VALIDITY AND EFFECTIVENESS LESSON PLAN OF PHYSIC LEARNING ARGUMENT DRIVEN INQUIRY (ADI) MODEL ASSISTED BY LECTORA INSPIRE SOFTWARE TO IMPROVE THE SKILLS OF SCIENTIFIC ARGUMENTATION OF HIGH SCHOOL STUDENTS

Hunaidah[*], Erniwati, L Tahang, L Sukariasih, L M Galib, M Anas, L Sahara, R Eso, Vivi

Department of Physics Education, Faculty of Teacher Training and Education, Halu Oleo University, Kendari, Indonesia

*E-mail: hunaidahuho@gmail.com

Abstract. Scientific argumentation is an important skill in learning science that is integrated with science learning. The scientific argumentation in the science learning process is the basis for students to think, act and connect knowledge through argumentation to build their knowledge. This study aims to produce a Lesson Plan (LP) on the concept of harmonic motion, sound waves and light with the ADI learning model assisted by Lectora Inspire software that is valid and effective in improving the scientific argumentation skills of high school students. The type of research in this study is Research and Development which adapted the stages developed by Borg & Gall (1989), which are product-oriented in the education field with the research design one-group pretest-posttest design. The trial phase was carried out in Kendari 6 State Senior High School, Kendari 5 State Senior High School and Kendari 9 State Senior High School with 79 research subjects. The results showed that: Lesson Plan with the ADI learning model assisted by the developed Lectora Inspire software had validity with the average Aiken Index $V = 0.89$ with very high criteria and effectiveness with the Aiken Index $V = 0.77$ with high criteria for improving skills scientific argumentation of students.

Keywords: The Skill of Scientific Argumentation, Physics' Lesson Plan, ADI model Assisted by Lectora Inspire Software.

INTRODUCTION

The 21st century is marked as a century of openness or the age of globalization, that human life experiences fundamental changes that are different from the order of life in the previous century (Wijaya, et al. 2016). the transition from an industrial society to a knowledge-based society affects several aspects of both culture and education. Change is needed to prepare themselves to be able to live and work in the era of knowledge, especially in the field of education (Trilling & Hood, 1999: 3).

The implementation of the 2013 curriculum implies that teachers develop or compile learning tools by adjusting several components with the guidelines contained in the Republic of Indonesia Minister of Education and Culture Regulation No. 103 of 2014 concerning learning in primary and secondary education. Republic of Indonesia Government Regulation number 32 of 2013 article 19 paragraph 3 states that relating to the standard process implies that educators in each education unit are expected to plan the learning process, implement the learning process, assess learning outcomes, and supervise the learning process to implement an effective and efficient learning process.

One of the learning tools used by teachers is the Lesson Plan (LP). The Argument Driven Inquiry (ADI) learning model is one of the learning models designed to create a class that can help students understand how to make a scientific explanation, how to generalize scientific facts, use data to answer scientific questions. In the ADI model syntax there is a phase of collecting data by conducting an experiment and argument discussion phase. In addition, according to Redhana (2015) a number of learning can develop the skills demanded in the 21st century, one of them is argument-based learning. The results of research from Tuba Demircioglu and Sedat Ucar (2012) on the effects of ADI on argumentation skills showed significant results. Some studies show that the ADI learning model is more effective in improving the quality of students' scientific argumentation skills during learning (Hilda, 2017).

The importance of ICT (Information Communication and Technology) has implications for various government policies, especially in preparing the supporting tools and resources. Gunawan (2015: 14) states that in the education field, every educational institution is expected to be able to integrate the curriculum implemented based on ICT. This illustrates at a glance that human life in the future cannot be separated from developments and products related to ICT, including in the learning process that is only computer assisted and computer-based learning.

The Lectora Inspire software is a learning media development tool, and also known as authoring software, developed by the Trivantis company (Romadhan, 2015). Lectora Inspire software is an electronic learning development software (e-learning) that is relatively easy to apply because it does not require understanding sophisticated programming languages (Shalikhah, 2016).

METHOD

This type of research is Research and Development by adapting stages one to five of the ten stages developed by Borg & Gall (1989). This study developed a Physics lesson plan with the ADI learning model assisted by Lectora Inspire Software on the subject harmonic vibration, sound waves and light at the high school unit level. The stages of development (Development) can be seen in Figure 1.
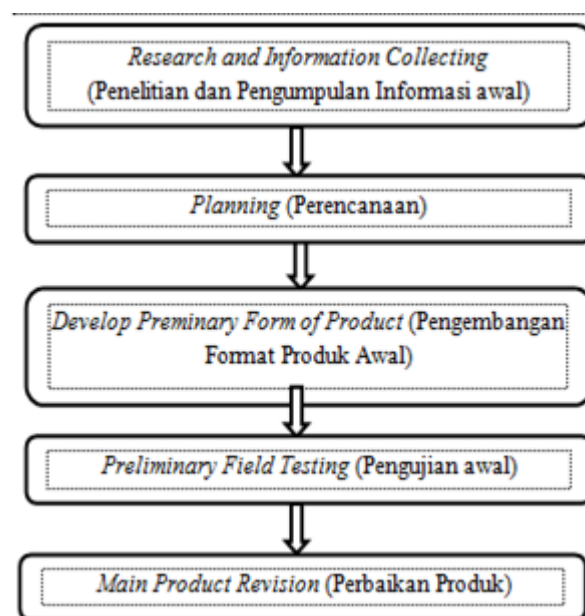

