

The Development of E-Learning Based Instructional Media for English Education at Medan Civil Aviation Academy

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Abstract. The research aims to give comprehension of the concept of E-Learning as an instructional media, to develop E-Learning based instructional media for English and to know the effectiveness of E-Learning as an instructional media to improve cadets' skill in English. E-Learning based instructional media was developed in Learning Management System (LMS) of Medan Civil Aviation Academy consisting of applicable features to be used easily and effectively by lecturer and cadets based on Elementary English lesson plan. The research was conducted at Medan Civil Aviation Academy in the odd semester of 2019/2020 academic year. The population was 144 cadets of first year and 24 cadets were taken as the sample through cluster random sampling technique. The method used in this research was research and development method and the technique of collecting data were by test and questionnaire. The results of the research concluded that cadets conducting E-Learning based instructional media achieved higher score (70,10) than conventional method (56,67), the development of E-Learning based instructional media showed high effectiveness in learning process gained from valid and reliable questionnaire ($r_{11} = 0.8205$) and the development of E-Learning based instructional media was stated in a very good category in term of usability aspect.

Keywords: Conventional Method, E-learning, English, Effectiveness, Instructional Media, Usability

Received 22 July 2020 | Revised 15 December 2020 | Accepted 31 January 2021

1. Introduction

The development of technology in the industrial revolution era of 4.0 which emphasizes the pattern of digitalization requires that the education would be able to produce qualified lecturers who can take the advantages to improve the quality of students. It has become one of the opportunities that is quite challenging for lecturers [1] in creating concepts and mechanisms of teaching and learning based on information technology. The rapid development of technology

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can not be avoided even can provide convenience if properly implied in education. We can apply it in instructional media to improve learning effectiveness.

Instructional media is a tool that can be used to facilitate the learning process, one of it is in form of E-Learning which transforms conventional education into digital form. E-Learning can be used as an alternative media for students and lecturers to learn if they cannot meet face to face in the classroom.

Medan Civil Aviation Academy (ATKP) as one of the higher education institutions in the aviation world strives to utilize the development of information technology in the learning process, however, the use of E-Learning has not been fully applied in the campus. Therefore, the authors intended to conduct a study on the development of E-Learning based instructional media for English at ATKP Medan.

2. Literature Review

Many terms are used to call electronic learning, including: on-line learning, internet-enabled learning, virtual learning, or web-based learning. There are 3 (three) important things as requirements for electronic learning activities (E-Learning), namely: (a) learning activities carried out through network utilization ("networks" in this description are limited to internet use. Networks may include LAN or WAN), (b) the availability of learning service that can be utilized by learning participants, such as CD-ROMs, or printed materials, and (c) the availability of tutor that can help participants to learn if they find difficulties. Thus, it can simply be said that electronic learning (E-Learning) is a learning activity that utilizes networks (Internet, LAN, WAN) as a method of delivery, interaction, and facilitation and is supported by various other forms of learning services [2].

The benefits of electronic learning according to Bates and Wulf [2] consist of 4 things, namely: 1) Increase the level of learning interaction between student and teacher or instructor (enhance interactivity), 2) Enable learning interaction anywhere and any time (time and place flexibility), 3) Reach students in wide range (potential to reach a global audience), 4) Facilitate the improvement and storage of learning materials (easy updating of content as well as archivable capabilities).

Lecturers need to have abilities to: a) Understanding E-Learning, b) Identifying student characteristics, c) Designing and developing interactive learning material in accordance with new technological developments, d) Adapting teaching strategies to deliver material electronically, e) Organizing material in a format that is easy to learn, f) Conducting training and practice electronically, g) Engaging in planning, developing, and decision making, h) Evaluating the success of learning, attitude and perception of the students [3].

The strategy of applying E-Learning to support the implementation of learning process is expected to increase the comprehension of students on the material given; increase the active participation of students; improve students' self learning skills; improve the quality of education and training materials, improve the ability to share information by information technology devices; expand the teaching-learning process by using computer networks. To achieve those things, in developing an E-Learning application it is necessary to note that the materials displayed must support the delivery of valid information, not only prioritizing the aesthetics; pay close attention to the teaching-learning techniques used; pay attention to student progress

evaluation techniques and student progress data storage. Moreover, E-Learning should be displayed in an interesting form and features so it can improve attract learner's attention to operate E-Learning [4].

