

## Development of E-Authentic Assessment in Computer Network Learning

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**Abstract** - This research is aimed to produce an online instrument of authentic assessment in computer network learning which uses problem-based learning model. This web-based authentic assessment instrument shares similar content with the conventional authentic assessment yet is more effective and efficient. In order to get a valid, practical, and effective authentic assessment, several tests are carried out in Computer Science Faculty of Dharmas Indonesia University. This research employs ADDIE (Analysis, Design, Development, Implementation, and Evaluation) method and the data is analyzed in descriptive-quantitative approach. The validity of the product is tested by some experts and its practicality is tested by the users based on the result of the students' learning outcomes. The result of validity test shows that the developed authentic assessment is 96% valid. The result of practical test shows that the developed authentic assessment is very practical with 93% for semester learning plans (RPS). According to the result of effectiveness test, the developed authentic assessment is effective for homogenous sample with sig value  $0,007 < 0,05$ , indicating that there is a significant difference of learning outcomes between controlled class and experiment class. This means that the developed authentic assessment in computer network learning is valid, practical, and effective to measure the students' skill and competence.

**Keywords:** e-authentic assessment, computer network, media, website.

### I. INTRODUCTION

Since lecturer is the one who directly interact with students in class, their professionalism are crucial and therefore, required in improving the quality of education. Lecturer must have pedagogical ability, which includes the capability in giving assessment. This skill becomes an instrument in evaluating lecturer's competence in pedagogical aspect, where the lecturer becomes both the main component and the executor in the development of the assessment, and the assessment process itself.

Assessment is crucial component in a learning process because the purpose of learning itself is to improve the student's behavior [1]. Assessment is a process of collecting, analyzing, and estimating information in order to find the level of the student's achievement based on the objectives of the course. Therefore, the right assessment system would be able to reflect the learning quality and useful for the lecturer to plan a learning strategy [2]. The right assessment system would also motivate the student to improve their competence. The information that is obtained through assessment can be used in the student evaluation, deciding curriculum, school programme, and education policy [3].

However, assessment is mostly misunderstood in the way of referring it with test-taking or

evaluation. Assessment is a process that use systematic method to collect, analyze, and estimate the data or information in order to determine whether an individual (student) is considered to have the expected competence according the objectives of the learning [4]. This statement is supported by the definition of assessment in Standar Penilaian Pendidikan (BNSP, 2007) which states that assessment is the process of collecting and processing information to determine the student's learning outcomes. In order to get a proper assessment, the fundamental principle that must be complied is the instrument that is used in assessing the student's learning outcomes [5]. Therefore, the instrument that is used should be compatible with the learning situation. Student should be able to do the activity or authentic assignment which represents the implementation of the knowledge and skill. An activity is aimed to assess the student must emphasize the areas that should be assessed, both the process and the outcomes, with various authentic assessment instrument adjusted with the requirement of the competence [6]. Authentic assessment itself consist of performance, project, portfolio, written test and self-evaluation [7].

Studies that are conducted by [8], [9] show that educator at school mostly uses multiple choices question in class assessment. The options are a form of discrimination of student's answer,

since the answer implies that the student has partial, incomplete or wrong information. The options in multiple choices question do not stimulate the student's cognitive when they answer the question in a random way. Therefore, it is important to find another assessment model that can improve student's higher order thinking skills.

Authentic assessment is an assessment model of learning outcomes that appreciate the student's learning skill. According to [10], assessment is the term that includes the process of getting information about the student's learning. Burton [11] defines authentic assessment as a process of assessing by combining knowledge and the practice. Authentic assessment is a model that assesses student in doing task in the real world situation so the student can implement the relevant knowledge in their environment. This model is considered as a new approach in assessment [12], which help the student to relate the knowledge that is gained in learning with the relevant context and real, complicated situation [13].

