

DEVELOPMENT OF BIOLOGY LEARNING TOOLS OF COOPERATIVE-BASED MODEL OF NHT TYPE WITH CTL APPROACH ON DIGESTIVE SYSTEM SUBJECT TO GRADE XI OF SENIOR HIGH SCHOOL

Isnada Sulaiman

Universitas Pejuang Republik Indonesia
nhadaalan@gmail.com

ABSTRACT

This study is research and development which focuses on the development of cooperative learning tools of Numbered Heads Together (NHT) type with contextual Teaching and Learning (CTL) approach. The model used is referred to 4D (defining, design, development and dissemination) by Thiagarajan (1974). The development process on the defining and design stages produced prototype 1 (lesson plan, students book and workbook). The development on the development stage was a validation process which produced a valid prototype 2. On tryout phase, the tools produced practical and effective tools and optimize the existing tools, revision was conducted to produce prototype 3. The development in dissemination stage was a disseminating phase of existing tools. The result of the dissemination stage was the final prototype.

The result reveals that NHT learning tools with CTL approach has met effective criteria with indicators (1) the result of learning has met the minimum completeness criteria 68, that the classical completeness is also achieved, (2) teacher and students activities are in the category of completely conducted, (3) teacher's competence in managing the learning is in high category, and (4) students response has met the criteria and is in positive category. Based on the examination of the experts and the result of the test indicate that the cooperative learning tools of NHT type with CTL approach has met the criteria of validity, practical, and effective.

Keywords: NHT (*Number Head Together*), CTL (*Contextual Teaching and Learning*), 4D (*Four D*)

A. INTRODUCTION

In a changing society situation, ideally education is not only oriented to the past and present, but it should be a process that anticipates and discusses the future. Education should look far ahead and think about what students will face in the future, gives dominance to the teacher and does not provide access for students to develop independently through their thought processes.

One way to overcome the problem of quality improvement in science education, especially biology, is to apply learning that focuses on problem solving skills, object observing skills, decision making skills, logical thinking, systematically and skills in asking questions. Learning will be more focused on students, and students are active in participating in teaching and learning activities.

The cooperative learning model is very suitable to answer the learning problems faced by students. Cooperative learning directs students to conduct social interaction both between students and teachers, and between students and students. In order for them to be able to show effective problem solving strategies in each of their closest development zones. Students will find and understand concepts and be able to solve even difficult problems (Isjoni, 2010).

Cooperative learning is seen as a powerful means to motivate learning and have a positive influence on the classroom climate which in turn will contribute to greater achievement, increase positive attitudes and deeper self-esteem, develop better collaborative skills, and encourage motivation which is greater to students in need (Huda, 2011). One model of cooperative learning that is considered capable of overcoming problems Quality improvement in these Biology subjects is the NHT type of cooperative learning model. The reasons for using NHT as one of the learning models are: (1) reducing subjective feelings in students (feeling cornered, always chosen) when the teacher appoints one student to answer, (2) involves more students in studying the material covered in a lesson.

Biology as part of daily life, then in the learning process, it needs to be implemented using a particular context, especially in real world contexts. The CTL approach is a context approach that directs students to learn about critical thinking to obtain essential knowledge and concepts from subject matter. Based on contextual problems, students are gradually guided to master biological concepts.

According to Johnson (2011) CTL learning and teaching will involve students in important activities that help them connect academic learning with the real life context they face. Students will see meaning in learning by linking the two.

According to Sanjaya (2008), through learning CTL (Contextual Teaching Learning) students are expected to learn through "experiencing". There are 7 main components underlying learning with the CTL approach, namely: (1) constructivism, (2) inquiry, (3) asking questions, (4) learning community, (5) modeling, (6) reflection, and (7) real assessment.

So that the NHT type of cooperative learning with the CTL approach can work well in the application process, then an appropriate learning tool is needed. Because learning tools provide convenience and can help teachers to prepare and carry out teaching and learning activities. To produce good learning tools, it is necessary to develop learning tools.

The development model that will be used in this research is the development model proposed by Thiagarajan or called the 4-D model. The Thiagarajan Development Model (4D) consists of define, design, develop, and disseminate.

B. FORMULATION OF THE PROBLEM

Based on the background description above, the formulation of the problem in this study is "How is the Development of learning tools based on the NHT type cooperative model with the CTL approach on the digestive system material valid, practical and effective?"