E-Learning has been applied in many higher educations around the world. It becomes an evolution of learning process from conventional method to a new system of education. It has many features and teaching approaches that support learning process so it needs to conduct benchmarks to improve the quality assurance of E-Learning [5].

E-Learning can be applied in many subjects and application. For instance, LariJava application [6] that was developed to learn problem-solving method. It was updated with some features and had a test to gain the results. E-Learning takes the advantage of technology so it enables to be integrated in a large scale of E-learning such as E-Learning based on NRENS [7] that apply XMDD paradigm, using DIME low-code for data modeling, process modelling and prototyping.

E-learning can change the whole education system and provide learning from various online learning. To enhance E-Learning that focuses on deep learning techniques, it can apply Recommendation System [8] that used a software agent to recommend actions to the learners by various methods and one of the most frequently used method is collaborative filtering.

3. Method

3.1 Population and Sample

The population of this study was all ATKP Medan cadets in Semester I of 2019/2020 totalling 144 consisting of 24 people of Air Traffic Control course, 48 people of Airport Electric Engineering course, 24 people of Telecommunications and Air Navigation Engineering course and 24 people of Aircraft Maintenance Engineering course. The research sample was drawn by cluster random sampling technique and one class was drawn as a research sample.

3.2 Research Stages

This research used research and development (R&D) research methods. The steps taken by researchers were as follows: 1) Data Collection: collect the questions to English testing instrument and questionnaire of E-Learning; 2) Planning: make the concepts of developing E-Learning in one semester based on lesson plan; 3) Initial Product Development: developing an English E-Learning by inputting material into moodle MLS or E-Learning Elementary English; 4) Product Testing: conduct a test by applying English E-Learning to 24 sample of cadets of Air Traffic Control Program; 5) Completing of Final Product: make evaluation to the problems encountered during product trials; 6) Dissemination and Implementation: English E-Learning product can already be implemented as English instructional media.

3.3 Data Collection Technique

Data collection technique in this study used a test that was an English learning outcome test for Elementary English totaling of 40 multiple choice questions and an E-Learning questionnaire with a total of 15 statements.

Table1. Sample of Questionnaire

No	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	E-learning is an instructional media that is appropriate to be applied in campus.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Campus facilities support access to E-Learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	E-Learning is easy to operate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	E-Learning provides materials that comply to lesson plan.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	The display of E-Learning is interesting to see.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	The features and contents of E-Learning make student active to study.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	E-Learning makes learning English more fun.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	E-Learning English makes mastery of the materials better.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	E-Learning helps student to study because it can be accessed anywhere and anytime.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	E-Learning helps student to understand English easily.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	E-Learning increases student's motivation to learn English.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	E-Learning makes time to study more efficient.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	E-Learning material is easy to learn and understand.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	E-Learning provides complete and useful material.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	E-Learning can record student's tracks and learning outcomes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Questionnaire was developed to determine the level of media eligibility for students. This questionnaire was developed by adopting the assessment criteria for usability aspects in the USE Questionnaire developed by Arnold Lund. Indicators of usability aspects included (1) usefulness, (2) Ease of Use, (3) Ease of Learning, (4) Satisfaction.

Table 2. Questionnaire Instruments

No	Aspect of Assessment	Indicator of Assessment	Items
1	<i>Usability</i>	<i>Usefulness</i> (usefulness of instructional media to comprehend learning material)	4, 11, 12, 14, 15
		<i>Ease of Use</i> (ease of using E-Learning)	3, 9
		<i>Ease of Learning</i> (ease of learning E-Learning)	6, 8, 10, 13
		<i>Satisfaction</i> (satisfaction in using instructional media)	1, 2, 5, 7

The scale to measure the questionnaire used a Likert scale with 5 answer choices and the score range for the questionnaire as follows:

Table 3. Score Range

Score Range	Score Range	Category
$M_i + 1.80 S_{Bi} < X$	$4,206 < X$	Very good
$M_i + 0,60 S_{Bi} < X \leq M_i + 1,80 S_{Bi}$	$3,402 < X \leq 4,206$	Good
$M_i - 0,60 S_{Bi} < X \leq M_i + 0,60 S_{Bi}$	$2,589 < X \leq 3,402$	Fair
$M_i - 1,80 S_{Bi} < X \leq M_i - 0,60 S_{Bi}$	$1,794 < X \leq 2,589$	Poor
$X \leq M_i - 1,80 S_{Bi}$	$X \leq 1,794$	Very Poor

3.4 Experiment of Research Instruments

The purpose of conducting an experiment was to find out the ability of a tool in measuring the validity and reliability of a test. The test of learning outcome and questionnaire were given to cadets in the first semester of the 2019/2020 of Air Traffic Control program with a total of 24 people. The validity of the questionnaire was calculated by using the Product Moment Correlation formula and the Reliability test was calculated by the Spearman-Brown formula.