Authentic assessment is an assessment model that is based on the student's practice, where their performance in the real world is simulated [14]. According to Gulikers, Bastiaens, &Kirschner [15], authentic assessment is the assessment that requires the student to use their competence, or combine the cognitive, psychomotor, and affective aspect that must be implemented in their life. Authentic in this sense is subjective, therefore it is important to consider the perspective of the assessment that will affect the learning. In addition, Frey [16] defines authentic assessment as a synchronic assessment between the task in the class and what is needed in the real world. He also believes that an assessment is considered authentic when the task, content, requirements, and the research method are related with what is needed in the real world. Research shows that an assessment is way more authentic when the assessment is similar with the real world situation [17].

Not only considering the affective aspect, cognitive, and psychomotor, and the variation of instruments that are used, E-authentic assessment also considers the input, process, and the output of student's learning [18], [19]. Assessment of student's learning must be conducted in the beginning of the learning (input), during the learning (process), and after the learning (output) [20].

The E-Authentic assessments that are previously used by lecturers are mostly the test-model assessment, without considering the cognitive, affective, and psychomotor aspect. The system in the test-model assessment indicates that the learning output is measured through the score the written test [21]. In the execution, the lecturer must prepare the assessment, especially designing the rubric of the assessment and set certain criteria for the assessment, even before conducting the test itself [22]. Authentic assessment will focus on the functional skill which will help the student to be independent and confident in their environment [23].

Computer network is one of expertise courses in computer informatics field in which this subject has a big contribution in the development of the Information Technology [24]. It deals with the concept of network in general, starting from the state of art of the computer network, implementing the concept in network design, both wired and wireless [25].The students who pass this class should be able to develop the basic knowledge and skill of a good and efficient computer network [26].

The researchers also conducted some interviews to the students of Computer Science Faculty of Dharmas Indonesia University who has passed the computer network course. The students state that the assessment is always conducted by the end of the learning and is used as the main source. Furthermore, the assessment that the lecturer used is test-model assessment, without considering the cognitive, affective, or psychomotor aspect. This model then shows that the student's learning outcome is measured by objective written test.

If the assessment of cognitive aspect was conducted through written test, lecturer assesses the psychomotor aspect based on the student's performance, where the student must demonstrate certain competence through practicing, project, and portfolio evaluation. However, this assessment would spend a large amount of paper and there is no guarantee about the efficiency of the assessment. A web-based assessment (e-authentic assessment) hence is needed; a system that can accommodate an effective and efficient assessment. Due to this case, it is important to conduct a research regarding the development of web-based assessment in learning in order to improve their psychomotor competence in computer network learning without ignoring the cognitive and

affective aspect. The aim of this research is to develop and produce e-authentic as an assessment instrument based on Problem Based Learning model in computer network learning.

**II. MATERIALS AND METHOD**

This research is a development research that uses Research and Development (R & D) design. Research and Development is a research model used to produce certain products, and test the effectiveness of these products [27]. This development research was designed to produce a product that is in the form of an authentic assessment instrument in Network Learning Course. This development research product uses ADDIE models consists of five phases (analysis, design, development, implementation, and evaluation).The instruments used in this study are validation instruments, practicality instruments, and effectiveness instruments[28]. The technique of collecting qualitative data is done by interview, observation and study documentation[29]–[31].The validity of qualitative data credibility; the term used in qualitative research to replace the concept of validity on quantitative data is tested. Data credibility can be maintained by using several criteria of examination techniques, namely: 1) extension of the researcher's participation in the field, 2) increasing observational persistence, 3) triangulation [32]. The quantitative data is analyzed by descriptive statistics, while qualitative data is analyzed and preswnted with reduction, display, and conclusions [33].

**A. Validation**

- Product validation analysis is based on the results of the validator's assessment. The ddata is obtained through questionnaires and is analyzed using descriptive statistics [34]. The steps to carry out the analysis are as follows;
  - a. Give score answers with scoring techniques using a Likert scale technique.
  - b. Add the scores of each validator to all indicators.
  - c. Aiken’s V Statistics:

$$V = \sum s / [n(c - 1)] \tag{1}$$

- s = r - lo
- lo = lowest validity number (1)
- c = highest validity number (5)
- r = number given by an appraiser

**B. Practicality**

Practical data analysis is obtained from the lecturer's questionnaire responses to the products developed. Calculation of final value data from questionnaire results analyzed on a scale (0-100) is done using the formula:

$$P = \frac{f}{N} \times 100 \tag{2}$$

- P = Final Value
- f = Score
- N = Maximum Score

The practicality of the authentic assessment instrument in the table 1.