METHODOLOGY

This type of research is research & development (Research & Development). Conducting research at SMA Negeri 1 Tanete Rilau. The subject of the research was class XI students, on the digestive system material even semester of the 2011-2012 school year. The development of learning tools used in this study is a development model developed by Thiagarajan, which consists of 4 stages of development namely defining / defining, designing, developing, and disseminating. The stages of developing learning tools are as follows:

1. Defining Phase / define

The purpose of this stage is to define and define learning needs based on the analysis of the objectives and material constraints. The stages of definition include the following activities:

- a. Preliminary analysis: This activity aims to establish the problem that will be the basis in the development of learning tools. The analysis was conducted on the implementation of Biology learning in schools by studying the substance of the learning tools used.
- b. Student Analysis: This student analysis is done by paying attention to the characteristics, abilities, and experiences of students both individually and in groups which include characteristics such as; academic ability, background knowledge, and student learning experience. The students analyzed in this study were students of class XI of SMA Negeri 1 Tanete Rilau in the academic year 2011/2012.
- c. Concept / Material Analysis: Analysis of the concept / material aims to identify the main materials that will be studied by students, based on the SK and KD in the curriculum, as well as the characteristics of the main materials to be taught. The material analyzed is the subject of the food digestive system contained in the curriculum contents standard KTSP for biology class XI high school students even semester.
- d. Formulation of Learning Objectives: Formulation of learning objectives is based on the results of the analysis that has been done in the four previous steps. Learning objectives in this case are developed from the formulation of achievement indicators KD / SK. The contents of the competency indicators then become a reference in determining the minimum completeness criteria (KKM). The breakdown of competency indicators and learning objectives becomes a reference in designing learning tools and compiling evaluation instruments.

2. Design Phase

The results of the defining process serve as the basis for preparing a prototype of learning tools. This process consists of four steps:

- a. Media selection that fits the purpose: Media selection is adjusted to the results of the analysis of the materials and facilities at school. The learning media used in this limited trial are slides on the digestive system, laptop / LCD. The chosen learning media must be able to facilitate students to understand the material taught by using the NHT type of cooperative learning model with the CTL approach.
- b. Format selection: choosing a format for developing learning tools including, choosing a format for designing content, choosing a learning strategy and learning resources. The choice of format can be done by reviewing the format of existing learning tools. In this study the format developed is based on the format established by the National Education Standards Agency (BSNP).
- c. Initial design: What is meant is the design of all activities that must be carried out before the trial is carried out. The initial design of the learning kit includes: Learning Implementation Plan (RPP), Student Book, Student Activity Sheet (LKS). All learning tools produced at this stage are called prototype 1 learning devices.

The instrument, which is designed to be used in the assessment of learning tools, consists of:

- Observation sheet, including observation sheet of the implementation of learning devices, observation management learning sheet, observation sheet of student activities.
- Questionnaire sheets, including questionnaire responses of students to the implementation of learning, questionnaire responses of students to student books and questionnaire responses of students to worksheets.
- Validation sheets, including the RPP validation format, student book validation format, LKS validation format, learning achievement test validation format, device implementation validation format, learning management validation format and student response questionnaire validation format.

3. Development Phase (*develop*)

Activities carried out at this stage include; (1) device validation by experts followed by revisions, and (2) limited trials. The results of stages (1) and (2) are used as a basis for revision.

- a. Validation of Learning Devices and Research Instruments by experts
These activities include evaluating prototype 1 learning tools and instruments, as well as revisions based on the suggestions from the validator. At the stage of validation of the device and instrument performed by experts.
Expert validation is an assessment of learning tools that have been developed by experts. Experts' assessment of learning tools includes; (1) format, (2) language, (3) illustrations, and (4) content that is adjusted to the level of thinking of high school students. At this stage the validator examines all the learning tools that have been produced (prototype 1). Furthermore, the suggestions from the validator are used as consideration for revision. After the prototype 1 device was revised, a prototype 2 learning device was obtained.
- b. Limited trials are conducted only once in one class. The aim is to get suggestions from teachers and students in order to revise the prototype 2 learning device. The learning activities in this pilot step are carried out by the teacher in the class. The series of testing activities consists of two stages, namely (1) the implementation of the learning process (device testing), and (2) the final test after the trial is finished. Furthermore, revision 2 was made based on the trial data and the results obtained prototype 3 learning device. The prototype 3 learning device that was tested was then socialized or implemented in another school, and suggestions from other teachers were then used as guidelines to get the final prototype.

