Developing HOTS-Oriented Learning Model with Scientific Approach for the Heads of IGTKI throughout Central Java

Sri Sularti Dewanti Handayani, Akaat Hasjiandito
Department of Early Childhood Teacher Education
Universitas Negeri Semarang, Indonesia
dewanti@mail.unnes.ac.id, akaat@mail.unnes.ac.id

Abstract

The problem raised in this study is that teachers have not yet implemented HOTS-oriented material with scientific method during the learning process. The objective of this research is to develop HOTS-oriented learning instructional tools with scientific approach in Kindergartens for the Head of IGTKI throughout the Central Java. The method implemented in this study is RnD. The subjects of this research is the Head of IGTKI throughout the Central Java with the total number of 35 people, however 15 people are selected as samples. The outcome produced from this research is HOTS-oriented learning instructional tools with scientific approach. Based on the assessment from the expert's validator, the instructional tool is considered valid (85.93%). The limited tryout administered presented that the instructional tool is deemed practical (82.72%) and received very good response proved (85.93). Wide-scale tryout then carried out to measure the effectiveness of the instructional tool, the teachers stated very practical (82,31), and it also received a good response (88,72%). In regards to the improvement on the Kindergarten teachers' comprehension, gain score of 0.66 is obtained (medium), under the details of 57.14% experience improvement with the criteria of 'medium' and 42,86% experience improvement with the criteria of 'high'. Thus, it can be concluded that this HOTS-oriented instructional tool with scientific approach is proved to be effective. Additionally, based on the findings, the heads of IGTKI are entitled of the autonomy rights to do any innovations on the learning towards the Kindergartens teachers whom they are being in charge of.

Keywords: Scientific Approach, HOTS *(Higher Order Thinking Skills)*

1. Introduction

Learning activity is the process that allows children to develop their potential further. Education/ learning activity in the 21st century frequently discuss, as the attempt to cope with the vast development and to master the life skill required, the importance for teachers and students to master their knowledge in four C dimension that includes Critical thinking, Creativity Communication, and Collaboration. Therefore, it is expected that teachers and students are able to think critically, take action creatively, communicate and collaborate effectively during the learning activity that is formulated based on Higher Order Thinking Skill (HOTS). Within HOTS-oriented learning activity, students are given the freedom to develop their creativity and their initiative in taking actions. Through the implementation of Curriculum 2013 for Early Childhood Education (PAUD), that is constructed based on student-center method and scientific method paradigm, a learning strategy where teacher shall be innovative in conducting the learning activity is required in order to facilitate the students to master the life skill needed to face the challenges in the 21st century (Shofwan et al.). Those life skills refer to HOTS that is presented using scientific approach in the teaching process. In kindergartens, teachers should develop HOTS-oriented learning activity as early as possible. So that students can think critically and creatively, as well as communicate collaboratively during the learning process. Play-and-learn activity is useful in helping the children to develop their knowledge and stimulate them to solve a certain problem they are facing throughout the learning process. Such scenario would naturally occur since young children are exceptional inquirers as seen from their habit to ask everything that they see due to their high level of quriousity (Yulianti, 2008 dalam Gultom, 2017).

The implementation of HOTS-oriented learning would help to shape children's ability to think critically. The learning process may be conducted using the process as follows: a) invite the students to recall the activities they have done. Basically, this process could help to construct critical thinking ability as they would automatically discuss about their previous activities with each other; during the discussion, they will try to remember, as the process of critical thinking, the activities they have been carried out, b) encourage the students to conduct 'question and answer' session, they respond to the questions and ensuring their freedom to raise their opinions and arguments,

c) guide the students in implementing the science or knowledge they have obtained from the activities they are doing, d) In the next stage, teacher ask the students to evaluate the activity they have completed. Evaluation train students to do high level of thinking concerning a particular knowledge, especially on the benefits from the activity that they have done, f) as the last stage of the process, teacher trains and lead the students to construct a new mindset and thoughts to create comething new, actualize their ideas, ande develop their knowledge. Based on the arguments presented above and in accordance with the Bloom Taxonomy, the (2004) revision is developed to better reflect the children's high level and critical thinking ability, also active participation as shown in the table 1:

