

## **Validation on learning devices of open inquiry integrated with lesson study-based NHT to improve learning result in biology at senior high school in north Minahasa**

**Femmy Roosje Kawuwung**

Study Program of Biology Education FMIPA State University of Manado, Indonesia

### **Abstract**

The research on learning device development was conducted from January to July 2015. Method of the research used 4-D model (four D Models) that include four stages, such as define, design, develop, and disseminate (data presented in this article is in develop stage), topic and scope of Biology on Lesson Study-based development (Plan, Do, & See) used four Biology teachers who collaborated with the researcher. The devices were tested using one group pretest-posttest design at Senior High School of SMA N 1 Dimembe at the tenth grade, X/a. Learning devices of Syllabus, Instructional Implementation Design, and Worksheets were delivered to 3 experts as validator. Results: 1) Evaluation of the expert for Syllabus was excellent by 10 criteria of evaluation as follow: identity of the syllabus; developing standard of competence; developing basic competence, developing the main subject of learning material; developing learning activity; developing indicator formulation; evaluation; determining time allocation; determining learning source; and developing the characters. 2) Evaluation of the expert for Instructional Implementation Design (RPP) was excellent by 10 criteria as follow: RPP format, standard of competence, basic competence, and indicator of competence achievement; objective of learning; teaching material; time allocation; learning activity; learning strategy of Open Inquiry Integrated with NHT; language and writing; the use of RPP. 3) Evaluation of the expert for the Worksheets was excellent by 8 criteria as follow: identity, basic competence, and indicator of competence achievement; objective of learning; topic description; directions and working steps; questions; tools and materials; table of observation. Results of the research showed validity of learning devices was excellent for Syllabus, RPP, Worksheets, and learning results of 25 students along with their scores that have been achieved respectively; 8 students with qualified marks (3.60-4.00); 14 (3-3,59); 3 (2.00-2.99).

**Keywords:** learning devices, open inquiry, learning result

### **Introduction**

The establishment of Integrated Curriculum of Education Unit (KTSP) was based on Laws of National Education System No. 20 in 2003 and Governmental Regulation no. 19 in 2005 about National Standard of Education. It contains curriculum as regulating design about objective, content, and learning material, as well as means, which are used guidance for performing the learning activity in order to achieve the goal of education. Objective of the national education conforms to local condition and potency of the related region, educational unit and the students. Development of curriculum in KTSP basically conforms to national standard of education in order to achieve the goal of national standard. Standard of national education comprises of standard of content, process, competence of the graduate, educator, means and infrastructures, management, funding, and evaluation on education. Curriculum development demands teacher's readiness on students-centered learning devices. Learning that directs to active participation of the student, in which the student acts as scientist and the teacher plays as facilitator and motivator (BSNP, 2007) <sup>[1]</sup>. Low quality of the students is shown by low level in absorbing learning material, lack of character establishment as is shown by attitude and life skill of the student. Teachers play important roles in improving quality of the students, so that they will be able to bring their

pedagogic into reality by comprehending characteristics of the students, mastering the theory and learning principles, as well as able in developing curriculum that relates to the supported subject, Ministry Regulation of National Education Number 16 in 2007. In order to increase student's activity, a student-centered learning devices development is performed, such as Syllabus, RPP of Open Inquiry integrated with Numbered Heads Together (NHT), and Worksheets. Learning devices are developed and based on Lesson Study. Lesson Study is the main form of improvement on learning quality and professionalism development of the teacher. In performing Lesson Study 1) teachers and coworkers learn the curriculum collaboratively, formulate the objective and the goal of such development, design the learning in order to achieve the goal, 2) perform and observe, 3) perform reflection to discuss the reviewed learning, revise, and design the next learning, Susilo (2011) <sup>[5]</sup>. Learning devices are developed using 4-D model by Thiagarajan (1974) <sup>[6]</sup> on topic of Biology scopes. Objective of the research was to obtain effective Biology learning devices in order to improve learning result.

### **Method**

Research of development used 4-D model that comprised of four stages, such as define, design, develop, and disseminate (data presented in this article is in develop stage). Validation

on learning devices to find out validity of the developed learning devices include: Syllabus, RPP, Worksheets with the topic of Biology scope. The qualified learning devices

will be tested at SMA N 1 Dimembe, class X/a, using one group pretest-posttest design.

