. Some of these questions provide high-level goals to guide the evaluation. Others are much more specific. For example, can users find a particular menu item? Is a graphic useful and attractive? Is the product engaging? Practical constraints also play a big role in shaping evaluation plans: tight schedules, low budgets, or little access to users constrain what evaluators can do. four core evaluation paradigms: (1) "quick and dirty" evaluations; (2) usability testing; (3) field studies; and (4) predictive evaluation. Other texts may use slightly different terms to refer to similar paradigms.

III. RESULTS

A. DECIDE framework

The DECIDE framework has six parts: 1. Determine the

overall goals of the evaluation. 2. Explore the questions that need to be answered to satisfy the goals. 3. choose the evaluation paradigm and techniques to answer the questions. 4. Identify the practical issues that need to be considered. 5. Decide on the ethical issues and how to ensure high ethical standards. 6. Evaluate, interpret, and present the data.

The evaluation paradigm and techniques to answer the questions is a usability testing. The research sample for this test were 22 first-year students of informatics and 6 Programming Lecturer at the Informatics Department of Polytechnic Pos Indonesia who represent the target population.

The first step, the respondent students were told how to log into the virtual laboratory and to perform tasks that have been given by lecturers. Furthermore, the students were not told how to use virtual lab. While the respondent lecturers

were told how to use the first page of the virtual laboratory with access rights and then add lecture material and laboratory assignments. Testing was conducted at the Laboratory of Programming 308 Politeknik Pos Indonesia.

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Laboratory tasks that tested for students are:

Input 10 integer data from the keyboard and then find the maximum, minimum, and average, and then display the data in ascending and descending.

The next step is the respondent will be asked to use the C programming virtual lab and do the problems given and fill out a questionnaire assessment. The questionnaire contains 10 items of questions about student response to the virtual lab.

Assessment includes aspects of legibility, convenience and satisfaction. These aspects are the parameters in usability and user experience. These aspects are scattered in question. Distribution of the questionnaire contained questions in this study can be viewed in Appendix C.1

The questionnaire used is closed, meaning that the researchers limited the alternative answers to be chosen by the respondent in accordance with the contents of the questionnaire items. Questionnaire in this study are arranged according to **Likert scale**.

After the questionnaires distributed, then the results of the questionnaire were analyzed with the presentation of the data in ordinal data table.

the practical issues that need to be considered is a

1. Elements (images, text, audio, video) in the virtual lab can be seen clearly
2. The display of the virtual lab is simple and not confusing
3. C language programming material in the virtual lab is clearly displayed so easily understood
4. The features in the virtual lab has a good function
5. The features available on the Virtual Lab is easy to use
6. I really enjoyed learning the C programming language in the virtual lab
7. Commands in the virtual lab is easy to understand
8. Commands in the virtual lab is easy to remember
9. Learning in a virtual lab is very boring

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10. Learning in a virtual lab is very pleasant

Evaluation Results of Student Respondents Here are the evaluation results in the form of students response data to the virtual lab of C programming TABLE 3. 1

TABULATION OF QUESTIONNAIRE DATA OF STUDENT RESPONDENTS

No	Statements	SA	A	D	DA	SDA
1	Elements (images, text, audio, video) in the virtual lab can be seen clearly	9	12	1		
2	The display of the virtual lab is simple and not confusing	7	10	5		
3	C language programming material in the virtual lab is displayed clearly so easily understood	3	12	6	1	
4	The features in the virtual lab has a good function	9	9	3	1	

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5	The features available on the Virtual Lab is easy to use	3	17	1	1	
6	I really enjoyed learning the C programming language in the virtual lab	5	9	6	2	
7	Commands in the virtual lab is easy to understand	6	9	6	1	
8	Commands in the virtual lab is easy to remember	7	8	7		
9	Learning in a virtual lab is very boring	1	2	6	13	
10	Learning in a virtual lab is very pleasant	4	13	5		

Evauation Results of Lecturer Respondents Here are the evaluation results in the form of lecturers

response data to the virtual lab of C programming

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TABLE 3. 2

TABULATION OF QUESTIONNAIRE DATA OF LECTURER STUDENT RESPONDENTS

No	Statements	SA	A	D	DA	SDA
1	Elements (images, text, audio, video) in the virtual lab can be seen clearly		5	1		
2	The display of the virtual lab is simple and not confusing	4	2			
3	C language programming material in the virtual lab is clearly displayed so easily understood	3	3			
4	The features in the virtual lab has a good function	4	2			
5	The features available on	3	3			

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	the Virtual Lab is easy to use					
6	I really enjoyed learning the C programming language in the virtual lab		5	1		
7	Commands in the virtual lab is easy to understand	5	1			
8	Commands in the virtual lab is easy to remember	4	2			
9	Learning in a virtual lab is very boring			2	4	
10	Learning in a virtual lab is very pleasant	4	2			

B. Analisys

In this research questionnaire, 10 statements given on the satisfaction of students and teachers about the use of virtual labs. To assess the respondents' answers, then the criteria for assessment of the respondent's answer was

prepared as follows.