TABLE 1  
CATEGORIES of PRODUCT PRACTICALITY

Interval	Category
0-20	Very impractical
21-40	Not practical
41-60	Less practical
61-80	Practical
81-100	Very practical

Source : Ridwan Abdullah Sani[35]

**C. Effectiveness**

This study consists of two variables, namely the independent variable (X) and the dependent variable (Y). The independent variable in this study is the authentic assessment, while the dependent variable in this study is the student learning outcomes in the realm of attitudes, knowledge and skills. This study uses a single group research design with a time series called basic time series design. Basic time series design is a research design that falls into the category of quasi-experiments. In practice, basic time series design uses only one experimental class without the control class being followed. In the design of this study, samples in the experimental class will be given a pre-test, authentic assessment treatment, and post-test several times. The design of this study is illustrated as shown in fig. 1:

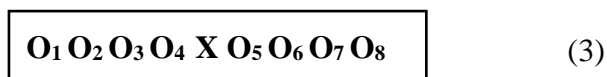


Fig 1 Time Series Experiment Design

- O<sub>1</sub> O<sub>2</sub> O<sub>3</sub> O<sub>4</sub> : Pre-test
- X : Authentic assessment treatment
- O<sub>5</sub> O<sub>6</sub> O<sub>7</sub> O<sub>8</sub> : Post-test

### III. RESULTS AND DISCUSSION

#### A. RESULT

Authentic assessment development in computer network learning to measure student skills produces research that includes: valid, practical criteria and effectiveness of instrument use, student responses, and educator responses. Data collection was done using observation sheets of practical skills, authentic assessment instruments and questionnaires. Data collection has been carried out in the Informatics Engineering Study Program of Dharmas Indonesia University in February to June 2019 with routing and wireless material for 4th semester IT students. The stages carried out to produce authentic products for learning computer network learning are:

##### 1. Analysis

###### a. Curriculum Analysis

Analysis of this curriculum refers to the syllabus of computer network subjects; the material developed in learning is a topic that is at a synopsis of computer network subjects

###### b. Material Analysis

Computer network learning material refers to the KPT-KKNI curriculum. Knowledge about routing and wireless is the basic capital for students before practicing in the laboratory. These criteria are important in order to prevent errors in configuring the equipment available in the laboratory. Based on this analysis, the material taken is routing and wireless.

###### c. Student analysis

This initial analysis is done by interview in order to determine the development of students in terms of skills during learning.

##### 2. Design

This design phase was carried out to make authentic computer network learning assessment. At this stage, authentic assessment is produced in accordance with the guidelines for making good and appropriate authentic assessment. The researcher designed an authentic assessment of computer network learning, following the authentic details of the assessment that had been produced:

###### a. Compile the Authentic Assessment Framework

Authentic assessment framework contains basic competencies and indicators of achievement of competencies in lesson plans. In addition, there is an assessment starting from cognitive, affective, and psychomotor aspects in authentic assessment.

###### b. Compiling E-Authentic assessment

Components Assessment The E-authentic assessment component includes Web design e-authentic assessment, interfaces and menus. Authentic assessments will be accessed via: <https://raimone-learning.com>. The main feature in this e-authentic assessment is the authentic rubric feature of the assessment. In this assessment form, lecturers input the instruments that will be used as references in student assessment. In this computer network course, there are several criteria that is used as guidelines in the assessment. There are several steps that must be taken to get the results on e-authentic assessments

###### c. Input assessment instruments

The process that is first performed by lecturers is inputting assessment instruments (authentic assessment); these instruments are inputted with the steps Topic Entry. This topic entry form is used to input topics of competency / learning topics, topics tailored to the subject as shown in fig 2.