**Table 1:** Category for Properness of Learning Devices As A Result of Development

Score Range	Criteria	Description
3.26-4.00	Excellent	Proper/no revision
2.51-3.25	Pretty good	Proper/no revision
1.76-2.50	Not so good	Less proper/need to be revised
1.00-1.75	Bad	Improper/must be revised

Source: Jufri, 2007

**Results and discussions**

**Table 2:** Results of Validation on Product of Syllabus by the Expert

No.	Criteria of evaluation	Validator's Value			Mean	Category
		V1	V2	V3		
1.	<b>Identity of Syllabus</b> Correct Identity: name of school, subject, Class/Program, semester, and time allocation.	4,0	4,0	4,0	4,0	Excellent
2.	Develop Standard of Competence	4,0	4,0	4,0	4,0	Excellent
	• Taken from Standard of the Subject Content					
	• Order based on hierarchy of concept disciplines and difficulty level of the material					
	• Correlation between standard of competence (SK) and basic competence (KD) in the subject					
	• Correlation between standard of competence (SK) and basic competence (KD) among the subjects					
	• Describe minimum ability qualification of the student					
3.	Develop Basic Competence	3,7	3,7	3,6	3,6	Excellent
	• Order based on hierarchy of concept and difficulty level of the material					
	• Correlation between standard of competence (SK) and basic competence (KD) in the subject.					
	• Correlation between basic competence (KD) and standard of competence (SK)					
4.	Develop the Main Material	3,6	3,8	3,5	3,6	Excellent
	• Relevance of the main material with SK and KD					
	• Conform to physical, intellectual, emotional, social, and spiritual development of the students					
	• Beneficial for the students					
	• Scientific structures include: depth and breadth of the material					
5.	Develop Learning Activity	3,6	3,7	3,8	3,7	Excellent
	• Provide learning experience that involve mental and physical process through interaction between students as well as the students and the teachers					
	• Pleasant learning					
6.	Develop Indicator Formulation	4,0	4,0	4,0	4,0	Excellent
	• Conform to intellectual development of the student					
	• Correlate with SK/KD					
	• Concern on beneficial aspect					
	• Show the student's achievement cognitively, affectively, and psychomotorically					
	• Concern on relevant learning sources					
	• Observable and measurable that include knowledge, attitude, and skills					
7.	Evaluation	3,7	3,6	3,7	3,6	Excellent
	• Subjective technique in accordance with the indicator					
8.	Determine Time Allocation	3,7	3,6	3,8	3,7	Excellent
	• Rationality of effective week, basic competence, breadth, depth, and difficulty level					
9.	Determine Learning Source	4,0	4,0	4,0	4,0	Excellent
	• Suitability between learning source and learning goal					
	• Suitability between learning source and intellectual level of the student					
	• Suitability between learning source and the taught material					
	• Suitability between learning source and environment of the student					
10.	Character Development	3,6	3,6	3,7	3,6	Excellent
	• Relate to indicator of competence achievement					

• Relate to learning activity					
• Conform to the development of knowledge, attitude, and skills					

**Table 3:** Results of Validation on Product of RPP Open Inquiry Integrated with Numbered Heads Together (NHT) by the Expert

No.	Evaluated Aspect	Validator's Value			Mean	Category
		V1	V2	V3		
1.	RPP Format					
	a. Confirmation on material distribution	3.8	3.7	3.7	3.7	Excellent
	b. Numbering					
	c. Attractiveness					
	d. Balance between text and illustration					
	e. Type and size of font					
2.	Standard of Competence, Basic Competence, and Indicator of Competence Achievement					
	a. Standard of competence in accordance with the syllabus	3.6	3.7	3.6	3.6	Excellent
	b. Basic competence in accordance with the syllabus					
3.	Objective of Learning					
	a. Description of competence achievement indicator	4.0	4.0	4.0	4.0	Excellent
	b. Formulated obviously, specifically, and operationally, so that it can be measured					
	c. Formulation conforms to intellectual development of the students					
4.	Teaching Material					
	a. Correct in accordance with the theory	4.0	4.0	4.0	4.0	Excellent
	b. Conform to order of the concept/ material					
	c. Conform to intellectual development of the student					
	d. Conform to standards of process and standard of content					
5.	Learning Strategy					
	a. Learning strategy according to the stages and described clearly	3.6	3.5	3.7	3.6	Excellent
6.	Learning Activity					
	a. Support the achievement of basic competence (KD)	4.0	4.0	4.0	4.0	Excellent
	b. Contain time allocation					
	c. Suitability with the learning steps					
7.	d. Activities of both teachers and the students are formulated clearly and operationally					
	a. Open Inquiry integrated with Numbered Heads Together (NHT)	4.0	4.0	4.0	4.0	Excellent
	▪ Stage 1: Numbering (teacher divides the students into several team, and each team consists of 4 or 5 students, in which each student in each group gets number)					
	▪ Stage 2: Introduction and Problem Identification (teacher describes the group establishment, teacher provides material to the students, handout, questioning, and facilitating the students to formulate the hypothesis)					
	▪ Stage 3: Heads Together (constructing investigative design, constructing hypothesis, and data analysis)					
	▪ Stage 4: Answering (appreciating result of the hypothesis testing & reporting the result of the group's work)					
	▪ Stage 5: Draw conclusion (teacher and student draw some conclusion)					
8.	Language and Writing					
	a. Use communicative language, simple, understandable and in accordance with the student's thought	4.0	4.0	4.0	4.0	Excellent
	b. Use correct language					
	c. Use correct Indonesian language: subject, predicate, object (EYD)					
	d. Use writing, spelling, and punctuation mark in accordance with the official Indonesian spelling system (EYD)					
9.	e. Use the terms appropriately and understandable by the students					
	Time Allocation					
10.	Conform to the amount of the presented learning materials and assignments that must be completed by the students	3.7	3.7	3.7	3.7	Excellent
	Benefit/Use of RPP					
	a. It can be used as guidance for teachers in learning process	3.8	3.7	3.8	3.7	Excellent
	b. Student-centered learning					