4. Discussion

4.1 Development of English E-Learning

The development of E-Learning used the Moddle Learning Management System (LMS) of ATKP Medan and the authors developed English E-Learning for Elementary English class. The teacher created the materials based on the lesson plan and needed computer/laptop and internet network to connect to the system. The results of product development included:

A. Create Learning Material

Lecturer can upload material files in form of text, audio, or audiovisual. Usually the provision of material in form of video tutorials will be more interesting to learn. Lecturer can provide a brief description of the material to be studied as well as provide direction about the activities that will be done by the cadets.

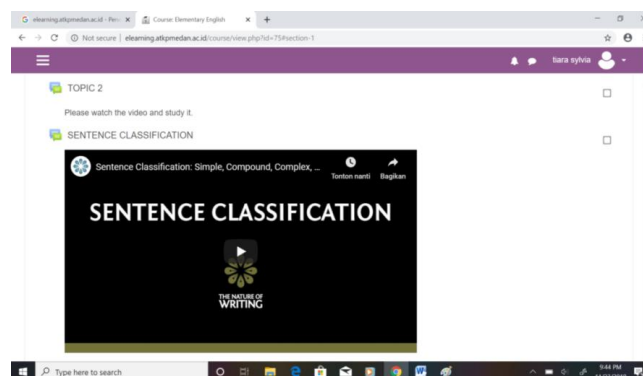


Figure 1. Learning material in video tutorial

B. Create Task

Lecturer can adjust the form of assignments and upload them in the form of online text or file uploads. Then, determine the limit and deadline to submit the tasks so that if the cadets send it over due date then the file will be rejected by the system. Lecturer can limit the number of files, the size of the file and the type of files to be uploaded by cadets.

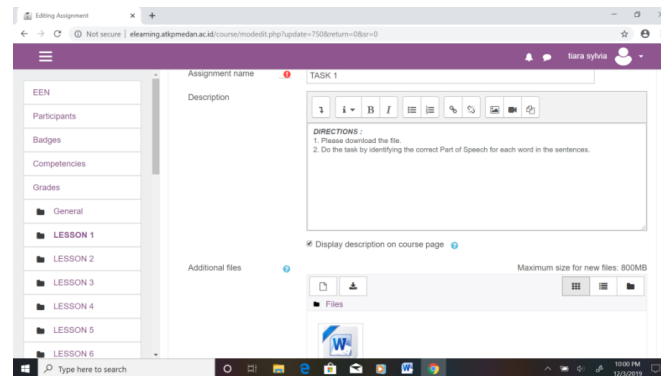


Figure 2. Create a Task

C. Create Quiz

The authors created multiple choice question by providing answer choices along with their answers by marking the correct answer then the score will appear after completing the quiz.

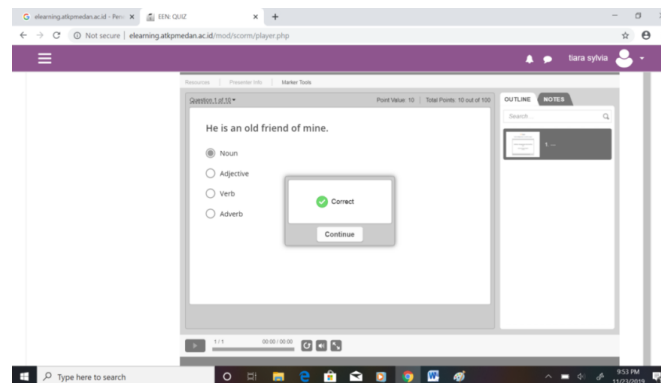


Figure 3. Create a Quiz

D. Create Chat Room

Lecturer can create a Chat room to discuss the topic. In this room lecturer and cadets can interact directly through text messages. Chat is available in online between lecturer and cadet, lecturer amongst all cadets and cadets amongst cadets. The message can be typed on the space bar and click the button to send the message.