Strongly Agree (SA) = 5

Agree (A) = 4

Doubtful (D) = 3

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Disagree (DA) = 2

Strongly Disagree (SDA) = 1

Furthermore, the average of respondents' answers are calculated. Interval is used to make it easier the assesment. To determine the length of the class interval, the formula used by Sudjana (2000) is as follows: Length of class interval = range : amount of class interval Where :

Range = upper limits – lower limits = 5 – 1 = 4

Amount of class interval = 5

Length of class interval = 4 : 5 = 0,8

Notes :

1,00 – 1,79 = Strongly Disagree (SDA)

1,80 – 2,59 = Disagree (DA)

2,60 – 3,39 = Doubtful (D)

3,40 – 4,19 = Agree (A)

4,20 - 5,00 =Strongly Agree (SA)

I.B.1 *Analisysof Student Questionaire*

The following is an analysis of each statement in the research questionnaire for student respondents

TABLE 3.3 CLARITY OF ELEMENTS

Response	Amount	Value	Score	Percentage
Strongly Agree	9	5	45	46.875

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Agree	12	4	48	50
Doubtful	1	3	3	3.125
Disagree	0	2	0	0
Strongly Disagree	0	1	0	0
Total	22		96	100

Table 3.3 above shows that the average score is 96/22

= 4.36 which is in the interval 4.20 to 5.00, which means strongly agree. Thus, it can be concluded that the majority of respondents strongly agreed with the statement regarding the clarity of the elements in the virtual lab.

TABLE 3. 4 SIMPLICITY

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	7	5	35	38.89
Agree	10	4	40	44.44

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Doubtful	5	3	15	16.67
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	22		90	100.00

Table 3.4 above shows that the average score is 90/22

= 4.09 which is in the interval 3.40 to 4.19, which means agree. Thus, it can be concluded that the majority of respondents agree with the statement about the simplicity of appearance of the virtual lab

TABEL 3. 5 CLARITY OF MATERIALS

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	9	5	45	48.91

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Agree	9	4	36	39.13
Doubtful	3	3	9	9.78
Disagree	1	2	2	2.17
Strongly Disagree	0	1	0	0.00
Total	22		92	100.00

Table 3.5 above shows that the average score is 92/22

= 4.18 which is in the interval 3.40 to 4.19, which means agree. Thus, it can be concluded that the majority of respondents agree with the statement about the clarity of the material on virtual lab.

TABLE 3. 6. FEATURES HAS A GOOD FUNCTION

Response	**Amount**	**Value**	**Score**	**Percentage**

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Strongly Agree	3	5	15	17.05
Agree	17	4	68	77.27
Doubtful	1	3	3	3.41
Disagree	1	2	2	2.27
Strongly Disagree	0	1	0	0.00
Total	22		88	100.00

Table 3.6 above shows that the average score is 88/22 = 4.00, which is in the interval 3.40 to 4.19, which means agree. Thus, it can be concluded that the majority of respondents agree with the statement about the features available in the virtual lab has a good function.

TABLE 3.7 EASY TO USE

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	3	5	15	17.05

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Agree	17	4	68	77.27
Doubtful	1	3	3	3.41
Disagree	1	2	2	2.27
Strongly Disagree	0	1	0	0.00
Total	22		88	100.00

Table 3.7 above shows that the average score is 88/22

= 4.00, which is in the interval 3.40 to 4.19, which means agree. Thus, it can be concluded that the majority of respondents agree with the statement about the features available in virtual lab are easy to use.