NO	NAMA TOPIK	ACTION
1	TOPIK 1: ARSITEKTUR JARINGAN	+Add Rubrik Delete
2	TOPIK 2: MODEL REFERENSI	+Add Rubrik Delete
3	TOPIK 3: ROUTING	+Add Rubrik Delete
4	TOPIK 4: WIRELESS	+Add Rubrik Delete

Fig 2 Topic Entry Form

After the topic is set, there will be several rubric ratings on each topic. Based on the concept of competency learning models, the rubric is categorized into rubric performance, competency rubric, and practicum rubric. This rubric Master Entry consists of components and sub components of the rubric as shown in fig 3.

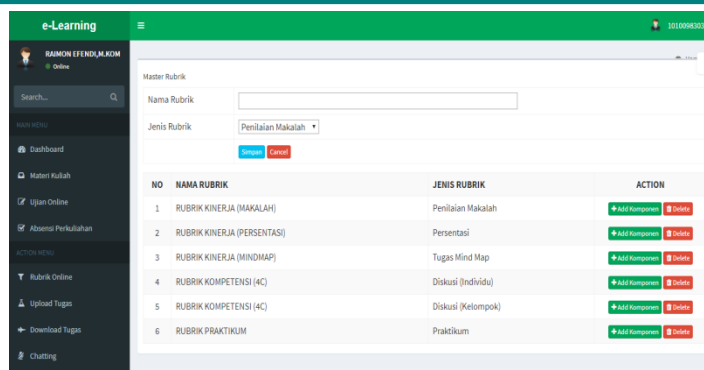


Fig 3 Entry master rubric

The e-authentic assessment facilities have been provided to recapitulate the assessments for all topics (affective, psychomotor and cognitive). The lecturer can see the overall value in the print menu, which will display the recap of the entire learning process that has been done by students for 1 semester, as shown in fig. 4.

Fig 4 Result of rubric

### 3. Development

At this stage of development, the aim is to obtain the authentic learning assessment that is valid. Validity test data is obtained from validator responses about validity of authentic assessment. In this validation stage, authentic Computer Network assessment undergoes several improvements based on suggestions from the validator as shown in Table 2.

TABLE II  
RESULTS of RPS

Aspect	Judgment Validat or			Σ s	Aiken's V	Result
	1	2	3			
Item 1	5	5	5	12	0.750	valid
Item 2	5	5	5	12	0.750	valid
Item 3	5	5	5	12	0.750	valid
Item 4	4	4	4	9	0.563	invalid
Item 5	4	4	4	10	0.625	valid
Item 6a	5	5	5	12	0.750	valid
Item 6b	5	5	5	12	0.750	valid

Item 6c	5	5	5	12	0.750	valid
Item 6d	5	5	5	12	0.750	valid
Item 6e	5	5	5	12	0.750	valid
Item 6f	5	5	5	12	0.750	valid
Item 7	4	5	5	11	0.688	valid
Item 8	5	4	4	10	0.625	valid
Item 9	5	5	5	12	0.750	valid
Item 10	5	4	4	10	0.625	valid
Average	5	5	5	11	0.708	valid

Based on Table III, it can be concluded that the assessment on RPS Automotive Engineering Basic Work is valid with the value of Aiken's V amounting to 0.708.

