Direct learning models assisted by Lectora Inspire media to improve the understanding of geometry concepts

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Abstract. This study produced a learning device using a direct learning model assisted by Lectora Inspire media to help improve students’ understanding skills in good quality geometry material. Development of learning devices using a modification of the Thiagarajan 4-D model. The research subjects were 18 first semester students in Geometry class. Learning tools produced in this study are Lecture Program Units, Learning Outcomes Tests, and Lectora Inspire learning media with the direct learning model syntax. The lecture device used in this study is said to be valid based on the results of validation by the validator. Learning devices also have practical criteria based on the percentage of 90% of lecturer activity at the first meeting and 93% at the second meeting. Learning devices are said to be effective based on the results of student tests which show more than 80% of students get high scores which show that students’ understanding increases, so this learning device is very helpful for students in understanding geometric concepts specifically in triangular congruence material.

1. Introduction
NCTM [1] states that one of the goals of learning mathematics is to help humans solve problems in everyday life. One way to make the learning process of mathematics in accordance with these functions and objectives is to build on the concepts that exist in mathematical content. In addition, Sagala [2] explains that knowledge is not obtained by being given or transferred to others, but constructed by the person himself, so that the person is able to develop his intellectual property. Along with the development of science and technology, people are required to have the ability to think critically, systematically, logically, think creatively, and work together effectively so that they can be developed further in this era of globalization [3]. Formal education, in this case, has an important role in developing the things mentioned above, namely by making quality learning. One of the most influential in learning is the right teaching material.

Given the weaknesses in conventional direct learning, there needs to be an effort to overcome this. Educators who are careful and responsive to the learning needs of students must use appropriate learning models, methods and media in learning so that students are motivated by learning [4]. Therefore, a method that is considered appropriate to overcome existing weaknesses, one of which is developing a direct learning model with the help of learning media. Media is an intermediary or communication channel to convey messages or opinions or information to the recipient of the message [5].

Learning media can be a tool to provide incentives for students to occur in the learning process [6]. In using instructional media, students are expected to be motivated to learn, overcome the limitations
of experience, senses, space and time that students have, enable students to interact directly with the
environment, produce uniformity of observation, and instill basic concepts correctly so that learning
objectives can be achieved [5]. In developing learning methods will not be separated from the name of
the media. The media is now widely used as the basis of learning because it is proven that the media
can be a communication tool and support educator interaction activities in learning activities,
including digital tools [6]. This digital tool allows lecturers to plan and provide interactive teaching
and support the global practice community with fellow educators in a better way [7].

One of the learning media that can be used is Lectora Inspire. Lectora Inspire is software an
electronic learning development (e-learning) that is relatively easy to apply or apply because it does
not require an understanding of sophisticated programming languages. Because Lectora Inspire has an
interface that is familiar to those of us who already know and control Microsoft Office [8]. Among the
several advantages of Lectore which was presented by Mas'ud [9], the use of Lectora on Geometry
courses can be designed and made several slides, display animated videos, as well as drawings related
to geometry theories so that students pay more attention to what is being conveyed. Geometry based
computer instruction had a significant effect on students' achievement in geometry compared to
traditional instruction [10].

Geometry, one of the oldest branches in mathematics, is known as one of the important learning
areas in mathematics, involving the concepts of planar and spatial shapes [11]. Congruence is defined
as the same shape which is not necessarily in the same size. The conceptualization of another
congruence which is more based on mathematics involves the observation of a proportional
relation when the relevant lengths in Similar shapes or within a shape are Compared [12].

Based on the observation that once researchers did towards the learning process in the classroom
and an interview with one of the students who took Geometry courses in the previous year at UNU
Blitar, it was found that most of the learning process in the classroom only emphasized understanding
the concept by means of lecturers transferring knowledge to students without the concept building
process. Learning can lead to student passivity and the dominant attitude of lecturers. This is
consistent with the opinion of Hadi [13] that the learning system in almost all college study programs
in Indonesia is still one-way, namely the provision of material by lecturers. In addition, it also does not
train students to do the thinking process in building their own mathematical concepts learned. The
learning is carried out in a monotonous manner, which is centered on the teacher and places the
teacher as a single source [14].

Many studies have developed learning tools on geometry [3, 10, 11-12], but researchers have not
yet discovered the concept of geometry with media lectora inspire. Some studies say that it is
important to further develop effective tools for geometry. Based on the description of the background,
the formulation of the problem in this study is how to Compile Direct Learning Model Learning
Devices with the Help of Media Lectora Inspire to Help Students Build Concepts on Geometry
Courses That Are Good Quality? Referring to the research question above, the purpose of this study
was to produce a direct learning model learning device with the help of the media Lectora Inspire to
help students build concepts on good quality geometry courses.

