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The Development of Learning Inquiry Model to Improve Students' Hots (Higher Order Thinking Skills) during The Covid 19 Pandemic

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Abstract. This study aims to determine the stages of developing Inquiry Learning (IL) model learning tools to improve students' Higher Order Thinking Skills (HOTS). In addition, the purpose of this study is to find out the learning tools with the inquiry learning (IL) model that are valid, effective, and practical. The research method used is development research. This development research adopted the modified Niagarajan, Semmel, and Semmel models. The four stages include define, design, develop, and disseminate. The results showed: 1). The stages of developing learning tools have been conducted using the IL model, which refers to the 4 D model, including defining, designing, developing, and disseminating. The learning tool is valid because it obtains an average score of 3.08 from three experts. The learning tools are practical because the observation' results of the IL Model implementation in the experimental class show that the stages of the model have been implemented perfectly with a percentage of 100%. In the data regarding the practicality of the IL model from the aspect of student activity in learning with IL, the results show that students are actively involved in learning with an average score of 3.40 (high activity). The average score of students taught using the IL model (experimental group) was higher than students in the conventional class (control group). The average score of students in the experimental group was 80.6, while the control group was 74.5. It means that the application of IL can improve students' HOTS thinking skills.

Keywords: *Inquiry Learning Model; Higher Order Thinking (HOTS)*

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INTRODUCTION

Life dynamic changes very rapidly, forcing each human to adapt their thinking, behaving, and acting. Adaptation is necessary to keep alive and survive. Due to the importance of adaptation, anything and anyone unable to adapt will be distinct (Kasali, Rhenald, 2017). The covid 19 pandemic requires many people to Work from Home (WFH), which is a momentum to adapt, and persons can only do it with critical and creative thinking skills. These thinking skills are called *Higher Order Thinking Skills* (HOTS). According to Sani, R. A (2019), *Higher Order Thinking Skills* (HOTS) is a stage of thinking that not only memorizes points verbally but also understands the meaning. Thus, it needs integrated thinking involving analysis, synthesis, associating, and concluding to create creative and productive ideas.

So far, students majoring in Government Science, Unismuh, especially those taking the Philosophy of Science course, have not been able to think critically and creatively. It is suspected due to the conventional learning method applied in the classroom where students only act as subjects, and the lecturer solely holds the authority. The teaching model orienting the teachers is no more relevant to be applied, especially in the Covid 19 pandemic era, which requires everyone to be more creative and innovative in life.

One learning model that can develop higher-order thinking skills (HOTS) is the inquiry learning model. Syamsidah et al. (2019) argued that the inquiry model is a learning model that optimally involves all students' abilities to search and investigate something systematically, critically, logically, and analytically to formulate the findings by themselves. Furthermore, Afandi & Sajidan (2017) explain that the inquiry learning model can stimulate critical and innovative thinking skills. The thinking skill allows students to solve problems and bring out creative ideas.

Inquiry learning model should be developed because it is relevant to develop students' critical and creative thinking skills, especially those who take Educational Philosophy subject. Students are expected to adapt to the covid 19 pandemic by having critical and creative thinking skills with HOTS. This study supports Unismuh Makassar's leading research related to the third leading research of the Center for human resource development, education and religion (HR KK) and (i) political education rooted in local wisdom.

LITERATURE REVIEW

Learning Media

Learning media is an important and strategical instrument in learning. It contains syllabus and lesson plans. Therefore, before entering the classroom, teachers should be ready with their learning media. The better the media, the higher the quality of the learning process. Butcher, Davies & Highton (2006) and Syamsidah et al. (2019) explained that learning media is also mentioned as "*guidelines and a common understanding* used by teachers to achieve the learning goals. Thus, learning media is defined as a unit of learning resources arranged in such a way to be implemented in

teaching.