TABLE 3. 8 ENJOYMENT IN THE USE OF VIRTUAL LAB

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	5	5	25	30.12
Agree	9	4	36	43.37
Doubtful	6	3	18	21.69

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Disagree	2	2	4	4.82
Strongly Disagree	0	1	0	0.00
Total	22		83	100.00

Table 3.8 above shows that the average score are 83/22 = 3.77, which is in the interval 3.40 to 4.19, which means agree. Thus, it can be concluded that the majority of respondents agree with the statement "I really enjoy learning the programming language C in the virtual lab"

TABLE 3. 9 EASY TO UNDERTAND

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	6	5	30	34.88
Agree	9	4	36	41.86
Doubtful	6	3	18	20.93
Disagree	1	2	2	2.33
Strongly Disagree	0	1	0	0.00

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Total	22		86	100.00

Table 3.9 above shows that the average score is 86/22

= 3.91 which is in the interval 3.40 to 4.19, which means agree. Thus, it can be concluded that the majority of respondents agree with the statement about the commands on a virtual lab are easy to understand

TABLE 3. 10 EASY TO REMEMBER

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	7	5	35	39.77
Agree	8	4	32	36.36
Doubtful	7	3	21	23.86
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	22		88	100.00

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Table 3.10 above shows that the average score is 88/22 = 4.00 which is in the interval 3.40 to 4.19, which means agree. Thus, it can be concluded that the majority of respondents agree with the statement that commands contained in the virtual lab are easy to remember.

TABLE BOREDO

3. 11 M

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	1	5	5	8.77
Agree	2	4	8	14.04
Doubtful	6	3	18	31.58
Disagree	13	2	26	45.61
Strongly Disagree	0	1	0	0.00
Total	22		57	100.00

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Table 3.11 above shows that the average score is 57/22 = 2.59 which is in the interval 1.80 to 2.59, which means do not agree. Thus, it can be concluded that the majority of respondents disagreed with the statement about the study using the virtual lab is very boring

TABLE 3. 12 ENJOYMENT

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	4	5	20	22.99
Agree	13	4	52	59.77
Doubtful	5	3	15	17.24
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	22		87	100.00

Table 3.12 above shows that the average score is 87/22

= 3.95 which is in the interval 3.40 to 4.19, which means agree. Thus, it can be concluded that the majority of respondents agree with the statement about learning with virtual lab is very pleasant.

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TABLE 3. 13 THE RESULTS OF THE QUESTIONNAIRE DATA PROCESSING

No	Statements	Score	Notes
1	Elements (images, text, audio, video) in the virtual lab can be seen clearly	4,36	Strongly Agree
2	The display of the virtual lab is simple and not confusing	4,09	Agree
3	C language programming material in the virtual lab is clearly displayed so easily understood	4,18	Agree
4	The features in the virtual lab has a good function	4,00	Agree

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5	The features available on the Virtual Lab is easy to use	4,00	Agree
6	I really enjoyed learning the C programming language in the virtual lab	3,77	Agree
7	Commands in the virtual lab is easy to understand	3,91	Agree
8	Commands in the virtual lab is easy to remember	4,00	Agree
9	Learning in a virtual lab is very boring	2,59	Disagree
10	Learning in a virtual lab is very pleasant	3,95	Agree

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I.B.2 *Analisys of Lecture Questionaire* The following is an analysis of each statement in the researchThe following is an analysis of each statement in

the research questionnaire for lecturer respondents

TABLE 3. 14 CLARITY OF ELEMENTS

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	0	5	0	0.00
Agree	5	4	20	86.96
Doubtful	1	3	3	13.04
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	6		23	100.00

Table above shows that the average score is 23/6 = 3.83 which is in the interval 3.40 to 4.19, which means agree. Thus, it can be concluded that the majority of respondents agree with the statement about the clarity of

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the elements in the virtual lab

TABLE 3. 15 SIMPLICITY

Response	Amount	Value	Score	Percentage
Strongly Agree	4	5	20	71.43
Agree	2	4	8	28.57
Doubtful	0	3	0	0.00
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	6		28	100.00

Table 3.15 above shows that the average score is 28/6

= 4.67 which is in the interval 4.20 to 5.00, which means strongly agree. Thus, it can be concluded that the majority of respondents strongly agreed with the statement about the simplicity of appearance of the virtual lab.

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TABLE 3. 16 CLARITY OF MATERIALS

Response	Amount	Value	Score	Percentage
Strongly Agree	3	5	15	55.56
Agree	3	4	12	44.44
Doubtful	0	3	0	0.00
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	6		27	100.00

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Table 3.16 above shows that the average score is 27/6 = 4.50 which is in the interval 4.20 to 5.00, which means strongly agree. Thus, it can be concluded that the majority of respondents strongly agreed with the statement regarding the clarity of the materials on virtual lab.