2. Method

The type of research in this study is development research. The learning in this study was assisted by
media tools Lectora Inspire with the main learning congruence. The learning tools consist of Lecture
Program Units (LPU), Learning Outcome Test instruments (LOT), and Media Lectora Inspire (MLI)
about triangular congruence. In addition to the development of devices, in this study also developed a
validation sheet, on learning devices assisted by Media Lectora Inspire (MLI).

This development research uses the models of Thiagarajan [15]. The Thiagarajan model consists of
four stages known as the 4-D (four D Model). The fourth stage is the stage of definition (define), stage
design (design), stage of development (develop), the deployment phase (disseminate).

The purpose of the defining stage is to define and define learning needs by analyzing the objectives
and boundaries of the material. Next is the design stage, the purpose of this stage is to design learning
devices, so that a obtained prototype can be (exaMLIes of learning devices). This stage begins after a
specific learning goal is established. The design phase consists of four main steps, namely test preparation, media selection, format selection, and initial design. The main activities in the design process are the selection of media and formats for materials and the making of the initial design of learning. The results of the design of the learning tools written at this stage are called Draft A.

The development phase to produce a draft of the revised learning device is based on expert input and data obtained from the trials. Activities at this stage are the assessment of experts in mathematics and field trials. Based on the analysis of the validation data of the learning device as well as the suggestions and input of experts, the Draft A learning device was then revised to obtain the Draft B learning tool. After the trial was carried out, a revision was made to Draft B. The revised Draft B at this stage was named as learning Draft C.

In this research, it only reaches the development stage. This is because the implementation of learning devices is still a trial phase, which is a form of development to test the validity and reliability of the instruments used. The development model of this research is explained in Figure 1 below.

![Figure 1. The development chart of 4-D model learning devices in this research](image-url)
Data collection consists of: 1) Validation (Assessment) whose contents in the form of learning device validation sheets consist of: LPU, LOT, and MLI validation sheets. Then the analysis is carried out on the results of the experts’ validation of the learning tool to revise the learning device. 2) Observation (observation) where observations are made relating to the data of the ability of the lecturer to manage learning, student activities in learning, and student responses. 3) Tests used to analyze mastery learning in a classical manner. Mastery of learning is achieved if each student earns a minimum of 75 out of 80% of the total number of students.

Data analysis results validation learning tool formula to determine the validity of the instrument of learning tools:

\[ \gamma = \frac{N \sum W X - (\sum W)(\sum X)}{\sqrt{(N \sum W^2 - W^2)(N \sum X^2 - X^2)}}. \]

Student and lecturer activity Percentage of lecturer and student activity is calculated using the percentage activity formula are:

\[ P = \frac{\sum X}{5} \times 100\%. \]

Data analysis of the results of the test, the first for validity of the items. The formulas used to determine the validity of item:

\[ r = \frac{p \sum_{i=1}^{n} A_i B_i - (\sum_{i=1}^{n} A_i)(\sum_{i=1}^{n} B_i)}{\sqrt{\left(p \sum_{i=1}^{n} A_i^2 - (\sum_{i=1}^{n} A_i)^2\right)\left(N \sum_{i=1}^{n} B_i^2 - (\sum_{i=1}^{n} B_i)^2\right)}}. \]

The reliability coefficient of a test form description can be estimated using the Alpha formula:

\[ \alpha = \frac{K}{K-1} \left(1 - \frac{\sum_{i=1}^{K} S_i^2}{S_e^2}\right). \]

For the quality criteria for learning tools, use the following rules: 1) Validity of validation the four components of the learning device (said to be good if a validity coefficient ≥ 0.60). 2) Practicality learning devices rated practical if a lecturer in learning activities achieve good or excellent category (≥80%). 3) The effectiveness of learning produced is said to be good if the percentage of student activity> 80% and average mastery of learning outcomes at least 80% of students who take the learning is able to achieve the level of mastery of minimal or is able to achieve a minimum score of 75 [16].

3. Result

Tools of learning that has been developed that is LPU, the LOT and MLI instrument, the development model of the device used in the Thiagarajan model begins with the definition phase with 5 main steps, namely 1) the initial analysis; 2) student analysis; 3) material analysis; 4) task analysis and 5) specification of learning indicators. At this stage selected material that will be used in the development of the device. The selected geometry material is triangular congruence. Learning indicators are determined in accordance with the learning objectives to be achieved. Indicators are listed in the teaching event unit.