Inquiry Learning Model

A learning model is a series of activities conducted by teachers to present learning materials. Thus, the learning model is usually referred to as the process before, while, and after the learning. Besides, the learning model is also related to facilities directly or indirectly used in the learning process. One of the learning models receiving serious attention from educational activities and observers is the inquiry learning model. This model emphasizes critical and analytical thinking to search and find a solution to a problem (St. Zubaidah, 2018; Syamsidah. et al., 2019). The inquiry model provides space for students to participate in the learning process. Thus, the model is expected to produce an independent, creative, and innovative output of education (Sanjaya, 2010).

Based on those statements, it can be concluded that inquiry learning is a learning model that prepares students in a situation demanding them to experiment by themselves to think critically and innovatively to search and find the solution to a problem being questioned. Inquiry learning is much affected by the cognitive learning paradigm. It argues that learning is a mental process by occupying all potentials we have optimally. Students should not only be able to memorize facts, but they should also find knowledge and ability by themselves. Thus, teachers had a task to design activities directing students to find out something in any subjects and push them to develop a scheme formed from the assimilation and accommodation process (Trianto, 2010; Ibrahim, M.dkk.2010).

Higher Order Thinking Skills (HOTS).

In facing the new normal era due to the Covid 19 pandemic, higher-order thinking skills are highly demanded. Students should not be taught only to understand the material, and not only to be directed to know a fact but also to seek information by themselves. Higher-order thinking skills not only memorize facts or deliver information by copying it from the source and pasting it to the hearer. Sani, R. A (2019) defined the Higher Order Thinking Skills as thinking widely to find a new challenge, applying new information or prior knowledge, and manipulating the information to seek all possible answers to a new situation.

Higher-order thinking skill is different from the common way to think, like memorizing or retelling information similar to the source. Higher Order Thinking Skills (HOTS) is a thinking process that requires someone to manipulate information and ideas in such a way to create new meaning and implications (Husna, N. 2018). Furthermore, Sani, RA, (2019) describe the Higher Order Thinking Skills as critical and creative thinking guided by ideas of truth that each has meaning. Critical thinking and creative thinking are dependent on each other, just similar between criteria and values and between reasoning and emotion. According to Sani, RA (2019), Higher Order Thinking Skills (HOTS) is a thinking way that not only memorizes information verbally but also understands the truth it contains. To understand a meaning, integrated

thinking is needed involving analysis, synthesis, associating, and concluding to create creative and productive ideas.

4 Based on some statements above, it can be concluded that Higher Order Thinking Skills (HOTS) is the ability to think, understand and comprehend, and describe, analyze, and predict. Thus, HOTS is expected to create critical, creative, and problem solver learners. Benjamin S Bloom divided the learning taxonomy into six categories: knowledge, comprehension, application, analysis, synthesis, and evaluation. Students' understanding levels are various, ranging from the lowest one (C1): to know or to remember, to the highest one (C6): evaluation (Sani, RA, 2019). Bloom taxonomy has been implemented for a long time in making instructional design in education. Anderson dan Krathwohl reviewed the Bloom taxonomy and revised some of the stages. following is the Bloom taxonomy after revised: C1 remember, C2 Understand, C3 Apply, C4 Analyze, C5 Evaluate, C6 Create as summarized by Sani, RA (2019)

RESEARCH METHODS

Design of Study

The study employed the developmental approach Thiagarajan, Semmel, and Semmel(1974), 15 consisting of four stages: defining, designing, developing, and distributing.

Research Subjects and Sites

1. The study subjects were all students and lecturers of Educational Philosophy in the Faculty of Social and Political Science, Unismuh Makassar.
2. The expert assessors refer to experts doing assessment or validation on the content of learning media prototypes.

13 The study was conducted in the Department of Governmental Science, Faculty of Social and Political Science, Unismuh Makassar.

Collection of Data

12 Data were collected through Focus Group Discussion (FGD), Interviews, documentation, and questionnaire.

Methods of Data Validation and Analysis

The qualitative approach was validated by triangulating the sources and methods. While data were analyzed using the descriptive method (Bogdan & Biklen, 1982).