TABLE 3. 17

FEATURES HAS A GOOD FUNCTION

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	4	5	20	71.43
Agree	2	4	8	28.57
Doubtful	0	3	0	0.00
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	6		28	100.00

Table 3.17 above shows that the average score is 28/6

= 4.67, which is in the interval 4.20 to 5.00, which means strongly agree. Thus, it can be concluded that the majority of respondents strongly agreed with the statement about the features available in the virtual lab has a good function.

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TABLE 3. 18 EASY TO USE

Response	Amount	Value	Score	Percentage
Strongly Agree	3	5	15	55.56
Agree	3	4	12	44.44
Doubtful	0	3	0	0.00
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	6		27	100.00

Table 3.18 above shows that the average score is 27/6

= 4.50, which is in the interval 4.20 to 5.00, which means strongly agree. Thus, it can be concluded that the majority

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of respondents strongly agreed with the statement about the features available in the virtual lab are easy to use.

TABLE 3. 19

ENJOYMENT IN THE USE OF VIRTUAL LAB

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	0	5	0	0.00
Agree	5	4	20	86.96
Doubtful	1	3	3	13.04
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	6		23	100.00

Table 3.19 above shows that the average score is 23/6 = 3.83, which is in the interval 3.40 to 4.19, which means agree. Thus, it can be concluded that the majority of respondents agree with the statement "I really enjoy learning the programming language C in the virtual lab"

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TABLE 3. 20 EASY TO UNDERSTAND

Response	Amount	Value	Score	Percentage
Strongly Agree	5	5	25	86.21
Agree	1	4	4	13.79
Doubtful	0	3	0	0.00
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	6		29	100.00

Table 3.20 above shows that the average score is 29/6

= 4.83 which is in the interval 4.20 to 5.00, which means strongly agree. Thus, it can be concluded that the majority of respondents strongly agreed with the statement that the commands the virtual lab are easy to understand

TABLE 3. 21 EASY TO REMEMBER

Response	Amount	Value	Score	Percentage

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Strongly Agree	4	5	20	71.43
Agree	2	4	8	28.57
Doubtful	0	3	0	0.00
Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	6		28	100.00

Table 3.21 above shows that the average score is 28/6

= 4.67 which is in the interval 4.20 to 5.00, which means strongly agree. Thus, it can be concluded that the majority of respondents strongly agreed with the statement that the commands contained in the virtual lab are easy to remember

TABLE 3. 22 BOREDOM

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	0	5	0	0.00

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Agree	0	4	0	0.00
Doubtful	2	3	6	42.86
Disagree	4	2	8	57.14
Strongly Disagree	0	1	0	0.00
Total	6		14	100.00

Table 3.22 above shows that the average score is 14/6

= 2.33 which is in the interval 1.80 to 2.59, which means do not agree. Thus, it can be concluded that the majority of respondents disagreed with the statement about the study using the virtual lab is very boring

TABLE 3. 23 ENJOYMENT

Response	**Amount**	**Value**	**Score**	**Percentage**
Strongly Agree	4	5	20	71.43
Agree	2	4	8	28.57
Doubtful	0	3	0	0.00

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Disagree	0	2	0	0.00
Strongly Disagree	0	1	0	0.00
Total	6		28	100.00

Table 3.23 above shows that the average score is 28/6 = 4.67 which is in the interval 4.20 to 5.00, which means strongly agree. Thus, it can be concluded that the majority of respondents strongly agreed with the statement about the study using the virtual lab is very pleasant.

TABLE 3. 24 THE RESULTS OF THE QUESTIONNAIRE DATA PROCESSING

No	Statements	Score	Notes
1	Elements (images, text, audio, video) in the virtual lab can be seen clearly	3.83	Agree
2	The display of the virtual lab is simple and not confusing	4.67	Strongly Agree
3	C language programming material in the virtual lab is clearly displayed so easily understood	4.50	Strongly Agree
4	The features in the virtual lab has a good	4.67	Strongly

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	function		Agree
5	The features available on the Virtual Lab is easy to use	4.50	Strongly Agree
6	I really enjoyed learning the C programming language in the virtual lab	3.83	Agree
7	Commands in the virtual lab is easy to understand	4.83	Strongly Agree
8	Commands in the virtual lab is easy to remember	4.67	Strongly Agree
9	Learning in a virtual lab is very boring	2.33	Strongly Disagree
10	Learning in a virtual lab is very pleasant	4.67	Strongly Agree

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IV. CONCLUSION

The results of testing and processing of qualitative data showed that the respondents agreed that a virtual laboratory in accordance with the goals of usability and user experience that is effective, efficient, safe to use, has a good utility, easy to learn and easy to remember by the users

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