TABLE III  
RESULTS of AUTHENTIC ASESMENT VALIDATION

No	Aspect	Judgment Validator			Σs	Aiken's V	Result
		1	2	3			
A	Item 1	4	5	4	10	0.625	valid
	Item 2	5	4	5	11	0.688	valid
	Item 3	5	4	5	11	0.688	valid
	Item 4	5	5	4	12	0.750	valid
B	Item 1	5	5	4	12	0.750	valid
	Item 2	5	4	5	11	0.688	valid
	Item 3	5	5	5	12	0.750	valid
	Item 4	5	5	5	12	0.750	valid
C	Item 1	5	5	5	12	0.750	valid
	Item 2	5	5	5	12	0.750	valid
	Item 3	5	4	5	11	0.688	valid
	Item 4	5	5	5	12	0.750	valid
	Item 5	5	4	5	11	0.688	valid

### 4. Implementation

This stage aims to obtain the authentic computer learning network learning that is practical and effective. Authentic assessment that has been refined based on expert testing is then tested. The authentic test of learning assessment begins with giving a pretest. Pretest data were analyzed and then the students are invited to use the authentic assessment. Finally the students were given a posttest. In order to identify the important information that exists in the study, the talking stick method after following the learning was employed. The type of test is written. The

procedure in this assessment are: a) Form: Essay; b) Type: Written test; c) Process: Lecturer assessment of learning activities; d) The results: Pretest (initial test) and Post-test (final test).

This study also aims to determine the effectiveness of authentic assessment. Below are the description of the practicality test and effectiveness test.

a. Test authentic assessment practices

Practical test of authentic assessment instrument is carried out on the lecturer. The analysis of the lecturer's practical results on authentic assessment can be seen in appendix 6. The following are the results of the practical assessment of each authentic assessment seen from the practical aspects of each practitioner in the following Table IV

TABLE IV  
PRACTICALITY RESULTS of RPS&  
AUTHENTIC ASSESSMENT

No	practitioner	Practical value (%)	
		RPS	E-Aut Ass
1	Practitioner 1	95	94
2	Practitioner 2	95	88
3	Practitioner 3	90	91
Average		93	91

In Table 4, it can be seen that the average value of each e-authentic assessment instrument ranges from 91 to 93 which can be categorized as very practical. Based on suggestions from Computer Network Lecturers at the Faculty of Computer Science, University of Dharmas Indonesia, authentic assessment instruments can be used in daily learning, and can be used as guidance in developing instruments on other computer science materials that have the same characteristics.

b. Authentic assessment effectiveness test

Effectiveness of the use of Authentic Assessment in learning computer networks to measure student skills are reviewed in two ways, namely by looking at the achievement of minimum score in a classical manner along with the diagram presented using time series and by calculating pretest and posttest data using the gained score of the test analysis.

c. Effectiveness is viewed from minimum mastery criteria in a classical manner with time series methods.

Classical completeness with the time series method can be seen in the average value of the students for 4 times face-to-face before using the Authentic Assessment instrument compared to the student grades after using Authentic Assessment instruments. The guide to determine the student completeness is to compare the values of the minimum mastery criteria that have been determined.

The value that is used is the value of the test results for each meeting conducted by the learning process four times before and four times after using Authentic Assessment instruments. Student test results are then given a value with the stipulated conditions; the value is compared with minimum mastery criteria for computer network subjects, which is 75. Comparison of overall student scores with time series calculations can be seen in table V

TABLE V  
COMPARISON of STUDENT GRADES WITH  
TIME SERIES CALCULATIONS

N o	Pr e-tes t	Avera ge	explanat ion	Pos t-test	avera ge	explanat ion
1	Pr e <sub>1</sub>	71.27	incompl ete	Pos t <sub>1</sub>	82.41	complet e
2	Pr e <sub>2</sub>	71.18	incompl ete	Pos t <sub>2</sub>	82.41	complet e
3	Pr e <sub>3</sub>	71.50	incompl ete	Pos t <sub>3</sub>	82.41	complet e
4	Pr e <sub>4</sub>	72.41	incompl ete	Pos t <sub>4</sub>	82.41	complet e

The following are the results of the pretest and posttest in Table V presented on line drawing graph IV.