Figure 1. Stages and Flow of Development

Data Collection Technique

The data collection technique in this study relates to the procedures for retrieving data in the research, namely questionnaire and test techniques. Questionnaire is used to collect descriptive data about the validity test of the developed lesson plan. The test included pretest and posttest to measure the contribution of the ADI learning model assisted by Lectora Inspire software in training students' scientific argumentation skills.

Data Analysis Technique

Data analysis of Physics lesson plan validity ADI learning model assisted by Lectora Inspire Software on the subject of harmonic vibration, sound and light waves by education experts and experts of Information and Telecommunications (IT), on tests of scientific argumentation skills. Validity analysis used the validity index proposed by Aiken and its categorization in Table 1.

$$V = \frac{\sum S}{n(c-1)} \quad S = r - I_O$$

Information :

V = The score given by the validator

S = The score given by the validator which reduced by the lowest score in the category used

n = Number of Validators

c = Many categories that can be chosen by Validators

r = The number given by the validator

I_O = The lowest value of the scale used

Table 1. Validity Criteria

Score Interval	Validity Criteria
0,80< V ≤ 1,00	Very High
0,60< V ≤ 0,80	High
0,40< V ≤ 0,60	Average
0,20< V ≤ 0,40	Low
0,00< V ≤ 0,20	Very Low

(Retnawati, 2016)

Effectiveness Analysis of Physics Lesson Plan ADI learning model assisted by Lectora Inspire Software

Results Analysis of scientific argumentation skills' test of students using pretest and posttest method. The enhancement in learning outcomes is obtained by using the n-gain criteria. The equations used to calculate the value of the test results of the scientific skills of individual student arguments are as follows:

$$Score = \frac{Score\ that\ obtained}{Total\ Score} \times 100$$

The enhancement criteria of students' argumentation skills can be seen through the gain score (Hake, 1999) with formula :

$$g = \frac{\%(Sf) - \%(Si)}{\%(Smaks) - \%(Si)}$$

Information :

g = *n-gain score*

Sf = *Posttest score*

Si = *Pretest score*

Smaks = Maximal Score

The gain score is interpreted according to the criteria according to Hake (Table 2)

Table 2. Gain criteria normalized

n-gain Range	Gain Criteria
$(g) \geq 0,7$	High
$0,7 > (g) \geq 0,3$	Average
$(g) < 0,3$	Low

(Hake, 1999)

Data on the effectiveness of Physics Lesson Plan ADI learning models assisted by Lectora Inspire Software were also obtained from the questionnaire responses of students. Assessment of students using a Likert scale with ranges 1-4 with categorization strongly agree = 4, agree = 3, less Agree = 2 and disagree = 1. Percentage of student responses to Physics lesson plans ADI learning model assisted by Lectora Inspire Software on the subject of harmonic vibration, sound waves and light at the high school unit level developed:

$$P = \frac{Total\ Answer\ Score}{Maximal\ Score\ of\ Responses} \times 100\%$$

Table 3. Categorization Criteria Assessment of student responses

Students Score Presentage	Description
76% - 100%	Very Good
51% - 75%	Good
26% - 50%	Less Good
0% - 25%	Not Good

(Adaptasi dari Riduwan, 2010)

RESULT AND DISCUSSION

A. Validity Results

1. Validation Results of Physics Lesson Plan ADI learning model Assisted by Lectora Inspire Software

Validation result of Physics Lesson Plan ADI learning model Assisted by Lectora Inspire Software developed can be seen in Table 4.

Table 4. Validation Results of Physics Lesson Plan ADI learning model Assisted by Lectora Inspire Software

Aspect	V= Aiken Index				V	Validation category
	LP 1	LP 2	LP 3	LP 4		
Format	0,75	0,79	0,82	0,80	0,79	High
Content	1,00	0,92	0,93	0,98	0,96	Very High
Learning Activities	0,92	0,92	0,92	0,92	0,92	Very High
Language	0,90	1,00	0,93	0,86	0,92	Very High

Table 5. Results of Validation by IT Expert for Physics Lesson Plan ADI learning model Assisted by Lectora Inspire Software

| Aspect	V= Aiken Index				V	Validation Category
	LP1	LP 2	LP3	LP4		
Quality	0,77	0,80	0,79	0,83	0,80	Very High
Program	0,79	0,84	0,87	0,90	0,85	Very High
Practicality	0,83	0,90	0,90	0,91	0,86	Very High
Language	0,80	0,83	0,88	0,93	0,86	Very High

Based on the results in Table 4 and Table 5, it was found that the Physics Lesson Plan of the ADI Learning Model Assisted by the Lectora Inspire Software that was developed included valid, both education expert validation with high and very high rating indicator categories and expert validation with very high rating indicator categories. This shows that the Physics Lesson Plan of the ADI Learning Model Assisted by the Lectora Inspire Software developed can be used to train the scientific argumentation skills of high school students.