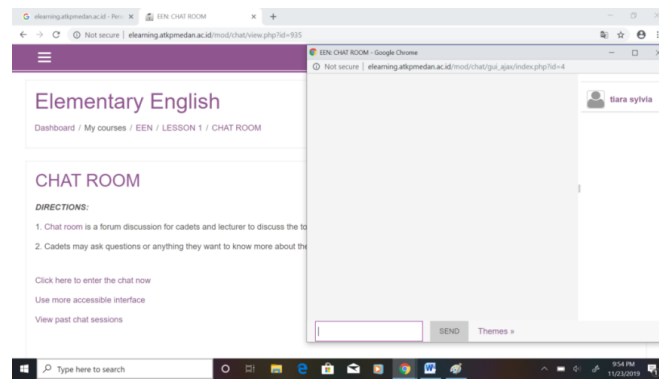


Figure 4. Create a Chat Room

E. Create Grading

Grading is a form of assessment conducted by a lecturer to evaluate the tasks done by cadets. Lecturer can add grading time to start assessment as a self-reminder in making assignments. In grading lecturer can see quiz score, assignments and examinations. Lecturer can see all the results of evaluation in a semester. This will make it easier for lecturer to evaluate cadets using E-Learning.

Select	User picture	First name / Surname	Email address	Status	Grade	Edit	Last modified (submission)	Online text	File submission
<input type="checkbox"/>		agnes dorothy kumbantobing	agneslumbantobing@gmail.com	Submitted for grading	GRADE	Edit	Monday, 25 November 2019, 11:13 AM		TM TUGAS
<input type="checkbox"/>		agum gumilang	agum.p@gmail.com	Submitted for grading	GRADE	Edit	Monday, 25 November 2019, 11:05 AM		TU 1 AGUM
<input type="checkbox"/>		albert butar-butar	albertbt@gmail.com	Submitted for grading	GRADE	Edit	Monday, 25 November 2019, 11:11 AM	1. Verb 2. Interjection 3. Adverb 4. Adjective	

Figure 5. Grading Summary

In the grading summary lecturer can see a list of cadets who have submitted their assignments, time of submission and grading status. After completing the assignment, a score will appear for each cadet. This score format can also be downloaded in the form of ms. excel.

	First name / Surname	Email address	Attempt	Started on	Last accessed on	Score
<input type="checkbox"/>	Nurul Syifa Zarawi	nuruzarawi@gmail.com	1	Monday, 25 November 2019, 9:57 AM	Monday, 25 November 2019, 10:26 AM	85
<input type="checkbox"/>	oscar oloan simanjuntak	oscarsimanjuntak@gmail.com	1	Monday, 25 November 2019, 10:00 AM	Monday, 25 November 2019, 10:06 AM	70
<input type="checkbox"/>	patricia Johana dwiyani	patriciadwiyani@gmail.com	1	Monday, 25 November 2019, 10:06 AM	Monday, 25 November 2019, 10:15 AM	65
<input type="checkbox"/>	ralfif pradya mulyana	ralfifmulyana@gmail.com	1	Monday, 25 November 2019, 9:25 AM	Monday, 25 November 2019, 10:02 AM	90
<input type="checkbox"/>	rath pratwi	rath.p@gmail.com	1	Monday, 25 November 2019, 10:05 AM	Monday, 25 November 2019, 10:20 AM	50
<input type="checkbox"/>	rizki aulia	rizki.a@gmail.com	1	Monday, 25 November 2019, 10:06 AM	Monday, 25 November 2019, 10:15 AM	85

Figure 6. Scoring

The review of the development of E-Learning as an instructional media can obtain:

1. E-Learning of LMS for Elementary English is managed to meet lesson plan with a total of 16 meetings and English test.
2. Learning material is managed based on the principles of developing instructional media both visually and textually, so that instructional messages can be optimally comprehended by cadets.
3. There are some features of activities available in E-Learning such as quiz, tasks and chat rooms as well as grading summary to find out the learning outcomes so lecturer and cadets must be active in implementing E-Learning.