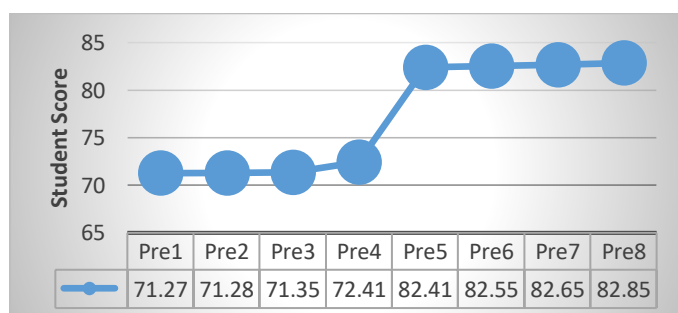


Fig 5 Display of Pretest and Posttest Results Data

The results of the data analysis shows that the good treatment are obtained, where the pretest shows a stable and consistent group condition ( $O1 = O2 = O3 = O4$ ), after being treated, the condition increases consistently ( $O5 = O6 = O7 = O8$ ). A good pre-test result is ( $O1 = O2 = O3 = O4$ ), and a good post-test result is ( $O5 = O6 = O7 = O8$ ). The magnitude of the effect of treatment is ( $O5 = O6 = O7 = O8$ ) - ( $O1 = O2 = O3 = O4$ ). In this study ( $O1 = O2 = O3 = O4$ ) = (Pre1 = Pre2 = Pre3 = Pre4) and for ( $O5 = O6 = O7 = O8$ ) = (Post1 = Post2 = Post3 = Post4).

According to the results of the study, the results of good treatment (Pre1 = Pre2 = Pre3 = Pre4) and the results of good treatment are obtained (Post1 = Post2 = Post3 = Post4). The results of the pretest showed a stable and consistent group condition, after being given treatment the situation improved consistently. The results of the calculation of the large treatment of students can be found in the Table VI

TABLE VI  
RESULTS of THE EFFECT TREATMENT WITH TIME SERIES

N o	Pre-test	Average	Post-test	average	Value of Effect of Treatment	Percent age
1	Pre <sub>1</sub>	71.27	Pos <sub>t1</sub>	82.41	0.39	39 %
2	Pre <sub>2</sub>	71.18	Pos <sub>t2</sub>	82.41	0.39	39 %
3	Pre <sub>3</sub>	71.50	Pos <sub>t3</sub>	82.41	0.38	38 %
4	Pre <sub>4</sub>	72.41	Pos <sub>t4</sub>	82.41	0.36	36%
Average					0.38	38 %

The magnitude of the effect of treatment is: (Post 1 = Post2 = Post3 = Post4) - (Pre1 = Pre2 = Pre3 = Pre4) so that the minimum score percentage of students is: 38%.

d. Effectiveness in terms of differences in the gain score test results.

Gain score test to see an increase in student learning outcomes from the value of the pre-test and post-test. The results of the analysis of student learning outcomes data using authentic assessment using the gain score test obtained a value of 0.38 medium categories. The results of the analysis of effectiveness using the gain score test. Thus it can be concluded that authentic assessment in computer network learning to measure student skills is effective for use.

5. Evaluation

This stage explains the evaluation of product development, namely authentic assessment in computer network learning. Evaluations are carried out starting from the analysis, design, develop, and implementation stages. This evaluation resulted in product revisions that served to improve the products developed.

B. Discussion

1. E-Authentic Assessment in computer network learning.

Computer network learning is conducted in both theoretical way and practice so the students can use and implement their competence after they graduate. Prior to the learning process, the lecturer should prepare the assessment instrument. The assessment instrument plays an important role in the successfulness of the process. Therefore, the development of authentic assessment is potential enough to fulfill the need of assessment in learning. The advantage of e-authentic learning is the ability of measuring the students' skill and giving chance to the students to learn independently. The developed E-authentic assessment instrument is expected to be a model and used as an example for lecturers in making e-authentic assessment instrument. The research and the developed authentic assessment instrument uses ADDIE, which consist of 5 stages, where it is expected to get a valid, practical, and effective authentic assessment instrument. The instrument is provided in the web (online) for the sake of efficiency. Authentic assessment instrument that has been developed, validated, and revised has been arranged in a book without publication. In analyzing the data, several steps have been taken; curriculum analysis, material analysis, and student analysis. This stage is conducted as a foundation in order to develop the authentic assessment in computer network course so it can facilitate the

students to learn independently. After analyzing the data, the authentic research provides two learning topics. Finally, the validity, practicality, and effectiveness of the product are then tested.