FINDINGS AND DISCUSSION

The study investigated two research questions, including: (1) What are the stages of Inquiry Learning (IL) model development that can improve students' HOTS, and (2) what is the valid, effective, and practical HOTS learning media model. The study has answered both research questions as explained in the previous section. Following is the discussion of findings based on relevant theory and concept, which supports the obtained empirical facts, including observation, interviews, documentation, and statistic analysis. As mentioned before, the study employed the Research

and Development approach adopted from the model introduced by Thiagarajan, Semmel and Semmel(1974), which underwent four stages: defining, desining, developing, and distributing. Each of the stages is explained below:

Defining Stage

The first step of this stage is front–end analysis. After observing lecturers in the classroom, it was found that the subject of educational Philosophy was carried out through a teacher learning approach leading to the low quality of the learning output. One of the lecturers applied the instructional method, while another applied the discussion method. Teaching educational Philosophy should not apply instructional methods. It should implement a discussion model instead, and if possible, the Inquiry Learning (IL) model should be considered. Being consistent with applying the IL model will train students' Higher Order Thinking Skills.

1. Analysis of Students

Students were analyzed to review their characteristics like background, especially their basic understanding of the concepts of Educational Philosophy. The analysis was carried out using tests and questionnaires. The analysis showed that the HOTS of students majoring in Govenrmental Studies (research subjets) was in the developing category. The learning results of the Educational Philosophy subject were in the medium category (the ² average score was 64.22 out of the maximum score of 100). However, the results had not shown the possibilities of creating an optimum learning process that can increase students' scientific thinking skills.

That student had low HOTS is highly likely influenced by the implementation of conventional learning as mentioned above. The Educational Philosophy lecturer metioned that they believed that the one-way learning method was the best approach since they still had limited understanding and knowledge about innovative teaching methods like IL.

2. Analysis of Concept

The subject of Educational Philosophy covers some basic competencies, including the basic concept of knowledge, historical discussion on knowledge, discussion on epistemology, ontology, and axiology of knowledge, basics of deductive and inductive thinking skills, and the benefits of learning Educational Philosophy. Educational Philosophy subject has rather different characteristics from other subjects. Thus, the lecturer of the subject should be more creative in selecting learning models and media to suit the subject's characteristics. However, based on the interviews conducted with the lecturer invited as the research subject, it was found that they had less understanding on ² the existence of the subject that should be taught using creative and constructive learning model rather than with conventional model (focusing on teacher talk and dominated by teacher or teacher center approach).

3. Analysis of Task

Tasks were distributed to students in the form of a test assessing their knowledge and skills related to the concept of Educational Philosophy that they learned. The topic is related to applying Educational Philosophy in real situations. They should develop it

and find out solutions through literature review.

The first task was a group task to make a deductive and inductive truth paper. The second task was to present the paper in front of the class. The third task was to discuss the paper's content with other students, and the lecturer monitored the discussion as the facilitator. Students' routine to formulate problems, discuss, and deliver ideas in front of their peers and lecturer is expected to increase their skills to do analysis, be initiative, solve problems, do a presentation, and so on so that their HOTS can be improved. Based on the observation, it was found that students' ability to complete the task or make paper and discuss with their friends had not been optimum yet due to their limited understanding of the concept of Educational Philosophy that they had learned.

4. Specification of Learning Goals

The specification was done to lengthen the duration of the activities in the classroom and laboratory. This method was set in a constructivist environment that was expected to give a chance to students to complete the task / solve the problems in a small group. The activities included planning, acting, monitoring, and evaluation, aiming to train students to understand and be skillful in planning, doing, and evaluating. In the end, they were expected to have their thinking skills improved to the HOTS level.

Based on the observation and interview, it was found that students involved as the research subject, in general, had not understood how to do the group project task. They also showed low ability to make a plan, do the action, and analyze.

Results of preliminary study, especially the defining stage (points 1-4), guided us to develop the specification of learning goals of Educational Philosophy subject as follows: (1) Students can explain the basic concept of knowledge, (2) students can explain the historical discussion on education, discussion on epistemology, ontology, and axiology of knowledge, basics of deductive thinking, (3) student have their HOTS developed, and (4) students become more independent, creative, and innovative.