5. Results of Analysis

5.1 English Test

The development of E-Learning is implemented to gain the effectiveness and usability of E-learning as instructional media. The analysis is based on the test and questionnaire taken by the user or cadet. Refer to a Training Procedure Manual (TPM) of English that the minimum passing score for a course is 65. The pretest of English learning outcome was given to 24 cadets in a class of Air Traffic Control Program for 40 multiple choice items. An experiment was conducted to determine the effectiveness of the implementation of E-Learning in improving English learning outcomes. The average grade of pretest was 56.67. Furthermore, a post-test of English learning outcome was given to 24 cadets of 40 multiple choice questions after the respondents completing E-Learning program. The post-test gained an average grade of 70.10. The data also presented the increasing score for student's achievement compared with score taken from conventional method (pre-test) and E-learning (post-test). The result showed that average score of E-Learning $70.10 > 56.67$. It can be concluded that E-Learning as an instructional media is effective and useable to improve learning outcomes.

Table 4. Score of English Test

No	Student	Score Pre-Test (Conventional)	Score Post-Test (E-Learning)
1	1	67,5	72,5
2	2	55	55
3	3	42,5	67,5
4	4	75	72,5
5	5	45	80
6	6	65	62,5
7	7	52,5	82,5
8	8	50	57,5
9	9	52,5	87,5
10	10	75	90
11	11	40	65
12	12	77,5	77,5
13	13	67,5	77,5
14	14	65	57,5
15	15	32,5	75
16	16	40	55
17	17	42,5	55
18	18	50	80
19	19	72,5	72,5
20	20	55	85
21	21	65	55

22	22	55	52,5
23	23	42,5	65
24	24	75	82,5
Total		1360	1682,5
Average		56,67	70,10

5.2 Questionnaire

To find out the effectiveness of the development of E-Learning as an instructional media, questionnaire was given to the respondents. Then the data of questionnaire were analyzed to find its validity and reliability.

- Validity: from 24 respondents $r_{table} = 0.404$. The result of the analysis of 15 questionnaire questions obtained 15 items were valid.
- Reliability: reliability test of the questionnaire was obtained ($r_{11} = 0.8205$) and included in high reliability criteria so that it can be concluded that English E-Learning as an instructional media is reliable. Then, the calculation of the questionnaire gives the following results:

Table 5. Result of Questionnaire

No	Aspect of Assessment	Score Average	Category
1	<i>Usefulness</i>	4,64	Very good
2	<i>Ease of Use</i>	4,67	Very good
3	<i>Ease of Learning</i>	4,50	Very good
4	<i>Satisfaction</i>	4,55	Very good
Average		4,59	Very good

Based on the data, the development of E-Learning obtained a category of "Very Good". It could be concluded that the development of English E-Learning received positive responses from the cadets and was effective in improving learning outcomes.

5.3 Research Limitation

The research was carried out as well and careful as possible using scientific method procedures. However, there are some weaknesses that can not be avoided in this research that can affect the results of research. Therefore, in this research, some limitations and weaknesses are stated: 1. Data in this study were obtained from English learning outcome test and questionnaire. In this case, it is possible that the answers given by cadets do not reflect the actual conditions. This could have happened because the conditions of cadets were not optimal during the experiment and others external influences; 2. The respondents of this study were only cadets so it needs to be followed up by respondents from learning material and media experts.

6. Conclusions and Recommendations

6.1 Conclusions

The conclusions that can be drawn from this study are as follows:

- The development of E-Learning for English education at ATKP Medan implements the Middle Learning Management System (LMS).

2. E-Learning is managed based on the principles of developing instructional media both visually and textually.
3. Data collection techniques in this study use an English test (40 multiple choice) and questionnaire (15 questions).
4. English learning outcome of cadets applying E-Learning is higher (70.10) than conventional learning (56.67) so that the implementation of E-Learning as an instructional media is considered to be effective to improve learning outcomes.
5. E-Learning for English education as an instructional media shows high effectiveness than conventional method seen from the aspect of usability (usefulness, ease of use, ease of learning and satisfaction) of 4,59 in category of very good.

5.2 Recommendations

The development of English E-Learning still has weaknesses, so it is recommended to develop further research, as follows:

1. ATKP Medan should develop and implement blended learning in learning process to support conventional method in the campus.
2. The lecturer must be active in developing E-Learning program by trying more applications available in the moodle of E-Learning and updating the material to create more interesting learning activities.
3. The students must actively access E-Learning (LMS) to gain more knowledge or called as student centered learning (SCL).
4. Researchers can follow up the results of this research to develop another method or application of E-Learning.

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