The effectiveness of developed Lesson Plan can be measured through the results of tests of scientific argumentation skills and questionnaires responses of students to the learning process. Assessments' results of indicators of the argumentation and response skills of high school students can be seen in Table 6 and Table 7.

Table 6. Results of Assessment of Argumentation Skills Indicators for High School Students in the Implication Stage

Argumentation Skills Indicator	Pretest Score	Posttest Score	<g>	Category
Claim made	23,41	91,11	0,87	High
Ground used	16,87	85,67	0,83	High
Warrants given	33,43	89,01	0,83	High
Counter argument generated	25,67	83,44	0,79	High
Rebuttal Offered	16,57	77,89	0,73	High

Table 6 shows that all indicators of argumentation skills in the posttest include complete categories, it is ≥ 75. In the analysis <g> it can be seen that each indicator has increased in the high category. The highest increase is seen in the statement making indicator of 0.87.
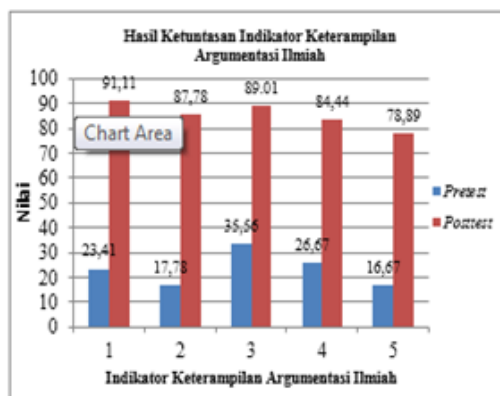
Graph.1. indicator of scientific argumentation skills

a. Student's Responses

The response data of students is obtained by using questionnaires that are shared and filled out by students when all learning activities with the ADI learning model assisted by Lectora Inspire Software have been implemented. Questionnaires are filled out by students assuming that students fill it honestly. The results of student response analysis are presented in Table 6

Table 7. Students' responses to learning activities by applying Lesson Plans with the ADI model assisted by Lectora Inspire Software

No.	Statement	(%)	Category
1.	ADI learning model assisted by Lectora Inspire software is very fun	93,00	Very Good
2.	ADI learning model assisted by Lectora Inspire software can improve scientific argumentation skills	95,25	Very Good
3.	The argumentation activities carried out in learning are not boring	86,39	Very Good
4	The argumentation and experimental activities carried out made it easy for me to understand the concept	82,59	Very Good
5.	Discussion activities are very helpful in understanding concepts and practicing argumentation skills	88,92	Very Good
6	Scientific argumentation skills' test that were provided can practice argumentation skills	98,42	Very Good
	Skor Rata-rata	90,76	Very Good

Description: SA = Strongly Agree; S = Agree; D = Disagree; SDA = Strongly Disagree

Table 7 shows the percentage of students' responses to learning activities that apply Physics Lesson Plans ADI learning model assisted by Lectora Inspire Software to improve students' scientific argumentation skills on the subject of harmonic and light-sound vibrations by presenting an average score of 90.76 with very good categories

CONCLUSION

Lesson Plan of Physic Learning Argument Driven Inquiry (ADI) Model Assisted by Lectora Inspire Software which was developed valid and effective in improving the scientific argumentation skills of high school students.

REFERENCES

Borg, Walter R dan Gall, Meredith D. 1989. *Education Research.* Longman: New York

Demircioglu, T. dan Ucar, S. 2012. *The Effect Of Argument Driven Inquiry On Pre-Service Science Teachers' Attitude And Argumentation Skills*. Procedia-Social and Behavioral Sciences. Vol. 46. Page 5035-5039.

Hake, Richard R. 1999. *Analyzing Change/Gain Scores*. *Dept. of Physics, Indiana University:*USA.

Mouraz, A., Leite, Carlinda., Trindade, Rui., Manuel, Jose. 2014. *Argumentative Skills in Higher Education: A Comparative Approach.* American Research Institute for Policy Development: New York.

Sampson, Victor., & Schleigh, Sharon. 2016. *Scintific Argumentation In Biology Classroom Activities*. National Science Teachers Association: Virginia.

Schen, Melissa S. 2007.*Scientific Reasoning Skills Development In The Introductory Biology Courses For Undergraduates* (Unpublished doctoral disertasion). State University: Colombus.

Trilling, Bernie dan Hood, Paul. 1999. *Learning, Technology, and Education Reform In The Knowledge Age,* (Online), (https://www.wested.org/online_pubs/learning_technology.pdf.), diakses tanggal 16 Februari 2018).

Walker, Joi Phelps., Sampson, Victor., Grooms, Jonathon., Anderson, Brittany., dan Zimmerman, Carol O. 2011. *Argument-Driven Inquiry in Undergraduate Chemistry Labs: The Impact on Students' Conceptual Understanding, Argument Skills, and Attitudes Toward Science*.