Table 1. Bloom Taxonomy, revision (2004)

Previous Bloom Taxonomy	Revised Bloom Taxonomy
Knowlegde	*Remember*
Comprehension	*Undestand*
Implementation	*Implement*
Analysis	*Analyze*
Synthesis	*Evaluate*
Evluation	*Create*

Furthermore, in regards to the learning activity as seen at table 1, shows that teachers need to develop learning instructional tools as for their guidance in preparing, conducting, and evaluating the learning activity. Therefore, they need to prepare an innovative instructional tools in the form of RPPM (Rencana Pelaksanaan Pembelajaran Mingguan) or Weekly Lesson Plan and RPPH (Rencana Pelaksanaan Pembelajaran Harian) or Daily Lesson Plan for Kindergatens. Those instructional tools prepared should be checked for its validity by the experts. According to Nieven in Rochmad (2012), validity of the resulted product (teaching instructional tools) is valued from the consistency of the material. Based on the validation from the expert's team, the instructional tools are either considered valid by the material experts or deemed to require a bit of revision (Giatman et al.; Kanto et al.; Nuraini et al.). After that, the instructional tools can be used in field try-out to be improved further based on the inputs and suggestions for the whole learning components. It is necessary to identify the practicality from the learning instructional tools produces. Practicality is easiness provided in a product ether during the preparation, implementation, interpretation, or in its storage (Arikunto, 2010). A product is considered practical according to the indicator of implementation (Nieveen dalam Subekti, 2012).

3. Methods

This study is an academic research with Rsearch & Development (R&D) approach. A Research and Development is a research method used to produce a certain product then test the effectiveness of the product.

3.1. Stages of the Research:

For the stages required in this study, knowing that it applied Research & Development method, it is illustrated as figure 1:

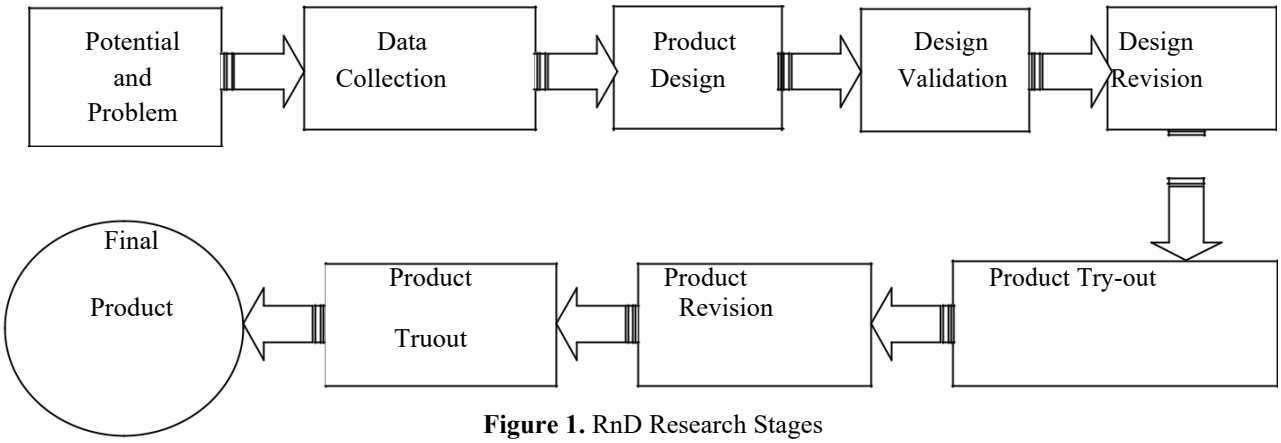

Figure 1. RnD Research Stages

3.2. Population/ Research Sample

This research is conducted in Central Java Province. The population in this research are all the leaders of IGTKI in Central Java Province, with the total number of 35 people. There are 15 samples selected, because the leader of IGTKI in each Regency/city tend to have similar/homogenuous theoretical principle on scientific approach learning as also similar comprehension on HOTS; and the research subjects have not implemented HOTS in kindergarten.