The defining phase is continued with the prototype design stage (draft A) learning device with 4 steps, namely 1) preparation of the test; 2) selection of media Lectora Inspire; 3) format selection; 4) initial design. The following are the results of draft I in Figure 2.
Next is the development stage, at this stage draft B of the revised learning tool is produced based on input from experts and data obtained from the trial. After analyzing the validation sheet by 2 experts, the instrument validation results obtained are in the form of instrument validity coefficient ($\gamma$) and its interpretation. The following validation and interpretation results are presented in Table 1.

| No | Learning Devices | Validitas ($\gamma$) | Interpretasi |
|----|------------------|---------------------|--------------|
| 1. | LPU              | 0,98                | High         |
| 2. | LOT              | 0,98                | High         |
| 3. | MLI              | 0,99                | High         |

From Table 1 it can be seen that the learning device consists of LPU, LOT and MLI instruments have very high validity coefficients. So that the learning device can be said to be valid. Although the learning device is said to be valid, this learning tool still needs to be revised. This revision was carried out also with the advice given by experts.

After a revision is made based on suggestions or input from the validator, a draft B is produced and learning tools assisted by media Lectore Inspire on triangular congruence material. After draft B was produced, the draft was then piloted. Learning devices rated practical if a lecturer in learning activities reach either category (the category of faculty activity $\geq$ 80%). Figure 4 is percentage of lecturer activity. From Figure 4, shows that the learning device assisted by media Lectore Inspire has fulfilled the practicality criteria of learning devices.
In the effectiveness test, the learning device is said to be effective if in the field trial data, the percentage of student activity is \( > 80\%\), the learning outcomes test is said to be valid and reliable, and the student gives a positive response \( > 80\%\). Based on data analysis of student activity, the results are shown in Figure 5.

From Figure 5, it was found that the percentage of student activity at the first meeting reached 89\% in the good category and at the second and third meetings reached 93\% in the good category, the percentage of student activity increased from the first meeting to the second meeting. This shows that the criteria have been achieved and students are active in participating in learning activities assisted by Lectore Inspire.

After learning is done, an evaluation is given in the form of learning outcomes tests (LOT). LOT is done by students individually. The results of LOT analysis in the form of item validation of LOT items and test reliability are shown in Table 2.
Table 2. Validation of Question Points and Test Reliability

| No. Soal | Validitas | Interpretasi validitas | Reliabilitas |
|----------|-----------|------------------------|--------------|
| 1        | 0.61012   | High                   |              |
| 2        | 0.90716   | Very high              | 0.8466       |
| 3        | 0.79832   | High                   |              |
| 4        | 0.80186   | Very high              |              |

Based on the validation data of the learning outcomes test above it was found that two questions (numbers 2 and 4) had very high validity and two other questions (number 1, 3) high validity. So that the test questions can be said to be valid, but based on the input of the validator, a revision is done on the problem picture. After the revision was carried out, a draft was produced 3.

The results of the calculation of test reliability were obtained by the value of \( r = 0.8466 \) with the category of "very high". Thus, the test instrument can be said to be reliable.

Based on the criteria of effectiveness, thoroughness of learning outcomes that is at least 80% of students are able to achieve the level of mastery of the material or are able to achieve a score of at least 75.

Table 3. Mastery Test Results Learning

| Learning Outcomes Test   | Students |
|--------------------------|----------|
| Very High                | 3        |
| High                     | 6        |
| Moderate                 | 5        |
| Low                      | 0        |
| Very Low                 | 4        |

From Table 3 contains 18 students (> 82% of students) who achieve a minimum score of 75 and 4 students who do not meet the criteria for mastery the test of learning outcomes. This shows that most students have been able to reach the level of mastery of the material in the High category. So that the mastery learning criteria for the learning outcomes test have been achieved.

4. Discussion

A learning device of good quality if it meets the quality aspects that validity, practicality and effectiveness [17]. This study produced learning tools assisted by media Lectore Inspire on triangular congruence material. The learning device produced is LPU, LOT and MLI instruments. Validity test of learning devices was obtained through validation of learning devices (LPU, LOT, MLI) by 2 experts. In the validation results of the two validators have been obtained that LPU validity coefficient and LOT is 0.98. While the MLI validity coefficient is 0.99. Then the learning device can be said to be valid. This is in line with research Holila [18] who received practical teaching materials after getting analysis from experts (validator).

The second criterion of learning device quality is practicality criteria. Based on the observer's assessment of lecturer activities with colleagues, the lecturers' activities at the first meeting reached 90% and at the second meeting reached 93%. This shows that the learning device can be said to be practical because the percentage of lecturer activity is > 80% [13].

