Transformation of Offline to Online Learning through the Development of Econometric Teaching Materials and Their Impact on Student Learning Outcomes

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Abstract

One form of transformation of offline to online learning is the change of printed learning materials to non-printed teaching materials. The hope is that it can facilitate and support the management of online learning. In general, this study aims to determine the level of feasibility and effectiveness teaching materials in econometrics courses can improve student learning outcomes. This study uses research and development (R&D) methods using the ADDIE model. This research was conducted on fifth-semester students of class A who took econometrics courses in the economic education study program in the 2021/2022 academic year. For a small trial sample, 30 students were taken. The results of the effectiveness test concluded that student learning outcomes after using econometrics teaching materials were higher than the results of student pretests. This shows that the non-printed Econometrics teaching materials produced are proven to be effective in improving student learning outcomes.

I. Introduction

Information technology development has grown very rapidly, where almost all fields of work have been dominated by information technology. Technological development is a science of continuous knowledge and technology growth brings civilization more forward (Cholily and Kusgiarohmah, 2019)**.**

The outbreak of this virus has an impact of a nation and Globally (Ningrum *et al*, 2020). The presence of Covid-19 as a pandemic certainly has an economic, social and psychological impact on society (Saleh and Mujahiddin, 2020). Covid 19 pandemic caused all efforts not to be as maximal as expected (Sihombing and Nasib, 2020).

The problem is that the current online lecture policy demands a transformation of learning not only from the side of the transition from offline to online but also demands a transformation of adaptive teaching materials to be used especially in online conditions like this. The limitations of movement and the red zone due to Covid-19 of course limit student access to find books and so on.

Based on the experience of online implementation so far, it turns out that there are obstacles faced by both students but also faced by facilitators, namely teachers/lecturers. According to the Director of Secondary Education and Special Education, Praptono (2020) explained that "There are 3 main areas that are often debated or complained about by teachers. The first is how teachers can design a good learning program. Second, if the design already exists, then the material aspect of what the content is like. Then what is also felt is that the home environment is often not conducive to online learning. This often

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makes some teachers implement online learning activities at night " (accessed on https://news.detik.com/berita/d-4960285/kemendikbud-soal-kendala-belajar-di-rumah-materi- ajar-rumah-tak-kondusif May 10, 2020).

The results of observations on students regarding the constraints of online lectures are that apart from quota and network problems, there are also obstacles to accessing information in the form of relevant teaching materials. Learning from home in all corners of the region makes it difficult to distribute textbooks. For this reason, so that learning can run well, it must be supported by teaching materials that are relevant to the lesson plan material in the form of preparing course teaching materials.

Based on the problems and expert opinions above, it is emphasized that efforts need to be made to make improvements to manage learning in the classroom so that it is more conducive and controlled. One of them is through research and development of teaching materials, in this case, the web-based econometrics course to improve student learning outcomes.

II. Review of Literature

2.1 Teaching Materials

Teaching materials are information, tools, and/or texts needed by teachers for planning and studying the implementation of learning (Hamdani, 2011: 218). Teaching materials are a set of learning tools or tools that contain learning materials, methods, limitations, and evaluation methods that are designed systematically and attractively to achieve the expected goals, namely achieving competencies or sub-competencies with all their complexity. This understanding explains that a teaching material must be designed and written with instructional rules because it will be used by educators to assist and support the learning process.

Directorate General of Primary and Secondary Education Ministry of National Education (2008), teaching materials have several characteristics.
a. Self-instructional that is, teaching materials can make students able to teach themselves with the developed teaching materials.
b. Self-contained that is, all subject matter from one competency unit or sub-competency being studied is contained in one complete teaching material.
c. Stand alone (stand-alone) i.e. teaching materials developed do not depend on other teaching materials or do not have to be used together with other teaching materials.
d. Adaptive namely teaching materials should have a high adaptive power to the development of science and technology.
e. User friendly that is, every instruction and information display that appears is helpful and friendly to the user, including the ease with which the user can respond and access as desired.