3.3. Research Design

This development research is designed through the background study with descriptive qualitative approach in order to identify the potential and problem that occur, continued with designing the product model development, validate the design, and revise the design. The process is then continued with limited try-out on the model design through conducting experiment method (one group pretest -posttest design), revising the product if necessary, and developing the final product. The research plan is illustrated in the table 2.:

Table 2. Research design of one group pretest posttest design

Class	Pre-test	Treatment	Post-test
Experiment	O1	X	O2

Note:
O1 : pre-test for experiment class
O2 : post-test for control class
X : treatment, learning treatment with scientific approach using HOTS-oriented learning instructional tools

3.4. Data Collection Technique

Data collection technique applied during the background study used several instruments, such as questionnaire, interview, and literary studies. Al these three techniques is used to identify the potential and problem faced by teachers during the learning process in implementing scientific method with HOTS-oriented material along with its implementation in composing the instructional tools. After administering the treatment, that is socializing the learning strategy with scientific approach for HOTS-oriented material, a limited try-out using test and questionnaire is carried out during the product design development study in order to identify and measure the success rate of the product.

4. Results and Discussion

4.1. Developing HOTS Oriented Instructional Tools with Scientific Approach

Instructional tools that is intended to be developed in this research are *RPPM (Rencana Pelaksanaan Pembelajaran Mingguan)* or Weekly Lesson Plan and *RPPH (Rencana Pelaksanaan Pembelajaran Harian)* or Daily Lesson Plan. Both are constructed based on HOTS and scientific method. The development stages are carried out in the order as follows:

a. *Define* Stage
   In this stage, the researchers determine the components of the scientific approach that will be included in the HOTS-oriented learning instructional tools. The content of information is obtained through focus group discussion acitivity among the members of IGTKI in Central Java that consist od 15 members. The inputs and suggestions from them becomes the main consideration since the developing of this instructional tool is intended for the learning implementation in Kindergatens.
b. *Design* Stage
   The RPPH or Daily Lesson Plan is designed along with the research subjects/ IGTKI members with new innovation. It is designed after they are given the treatment of socializing the implementation of HOTS-oriented learning with scientific method by observing the character of child's development in the viewer, layout, theme, and evaluation format in the Daily Lesson Plan.
c. *Development Stage*
   1) In this phase, RPPM and RPPH are done. The steps of conduct are as follow:
      Determining the components in the RPPM
      - Identity of institution that consists of theme, sub-theme, su-sub-theme, semester, age group and time allotment.

- Aspet of Development (Value of Religion and Morality, Cognitive, Language, Motor Physique, emotional Social, Arts)
- Core Competence
- Learning Materials

Determining the components in RPPH:

- Identity of institution that consists of, semester, daty/date, age group, theme, sub-theme, and time
- Core Competence and Learning Objectives
- Learning Materials
- Implementation of learning that consists of morning journal, opening, main activity, closing.
- Learning method
- Scoring Method/Format

2) Developing RPPM and RPPH based on the agreed content
3) Conducting validity test by experts.

Validity test by experts is done to measure whether the instructional tools (RPPM and RPPH) that is developed is suitable to be published to the entire members (the teachers) that is participated on the organization of IGTKI or not. Based on the validity test by experts, it can be inferred that the instructional tools developed is valid and can be used according to the suggestion and input from the validators. Here are the suggestions and inputs from the validators as describe at table 3.

Table 3. Result from the Experts Validator

Validator	%	Note	Suggestion/Input
Experts of Content (Academician)	82,54	Very Valid	The instructional tools is good and complete, but it needs some minor improvement in several parts.
Experts of Content (Kindergarten Practitioner Teacher)	89.32	Very Valid	The instructional tools is alreaedy very helpful, it is better if it is socialized
Average	85,93	Very Valid	

The result gained from the suggestions of the validators stated that the instructional tools with the scientific approach with HOTS orientation is already valid but there are still some different parts (between the Public and Islamic Kindergarten). Howevery that does not reduce the essence of the content from the instructional tools. It is done in order not to add or revise, so that it is ready to be used for education needs.