## 2. Validation of authentic assessment instrument

The development of authentic assessment instrument can support the assessment process in learning. Authentic instrument that is used must be valid. The authentic validation is conducted by 3 validators; Validator 1 grades 5 in the valid category. Validator 2; 5 in valid category. Validator 3; 5 in valid category. The authentic assessment instrument validation is done one time only, with some flaws of the developed e-authentic assessment instrument found. Then, the authentic assessment instrument is revised according to the suggestion of the validators. The result of the authentic assessment instrument validation by the validators shows that the instrument is valid with V Aiken 0,708 for semester learning plans (RPS) and V Aiken 0,716 for authentic assessment.

## 2. Practicality of the authentic assessment instrument

The practicality of the e-authentic assessment instrument is obtained from the result of lecturers' response of the questionnaire. Based on the result of practicality of RPS & the e-authentic assessment by the lecturers, the means of each e-authentic assessment instrument ranges from 91-93 which can be categorized as very practical. The result of the lecturers' response shows that the e-authentic assessment instrument is practical and can be used to measure student's competence. The learning activities and the assessment that is done can motivate the student and improve their learning interest, so the interactive learning process occurs. This authentic assessment instrument is also expected to be used in daily learning as a guide to develop the assessment instrument in other material.

## 3. Effectiveness of authentic assessment instrument

This research is seen in the ability of authentic assessment to stimulate the students to be active in learning and facilitate their understanding about assessment in learning. In this assessment, the effectiveness of authentic assessment can be seen from the outcomes of the students learning. A test is carried out in order to determine the effectiveness of the learning process. Learning outcomes is the students' capability after the

learning process. Learning process is an effective learning activity that can result a good learning outcomes. The goal of learning outcomes assessment is to measure the successfulness of learning process. Effectiveness of the authentic assessment instrument is proven by the score of a test where the result is 0,38 indicating a medium level of effectiveness. Hence, it can be concluded that the authentic assessment instrument in computer network learning can be categorized as effective in measuring the students' skill. Therefore, the result of this research shows that the developed authentic assessment in computer network learning is a valid instrument, practical, and effective and can be used in learning process.

## IV. CONCLUSION

### A. Conclusion

Below are some conclusions of the research "The Development of e-authentic assessment in computer network learning":

1. Developing this authentic assessment instrument uses ADDIE method by analyzing the curriculum, material requirements, and the student themselves in computer network learning to measure the students' competence.
2. Authentic assessment instrument in computer network learning to measure the students' competence fulfill these criteria:
  - a. Validity, proven by finishing the assessment phase that is given by credible lecturers to produce a valid instrument.
  - b. Practical, proven by the obtained score which indicates 'very practical' category given by lecturers
  - c. Effective, found in the result of the analysis of the students' learning outcomes using times series and the obtained score of the given test.

### B. Implications

This development research has produced a valid, practical, and effective instrument for authentic assessment. The authentic assessment in computer network learning can be used as a guide of assessment for lecturers and students in learning process. Based on the validation and practicality test, all of the statements regarding the indicators are positively responded by the experts and lecturers. This shows that the

developed authentic assessment can be used in learning process. Beside, this instrument can also help lecturers to develop assessment strategy in helping the student to be more creative and innovative.

### C. Suggestion

Below are some suggestions for the next related research:

1. Conducting a deeper study about the authentic assessment in learning that is developed by e-authentic assessment that can be used in learning process. Beside, this can help lecturers to develop assessment strategy in helping students to be more creative and innovative.
2. The advanced research about the development of authentic assessment in computer network learning for measuring the students' skill in various courses is necessary.
3. In developing the instruments, more pictures are necessary to help describing some statements and questions in a more communicative way to measure the students' skill, help improving the quality of research in the future.

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