Broadly speaking, the function of teaching materials for teachers is to direct all their activities in the learning process as well as a substance of competence that should be taught to students. The function of teaching materials for students is to be a guide in the learning process and is a substance of competence that should be studied. Prastowo (2011: 24) there are two main classifications of the division of functions of teaching materials, namely according to the parties who use the teaching materials and according to the learning strategies used.

2.2 Econometrics Learning Outcomes

From this learning process, it is hoped that the end result is to increase student success. Dimyati and Mudjiono (2013) state that learning outcomes are the result of an interaction between teaching and learning. From the lecturer's point of view, the act of teaching ends with the process of evaluating learning outcomes, while from the student's side, learning outcomes are the end of teaching from the peak of the learning process.

Student learning outcomes are influenced by several learning conditions, namely internal and external conditions. Internal factors are factors that exist in the organism, which are called individual factors. These factors are maturity or growth, intelligence, training and tests, motivation, personality traits. External factors that exist outside of these individual factors include family factors, lecturers, facilities and infrastructure, and the environment (Thobroni, 2015). External factors, in this case, by the way, lecturers develop teaching materials that will be studied in this research, are one of the factors that affect learning outcomes.

The learning outcomes referred to in this study are student learning outcomes in econometrics courses. When viewed from the type of material in this course, several concepts, principles, and procedures require interesting learning and motivate students to learn.

III. Research Method

This research uses research and development methods. The purpose of development research using ADDIE development design according to Multyatiningsih [11] is to develop and validate research products. In this case, it aims to develop teaching materials for econometrics courses that are appropriate and effective in learning.

The subjects of this study were fifth-semester students of class A in the Econometrics course at the Economic Education study program, Faculty of Economics, Medan State University, Academic Year 2021/2022. Data analysis in this study refers to three things, namely testing the feasibility of experts using the Likert scale method (Wagiran, 2013); testing the practicality, and testing the effectiveness of tutorial teaching media on social media in a small test group of students using a paired sample test. This article only examines the results of the effectiveness test of the development of teaching materials for econometrics courses.

The research design uses a quasi-experimental design in the non-equivalent group design type (Ismail, 2018). This design is almost the same as the pretest-posttest one group only design, only in this design, the experimental group is not chosen randomly. The research design can be described as the following table:

Table 1. Research Design Table

Class	PreTest	Treatment	Post Test
Experiment	O1	X	O2

Description
O1: Pretest value (before treatment) in the experimental class
O2: Posttest value (after treatment) in the experimental class
X: Lectures using econometrics teaching materials

The effectiveness test of the econometrics teaching materials was carried out based on the results of the learning outcomes test in a small, limited group trial (30 students) using a paired sample t-test. According to Kadir (2015), the essence of the analysis of the

difference between the two independent sample means is that the two data to be tested for differences come from the same group and produce two data distributions.

This before and after the experimental design is used to test the effectiveness of this econometrics teaching material on learning outcomes before and after treatment by using this econometrics teaching material in the form of a hypothesis:

Ho: There is no difference in learning outcomes before and after treatment using econometrics teaching materials that have been developed.

Ha: There are differences in learning outcomes before and after treatment using econometrics teaching materials that have been developed.

With the criteria to accept Ho, if the value of Sig> 0.05 and reject Ho if the value of Sig<0.05.

IV. Results and Discussion

4.1 Results

This study applies the ADDIE model with the following steps:

a. Stage of Analysis

This stage consists of two steps, namely needs analysis and material analysis. Needs analysis aims to obtain data on the state and availability of teaching materials used by lecturers and students, identify student characteristics according to their level of education according to the theory of student development. While material analysis is used to determine the material to be used in research.