4) Limited Testing

After it is announced as valid by the validators then the instructional tools is tested limitedly to 15 kindergarten teachers that they are all the committee of central IGTKI. The result of the test can be observed in the table 4:

Table 4. Limited Testing on the HOTS oriented

No	Indicator	%	Note	Comment/ Suggestion
1.	Practicality	82,72	Very Practical	The informations that becomes the complementary component, so that it adds more knowledge and information
2.	Response from Teacher	85,93	Very Good	This instructional tools is easy to understand
	Average	84,33		

The objective from the limited test is to see whether the instructional tools is practical enough to be used as well as the find out the response of the teachers as the users of the instructional tools.

5) Extended Testing
The final phase from the development process of this instructional tools is to do the extended testing. This phase is done to expand the information of the HOTS oriented instructional tools to the IGTKI so that the members can learn from it. After the members see the existing content in it, then the researcher conduct data collection in term of level of practicality and response from users of the instructional tools.

d. *Disseminate Stage* (Expansion)
This phase is done by socializing or publishing the instructional tools to the broader public.

4.2. The Effectiveness of HOTS Oriented Instructional tools

The effectiveness of the instructional tools can be seen from the three indicators, those are the improvement of the understanding of the teachers, level of practicality and the response of the user of the instructional tools. Based on the extending testing from the usage of instructional tools di Central Java Province, it is gained that the results are:

a. The improvement of teacher understanding upon the instructional tools with the HOTS oriented scientific approach

The average result of the knowledge level before the development of the instructional tools with the HOTS oriented scientific approach to the experiment group is 59.86. After the development of the instructional tools is done using the scientific approach, the average score gained is 86.5. the result of the improvement of the teacher understanding can be seen at tebale 5.

Table 5. The Improvement of Teacher Understanding upon the Instructional Tools with the HOTS Oriented Scientific Approach

No	Score	Experiment	
		Pre test	Post test
1	Average	59,9	86,5
2	Maximum	65,0	92,5
3	Minimum	55,0	82,5

The table 5 shows that the significance of the improvement of teachers understanding upon Instructional Tools with the HOTS Oriented Scientific Approach can be seen from the test of teachers understanding using the paired sample t-test.

Table 6. Testing on Improvement upon Teachers Knowledge

	Mean	T	Sig (2-tailed)
Pair 1 PretesEks- PostEks	26,64	33,576	.000

Based on table 6 shows that the testing on the improvement upon the experimental group gained the ^{t}count = 26.64 with p =0.000 < 0.05, which means that there is an improvement on the teachers understanding upon the Instructional Tools with the HOTS Oriented Scientific Approach that is significant on the experimental group. Meanwhile, to find out the criteria on the improvement of teachers understanding in the experimental class can be seen in the table 7.

Table 7. Score of Normalized Gain

Interval	Criteria	Experiment	
		Frequency	Percentage
g ≥ 0,7	High	15	42,86
0.3 ≤ g 0.7	Medium	20	57,14
g < 0,3	Low	0	0
Total		35	100
Average			0,66
Criteria			Medium

Based on the table 7, it can be inferred that the criteria of the improvement of teachers understanding upon the Instructional Tools with the HOTS Oriented Scientific Approach between the pretest and the post-test in the experimental class. The average gain score on the experimental class is 0.66 in the criteria of medium that indicates

that the teachers experience the improvement of understanding in the learning with HOTS oriented scientific approach with the medium criteria. From 35 teachers on the experimental class, there are 20 teachers (57.14%) experienced medium improvement, 15 teachers (42.86%) experienced high improvement.

b. Degree of Practicality of the Instructional Tools

Table 8. Degree of Practicality of Instructional Tools

Indicator	%	Note
Usability	78,82	Practical
Quality of Information	83,67	Very Practical
Quality of Structure	84,43	Very Practical
Average	82,31	Very Practical

Based on the table 8, it can be seen that the degree of practicality of Instructional Tools with the HOTS oriented Scientific Approach, which indicates the criteria of very practical with the score of 82.31.

c. Response of User upon the Instructional Tools

Response from the user with the presence of instructional tools with the HOTS oriented Scientific Approach, it is gained the score of 88.72% with the category of very good.

From the result of the study, about the instructional tools that is collaborated with the implementation HOTS oriented with the scientific approach learning process gained the innovation of instructional tools in the form of RPPM (Weekly Lesson Plan) and the RPPM (Daily Lesson Plan) for Kindergarten.