The third criterion of learning device quality is the criteria for effectiveness. From the effectiveness test, it was found that the percentage of student activity at the first meeting reached 89% with good category and at the second meeting reached 93% with good categories, this showed that most of the students actively participated in learning activities assisted by Lectore Inspire on geometry material. From the analysis of the learning outcomes test, it was found that more of 82% (14 of 18 students) achieved a score of more than 75. So that the mastery learning criteria for learning outcomes were
achieved. This shows that students are able to understand the material presented by the lecturer by using the media assisted by Lectore Inspire on geometry material. In the learning outcomes test there are 3 students in the very high category and 6 other in the high category. The learning outcome test was also reliable, as seen from the reliability coefficient of 0.8466 in the very high category [13].

5. Conclusion
The instructional media assisted by Lectore Inspire on geometry material has practical and effective valid criteria. In LPU, LOT and MLI is valid based on the results of expert validation, namely obtaining an average value of more than 0.98. Lecturers and students can use the learning tools well, because based on practicality shows the activity of the lecturers in learning activities is more than 82%. In addition, LOT results show the average value of each student in high category.

The use of media Lectore Inspire should also be used in other materials, not only geometry that requires a lot of visualization. In addition, it should be noted that the learning steps taken to be efficient in accordance with the estimated time. Lectore Inspire is very helpful for students in understanding lessons that require imagination such as 2D and 3D fields in geometry. For further research, the use of Lectore Inspire can be combined with other related material.

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References
[1] National Council of Teachers of Mathematics 2000 Principles and standards for school mathematics (Reston/VA: National Council of Teachers of Mathematics)
[2] Sagala S 2010 Konsep dan Makna Pembelajaran untuk Membantu Memecahkan Problematika Belajar dan Mengajar (Bandung: Alfabeta)
[3] Dewi I and Harahap S M 2016 The Development of Geometri Teaching Materials Based on Constructivism to Improve the Students’ Mathematic Reasoning Ability through Cooperative Learning Jigsaw at the Class VIII of SMP Negeri 3 Padangsidimpuan Journal of Education and Practice 7 68
[4] Ariani N and Haryanto D 2010 Pembelajaran Multimedia di Sekolah Pedoman Pembelajaran Inspiratif, Konstruktif, dan Prospektif (Jakarta: Prestasi Pustaka)
[5] Kemp J E and Dayton D K 1985 Planning and producing instructional media (New York: Harper and Row Publisher)
[6] Criticos C 1996 Media selection Plomp T & Ely D P (Eds.): International Encyclopedia of Educational Technology, 2nd edition (New York: Elsevier Science, Inc.)
[7] Kustandi, Cecep and Suctipto B 2011 Media Pembelajaran Manual dan Digital (Bogor: Ghalia Indonesia)
[8] Smaldino and Sharon E 2011 Instructional Technology & Media for Learning: Teknologi Pembelajaran dan Media untuk Belajar (Jakarta: Kencana)
[9] Mas’ud M 2012 Membuat Multimedia Pembelajaran dengan Lectora (Yogyakarta: Pustaka Shonif)
[10] Turk H S and Akyuz D 2016 The Effects of Using Dynamic Geometry on Eighth Grade Students’ Achievement and Attitude towards Triangles International Journal for Technology in Mathematics Education 23 95
[11] Fidan Y and Türmüklü E 2010 Examination of 5th grade students’ levels of geometric thinking in terms of some variables Pamukkale University Journal of Education 27 185
[12] Seago N M, Jacobs J K, Heck D J, Nelson CL, and Malzahn K A 2013 Impacting teachers’ understanding of geometric similarity: results from field testing of the Learning and
Teaching Geometry professional development materials *Professional Development in Education* 40

[13] Hadi R 2007 Dari Teacher-Centered Learning ke Student-Centered Learning: Perubahan Metode Pembelajaran di Perguruan Tinggi *Jurnal Pemikiran Alternatif Pendidikan* (INSANIA) 12

[14] Ardian A and Munadi S 2015 Pengaruh Strategi Pembelajaran Student-Centered Learning Dan Kemampuan Spasial *Jurnal Pendidikan Teknologi Dan Kejuruan* 22 454

[15] Thiagarajan S and Sammel M 1974 Instructional Development for Training Teachers Of Exceptional Children *A Source Book Blomingtn, Center For Innovation On Teaching The Handicapped*

[16] Hobri 2010 *Metodologi Penelitian Pengembangan Aplikasi Pada penelitian Pendidikan Matematika* (Jember: Pena Salsabila)

[17] Nieveen Nienke 1999 *Prototyping to Reach Product Quality* (Holland: University of Twente)

[18] Holila Anni 2016 Pengembangan Bahan Ajar Kalkulus 1 berbasis PBM untuk meningkatkan Kemampuan Pemecahan Masalah Matematis dan Kemandirian Belajar Mahasiswa STKIP Tapanuli Selatan Padangsidimpua *Thesis UNIMED*