This stage of analysis resulted in an agreement for the Econometrics teaching materials, namely:

CHAPTER 1   Introduction
CHAPTER 2   Descriptive Statistics
CHAPTER 3   Simple Linear Regression
CHAPTER 4   Multiple linear regression
CHAPTER 5   Multicollinearity
CHAPTER 6   Autocorrelation
CHAPTER 7   Heteroscedasticity
CHAPTER 8   Panel Data Regression Analysis
CHAPTER 9   Basic Properties of Simultaneous Equation Models
CHAPTER 10   Error Correction Model (ECM) Integration
CHAPTER 11   Regression Model With Qualitative Variants
CHAPTER 12   Vector Autoregression (VAR) Model Application

b. Stage of Design

At this stage, the following activities were carried out: (1) Designing econometrics teaching materials, (2) Designing instruments including learning outcomes test questions, material expert validation drafts, draft student readability questionnaires.

The result of this stage is a draft of Econometrics teaching materials. The draft cover of Econometrics teaching materials is as follows:
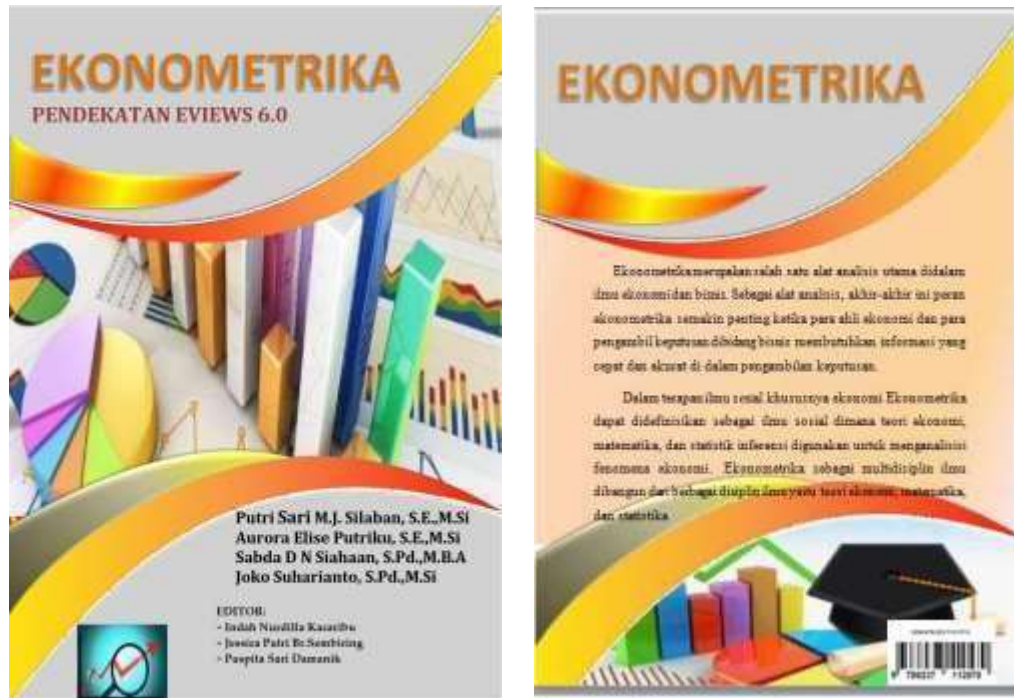
Figure 1. *Econometrics Textbook Cover*

c. Development Phase

At this stage, the development of the results that have been compiled at the design stage is carried out. The result of this stage is a feasibility assessment (validation) by experts which aims to determine whether the draft I of the econometrics teaching materials that have been developed is valid or not based on the assessment of the experts. If the results of the analysis of the expert's assessment of draft I am valid and suitable for use, then proceed with the trial of the draft I. However, if the results of the analysis of the experts' assessment of draft I am not valid, then a revision is held to obtain draft II.

1. Expert Validation namely the availability of design validation results by experts. The learning application that has been prepared at the product design stage is draft 1, then tested through several stages. The first stage is to test the validity of teaching materials by using an expert validity assessment.