On the implementation of learning for 6 days, it only uses two (2) forms of RPPH; the firs form contains the process of scientific approach (observing, asking, data collecting, analyzing, and communicating completely in the learning theme that is learned in the day) and the second form contains the acitivty of children in conducting the duty according to their interest. The creation of the children are various according to the idea in their minds. So that, the innovation of instructional tools of RPPH contains the instruments of HOTS< as the reference to reveal the idea of children's thought.

The instructional tools is tested and announced valid (**85.93**) by the experts. This is according to the valid statement that is mentioned by Nieven in Rochmad (2012), this can be seen from the product that is made (product of instructional tools) and the product related consistently between each other (material). Based on the validation score, the instructional tools can be used on the Kindergarten and can be perfected based on the development of theme, condition as well as the institution of each Kindergarten.

The product of instructional tools that is produced in this research requires more study on the level of practicality. Practicality is presenting ease of access that whether in term of preparing, using, interpreting as well as saving (Arikunto, 2010). The products is announced practical can be seen from the indicator of fulfillment (Nieveen in Subekti, 2012).

From the result of the questionnaires of practicality that is filled by the teachers on the extended testing to most of the teachers stated that on the criteria of fulfilled or practical, which indicates the average score of 82.31. This can be the indicator that the instructional tools with scientific approach to use. Beside that it is valid and practical, the product of instructional tools needs to be measured in term of effectiveness.

Meanwhile, the effectiveness of instructional tools can be achieved if the preparation on the planning, implementation and evaluation can be conducted according to the procedure as well as according to each functions. The final result from this research can be said effective because there is an improvement on the teachers understanding in using the HOTS Oriented Scientific Approach that is shown the score of 86.5. This is according to the effective study presented by Akker in Rizka (2014) that refers to the indicators of the effectiveness that can be seen from the learning results, response and motivation in following the lesson. This can be seen from the result of the improvement of the understanding that analyzed using the paired sample t-test. If it seen from the normalized gain score indicated that most of the improvement of understanding in the medium category. Thus, the research

about the improvement of Instructional Tools with the HOTS Oriented Scientific Approach that can be categorized as effective because it is already implemented and gained positive response from the teachers.

5. Conclusion

The development of Instructional Tools with the HOTS Oriented Scientific Approach covers several steps, those are: 1) defining, establishing content, 2) designing, that is create the instructional tools, 3) developing, that is to develop the RPPM and RPPH, and 4) disseminating, that is publishing the instructional tools. Based on the scoring from the expert validator, the instructional tools is announced to be very valid with the score of 85.93%, so that it can be used for the learning in Kindergarten. The result from the limited testing to 15 respondents stated that the instructional tolls is practical with the score of 82.31% and gained a response score of "good" with the score of 85.93%. The effectiveness test is used on the extended testing with the result from the teachers stated that the degree of practicality of the instructional tools gained the score of 82.31% with the category of very practical, and gained the response score of "good" with the score of 88.72%. Related to the improvement of the understanding of Kindergarten teachers upon the learning with the scientific approach gained the score of 0.66 or on the criteria of "medium" with the detail of 57.14% improvement happened on the medium criteria and 42.86% improvement happened on the high criteria.

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Biography

Sri Sularti Dewanti Handayani is an is a lecturer in the department of Early Childhood Teacher Education (ECTE), Universitas Negeri Semarang (Semarang State University), Indonesia. She holds a Bachelor in Guidance and Counseling and a Master and Doctor of Learning Technology from Universitas Negeri Jakarta, Indonesia. She has carried out funded research and published in the field of early childhood education. His research interest are in early childhood education and learning media.

Akaat Hasjiandito is an is a lecturer in the department of Early Childhood Teacher Education (ECTE), Universitas Negeri Semarang (Semarang State University), Indonesia. He holds a Bachelor in Curriculum and Education Technology from Universitas Negeri Semarang, Indonesia and a Master of Learning Technology from Universitas Negeri Semarang, Indonesia. He has carried out funded research and published in the field of early childhood education. His research interest are in learning media, blended learning, and ICT for early childhood.