**Table 4:** Results of Validation on Product of Worksheets by the Expert

No	Evaluated Aspect	Validator's Value			Mean	Category
		V1	V2	V3		
1	Worksheets Identity					
	Correct identity: date of activity, name of group/individual, subject, class, semester, and	3.8	3.7	4.0	3.8	Excellent

	time allocation					
2	Basic competence and indicator of competence achievement	4.0	4.0	4.0	4.0	Excellent
	a. Basic competence in accordance with syllabus/RPP					
	b. Indicator of competence achievement in accordance with syllabus/RPP					
3	Objective of learning	3.7	3.7	3.8	3.7	Excellent
	a. Description of indicator on competence achievement and basic competence					
	b. Formulated clearly					
	c. Formulation conforms to intellectual development of the students					
	d. More objectives that conform to time allocation					
4	Topic description	3.5	3.5	3.5	3.5	Excellent
	a. Conform to competence achievement and basic competence					
5	Direction and working steps	3.5	3.3	3.4	3.4	Excellent
	a. Obvious and measurable					
6	Question	3.6	3.6	3.7	3.6	Excellent
	a. Concise and clear					
	b. Inspire the answer					
	c. Increase curiosity					
	d. Conform to competence achievement and basic competence					
7	Tools and materials	3.5	3.4	3.5	3.4	Excellent
	a. Available and accessible					
8	Table of observation	3.4	3.3	3.4	3.3	Excellent
	a. Column of number					
	b. Criteria of observation					

**Table 5:** Learning Results of Cognitive Aspect

No	Observed Variable	Marks & Percentage
1	Student's marks	32% 56% 12%
2	Marks for quality	3.60-4.00 3.00-3.59 2.00-2.99
3	Numbers of the succeed students	8 14 3

**Discussions**

1) Evaluation of the expert for Syllabus is excellent by 10 criteria as follow: average syllabus identity (4.0); developing standard of competence (4.0); developing basic competence (3.6); developing the main material of learning (3.6); developing the learning activity (3.7); developing indicator formulation (4.0); evaluation (3.6); determining/setting time allocation (3.7); determining sources of learning (4.0); and developing character (3.6). 2) Evaluation of the expert for RPP is excellent by 10 criteria as follow: Average format of RPP (3.7); standard of competence (3.6), basic competence, and indicator of competence achievement (4.0); objective of learning (4.0); teaching material (3.6); time allocation (4.0); learning activity (4.0); learning strategy by Open Inquiry integrated with NHT (4.0); language and writing (3.7); the use of RPP (3.7) Evaluation of the expert for Worksheets is excellent by 8 criteria as follow: average identity (3.8); basic competence and indicator of competence achievement (4.0); objective of learning (3.7); topic description (3.5); direction and the work steps (3.4); question (3.6); tools and materials (3.4); table of observation (3.3). Results of the research showed excellent validity for Syllabus, RPP, worksheets and learning results of 25 students along with their marks respectively; 8 students get marks of quality (3.60-4.00); 14 (3-3.59); 3 (2.00-2.99). Data showed that learning results increase due to each student in the group get worksheets that contain topic, work description, and operational questions, which are easily understandable.

**Conclusions**

Data and discussions showed that validation process, which is developed in accordance with 4-D model, has met the validation, content, construct, and prediction. Evaluation of the expert for learning devices is excellent for Syllabus,

RPP, and worksheets. It showed that effective learning devices have been achieved. Learning devices are deserved to be applied for learning Biology at the tenth grade of Senior High Schools in North Minahasa.

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