   As for the validation of econometrics teaching materials through a questionnaire given to a team of experts in the field of Econometrics. Some experts who consider the validity of this content are (1) Dr. Arwansyah, M.Si. (Lecturer in Advanced Econometrics Course); and (2) Dr. Khairuddin E Tambunan, M.Pd. (Lecturer of Economic Education Study Program).

   Following are the results of the validation of the questionnaire by 2 validators as follows:

Table 2. Enter Module Revision from Validator

No	Name	Validation
1	Dr. Arwansyah, M.Si.	- The material presented in the econometrics teaching material is following the RPS Textbook/Material. - Make econometrics teaching materials more interesting and colorful. - Make sure that the econometrics teaching materials can be easily accessed by students.

2	Dr. Khairuddin E Tambunan, M.Pd.	• Econometrics teaching materials are made complete with the concept of collecting 6 KKNI assignments and quizzes. • Econometrics teaching materials are made in a more user-friendly way. • Improve the language editor to make it easier to understand.

Several aspects observed in the learning application can be seen in Table 5.1. Based on the results of the three experts' consideration of the 16 aspects observed received an overall rating as follows:

Table 3. Aspects of Content Validity of Econometrics Teaching Materials

No.	Observed aspects	Validator	
		1	2
1	Teaching materials according to the curriculum syllabus	4	4
2	Teaching materials are following the expected basic competencies	4	3
3	Teaching materials are relevant to the material that students must learn	4	4
4	The content of teaching materials has the correct and appropriate concept	5	3
5	Teaching materials help explain the concept	4	5
6	The teaching material contains sample calculation questions using the Eviews analysis tool	4	5
7	The teaching material contains assignment questions based on 6 KKNI assignments	4	3
8	The suitability of the practice questions with the material being studied	4	4
9	The suitability of sample questions and practice questions with the ability to be improved	5	4
10	The existing practice questions have met the proportion of difficulty levels	4	5
11	The language used is good and correct	4	4
12	The language used is easy to understand and understand	4	5
13	Interesting appearance and arrangement of teaching materials	4	4
14	Attractive arrangement of pictures and tables	3	5
15	The font size used is clear	3	4
16	Students can use teaching materials independently	4	4
	Total Validator Score	64	66

From the value data from the validator, further analysis is carried out using the analysis of the average total score, namely:
Average total score $= \dfrac{130}{2} = 65$

Then the formula for the percentage of results can be calculated by the following formula.

Result = $\dfrac{65}{80} \times 100\% = 81.25\%$

The result of the percentage value of the validator is 81.25%, meaning that if it refers to Table 2. The eligibility criteria for econometrics teaching materials, the feasibility category of the validator's assessment results is in the very feasible category because it is between the 81-100% interval.

2. Design Revision I (draft 2), namely the availability of a revised design draft resulting from design validation by experts. After going through the expert validation stage, the first revision of the draft econometrics teaching material was carried out by adjusting to the assessments of the experts to produce a draft 2 learning application.

d. Implementation Phase

The implementation stage is the stage of piloting small groups. The trials carried out were field trials on students who were used as research subjects to test the quality of development products.

This implementation phase was carried out with a limited trial of 2 meetings on Multiple Linear Regression material which was carried out in a small class sample, namely students in the fifth semester of class A in the Econometrics course, totaling 30 students. Furthermore, the results of the effectiveness test and the readability of the results of this trial will be discussed in the next evaluation stage.

e. Stage of Evaluation

At this stage, an evaluation of the practicality of the product that has been developed is carried out, by analyzing the data on the effectiveness and practicality of using the product. This evaluation stage is the product of a limited trial to obtain data on the practicality and effectiveness of the econometrics teaching materials that have been developed. Practicality data was obtained from the results of student assessments in a limited trial. As for the effectiveness data obtained from the results of student learning outcomes test scores in field trials.