Designing Stage

In this step, the instrument was developed. Based on results of front end analysis, analysis on students, concept, analysis of the task, and the specification of learning goals, we developed: a) questionnaire of students' and lecturer's response on the implementation of Lesson Plan, b) validation format of media including Lesson Plan, BPM, and module, c) observation sheet: learning activities and the implementation of Lesson Plan, d) observation sheet: learning activities and the implementation of the model, e) test to measure the HOTS (the test was based on cognitive, affective, and psychomotor levels), f) the selection of learning model. Here, we chose the IL learning model, g) the selection of scientific-based learning media format, h) draft including i) lesson plan using IL model, y) IL-based module, and k) model guidance book.

Development Stage

1. Validation from Experts

The validators assessed some aspects of the media, including format, language, construction, and content. Based on the suggestion from validators, the learning model and media were revised. Results of validation on the model book and media (prototype) are as follows: Each expert gave the scores of (model book = 3,10; RPP = 3,17; module = 3,05 and media assessment = 3,00) with the average value of 3,08 and the *judgment of expert* index coefficient = 1 (valid). However, some revisions were made based on the suggestion from experts to produce a better quality of model book and teaching media for Educational Philosophy subject in prototype II that is ready for field trial.

2. Practicality Test

Data about the practicality¹⁹ of the IL (Inquiry learning) model related to the implementation of the learning is presented in Table 1. The observation on the implementation of the IL model in the experimental class showed that each model was implemented perfectly with the percentage of 100% (high category of practicality). Data of IL model practicality from the aspect of students' activities in learning using the media is presented in Table 2. The results show that students in the group were actively involved in the learning activities with an average score of 3.40 (high activity).

Table 1. Results of Observation on Students' Activities in The Group

Activities	Average Scores
Working together or doing discussion in the group.	3.50
Answering, objecting, or giving ideas to the issues discussed.	3.45
Doing practice questions in WA group	3.6
Asking questions related to the problem being discussed, providing alternative solutions to problems, validating other groups' answers, or giving conclusions.	3.2
Pay attention to teacher explanations or directions, discussions, and explanations from a student in other groups.	3.4
Completing the Student Worksheet in time.	3.3
Show discipline by not doing other activities when following class discussion.	3.25
Average score	3,4

3. The Effectiveness

The effectiveness of the IL (model Inquiry Learning) model to improve HOTS was tested through extensive trials involving two classes which each contains 30 students. The results can be seen in Table 2. Both classes had a normal distribution with statistical values of 0,278 and 0,327. Both control and experimental classes had homogenous variance with the statistical Level score of 0,093 (See Table 2). The two-sided t test results show a significant difference between the class taught with the IL model and the one taught with the conventional method. The experimental class was regarded to result in better output based on the mean score of 80,6 higher than that of the control class (74,5). It means that the implementation of IL can improve HOTS.

Table 2. Results of ARD on the Field Trials / Expanded

No	Statements	Scores		Average Scores	Positive Response (%)
		1	2		
1	I easily understand the syntax of the Inquiry Learning Model (IL-M)	4	4	4	100
2	The stages of the IL-M strategy are clear and easy to implement	3	4	3,5	100
3	The language used in the IL-M strategy syntax is not clear and not communicative.	4	3	3,5	100
4.	I easily understand the Lesson Plan because it corresponds to the syllabus.	4	4	4	100
5	I think the steps provided in the MODULE (Student Worksheet) are very operational	3	4	3,5	100
6	I find it difficult to apply and follow the steps provided in the MODULE	4	3	3,5	100
7	The time allocated in the Lesson Plan and MODULE is sufficient to achieve the targeted competencies.	4	4	4	100
8	I find it difficult to understand the language used in the MODULE and Lesson Plan.	3	4	3,5	100
9	The competency indicators are following the syllabus, LESSON PLAN, and MODULE.	4	4	4	100
10	Experimental data and animated videos in MODULE create active and student-centered learning.	4	3	3,5	100
11	Stimulus questions in the MODULE stimulate and ease students to build concepts.	4	4	4	100
12	The stages of activities in the MODULE are in accordance with the MIL strategy.	4	3	3,5	100

13	The MODULE assists me in facilitating students in building their concepts.	4	4	4	100
14	Data from experiments and exercises in MODULE can motivate active and student-centered learning.	4	3	3,5	100
15	The layout of the MODULE is attractive and practical to use in learning	3	4	3,5	100
Average Score		3,73	3,67	3,7	100

The practicality of implementing the model on students can be seen in Table 3. It can be seen that among 30 students, 91.4% of them gave positive responses on the IL model and the media applied. Only 5.4 percent of students gave negative responses or were not really happy with implementing the model. It means that the application of IL can improve students' learning ability and independence. The findings confirmed Syamsidah et al. (2019) and (Syamsidah et al., 2020), who stated that the inquiry learning model could improve their independence and critical thinking skills.

Table 3. Results of ARM on Extensive Trials

No	Statements	Scores of 35 students				Average score	Responses %	
		1	2	3	4		+	-
1	I am happy to study using the IL-M strategy.	1	27	2	3,0	97,1	2,9	
2	The learning stages ease me understanding and building the concept of chemical balance.	1	26	3	3,1	97,1	2,9	
3	I find it easy to understand a concept because the teacher correlates the earlier concept we learned and the one we will learn.	1	22	7	3,2	97,1	2,9	
4.	Animation video presented in the classroom makes me interested to learn.	2	21	7	3,1	94,3	5,7	
5.	The context presented in the video is less clear and difficult to understand.	2	23	5	3,1	94,3	5,7	
6.	Learning using the strategy makes me difficult to collaborate and discuss in the group.	3	19	8	3,1	91,4	8,6	
7.	The learning strategy is student-centered.	3	20	7	3,1	91,4	8,6	

8.	IL-M-based MODUL is helpful in the learning process.	1	27	2	3,0	97,1	2,9	
9	I find it difficult to understand the language used in the module.	1	26	3	3,1	97,1	2,9	
10	Indicators of the competencies targeted in the learning are mentioned in the module.		25	5	3,1	100	-	
11	Data of experiment results are clearly stated in the module, easy to understand, and helpful to build concepts.	2	24	4	3,1	94,3	5,7	
12	Exercises in the module help me to understand the concept better.		28	2	3,1	100	0	
13	Test provided in each meeting is difficult to do.	5	18	7	3,1	85,7	14,3	
14	The test is in accordance with the indicators of learning competencies.	3	21	6	3,1	91,4	8,6	
Average Score						3,1	94,6	5,4

The practicality of implementing the media to students can be seen in Table 3. It shows that among 30 students, 91.4 % of them gave positive responses on the implementation of the IL model and the media used. Only 5.4 percent of them gave negative responses or were not satisfied with the implementation of the model. It means that the implementation of IL can increase HOTS.

CONCLUSIONS

The development stages of project-based learning media referring to the 4D model included *Define, design, develop, and disseminate*. The defining stage, conducted in the preliminary study, shows that the learning results in educational Philosophy subjects had not been optimum yet because of the inappropriate learning media and conventional learning model. The front-end analysis of the observation data shows that the teaching-learning approach still dominated the lecturer's learning approach. It majorly applies conventional teacher talking that is less constructive.

The research findings were valid because three experts gave the average value of 3.08. it was practical because the observation on the implementation of the IL Model in the experimental class showed that each stage of the model was implemented perfectly with the percentage of 100%. Data on the practicality of the IL model was obtained from students' activities in learning using IL Model. It shows that students are more actively involved in the group during learning, with an average of 3.40 (high activities). The effectiveness test results show that the class taught with IL was significantly different from the class applying the conventional method. The

experimental class resulted in a better outcome with a mean score of 80.6, while the control class showed 74.5. It means that implementing the IL model can increase students' HOTS.

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