1. Effectiveness Test

The effectiveness test was carried out with a pretest-posttest experimental design on different test materials (independent Sample Test and Paired Sample Test) in two meetings with the following results:

Table 4. Calculation Results of Pairwise Difference Test

| | | | | | Paired Differences | | | | |
| | | | | | 95% Confidence Interval of the Difference | | | | |
		mean	Std. Deviation	Std. Mean Error	Lower	Upper	T	df	Sig. (2-tailed)
Pair 1	before after	-30.5	6.479	1.182	-32,919	-28.08	-25.78	29	.000

Based on the table above, the t-count value is 25.78 with a Sig value. 000 < 0.05, then Ho is rejected. This means that student learning outcomes after learning treatment using econometrics teaching materials are significantly higher than the students' pretest results. This shows that the econometrics teaching materials produced are proven to be effective in improving student econometrics learning outcomes.

2. Practicality Test

The practicality test of econometrics teaching materials was carried out to know the level of convenience, usability, and time effectiveness by students.

Table 5. Assessment of the Readability of Teaching Materials on a Limited Sample

No	Indicator	Average
A	**Variable: Ease for Users (Learnability)**	
1	Instructions for using teaching materials	4.1
2	Use of language & sentence structure according to the student's ability level	4.1
3	Can support individual and group learning processes	4.3
4	Exercise can help students understand the concept	4.2
5	Non-printed teaching materials used can facilitate the learning process	4.0
B	**Variable: Usefulness (Efficiency)**	
1	Teaching materials can help students deepen their understanding of the material	4.0
2	Pictures in teaching materials can help students find concepts	4.1
3	Easy-to-understand teaching materials	4.2
4	Assignments on teaching materials can help students in understanding concepts	4.1
5	Teaching materials are more practical and can be adjusted to students' abilities without distinguishing SARA	4.5
6	The attractiveness of the display of teaching materials can motivate students to learn	4.1
C	**Variable: Effectiveness of time**	
1	The use of teaching materials can streamline learning time	4.0
2	Non-printed teaching materials used can streamline learning time	4.0

By adopting the calculations of Akbar (2011) it is known that the results of the practicality test of this product are 89.5%, meaning that this product is very practical for students to use, but with little input for revision.

3. Product Revision II namely the availability of a revised draft of econometrics teaching materials resulting from the limited test input. After going through the product trial phase on a small sample and also the readability test for students, then revisions are made according to student input.

4.2 Discussion

The development of econometrics teaching materials has a significant impact on student learning outcomes. This is in line with the results of research on the development of econometrics teaching materials that have been studied previously. Lestari, EP (2014) the results of the study show that Econometrics is still the most difficult subject taken by students. The existence of non-printed teaching materials that accommodate students' difficulties is expected to become literature that encourages students to better understand the contents of the subject matter books. In addition, the development of test materials must accommodate student difficulties so that they can obtain maximum results

This is in line with the results of the study, to facilitate the management of online learning, non-printed teaching materials have been compiled to make them more mobile to learn and can be opened from their smartphones or laptops. In addition, the results of this

development research confirm that econometrics teaching materials are proven to be able to improve student learning outcomes.

V. Conclusion

The rapid development of technology has brought about various changes in communication patterns and information dissemination, including in the world of education. One of the breakthroughs to facilitate learning is to change printed teaching materials into non-printed teaching materials that are relevant to use in courses, especially during online learning. The results of this research and development are in the form of econometrics teaching materials.

The results of the effectiveness test concluded that student learning outcomes after using econometrics learning media are higher than the students' pretest results. This shows that the resulting econometric learning media is proven to be effective in improving student econometric learning outcomes.

The results of this study are expected to increase students' interest and independence in learning with non-print econometrics teaching materials which are more popular among students, more easily accessible, and more effective, so that students can study whenever they want, according to their respective learning styles without having to bring books everywhere.

Authors' Contributions

The author has designed econometrics teaching materials by collaborating with media experts in the field of education. Prepare teaching materials, quizzes, and formative questions to evaluate student achievement. Furthermore, the authors also conducted trials on selected students to measure the validity, effectiveness, and practicality of econometrics.

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