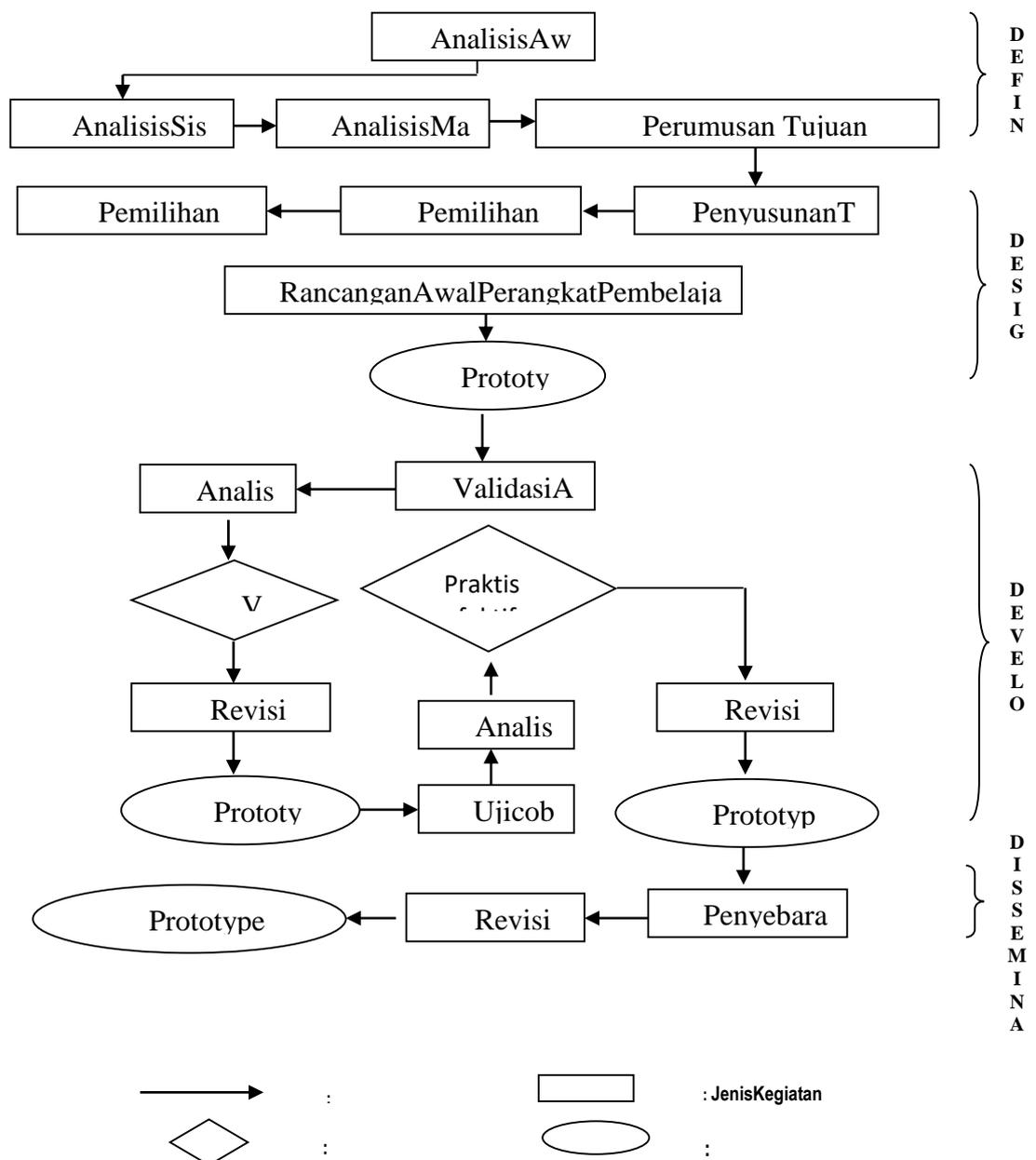
4. Dissemination Stage (*Disseminate*)

This stage is the stage of using tools that have been developed and have been tested on a broader scale. The revised learning kit was then distributed to teachers and education

practitioners. The purpose of this stage is to test the effectiveness of the device in learning activities. The target of this stage is from teachers who have experience in teaching biology, especially the digestive system of food, the results of this dissemination are used for the final revision of the teaching material developed. The distribution phase is carried out on a limited scale. Dissemination on a limited scale is done in the form of outreach and application in other schools. The distribution of equipment in this study included 5 schools, namely:

1. SMA Neg. 1 Tanete Rilau
2. SMA Neg. 2 unggulan Barru
3. SMA Neg. 1 Barru
4. SMA Neg. 1 Soppeng Riaja
5. SMA Neg. 1 Tanete Riaja.

Based on the four stages of development stated above, the entire process of developing learning tools and instruments can be illustrated in the following flow chart:



Picture. Modification of the 4D Development Model

OBSERVATION RESULT

Development of NHT (Number Head Together) cooperative learning tools with the CTL (Contextual Teaching Learning) approach based on the 4D development model by Thiagarajan, Semmel and Semmel which consists of four stages: the defining stage, the planning stage, the design stage development (development) and the stage of deployment (dissiminate). The results obtained at each phase of the development of learning tools in question can be described as follows:

1. Defining Phase (Define)

a. Preliminary Analysis

Based on the conditions in the field relating to biology learning, the following information is obtained: (1) biology learning is still dominated by teachers, so that the allocation of time available for learning is more used by teachers to explain using the lecture method, which has implications for students to become learners who are passive. (2) there is no synchronization between the textbooks and the tasks contained in the worksheets, and students only record answers based on textbooks, so they do not give students the opportunity to construct their own knowledge, which results in the inability of students to reflect back on what has been learned.

b. Student Analysis

Students analyzed in this study were students of class XI Neg High School. 1 Tanete is shining. Based on the results of observations, the results of student analysis obtained are as follows:

1. Academic ability of class XI High School Neg. 1 Tanete Rilau 2011/2012 school year has diverse abilities.
2. Based on the background knowledge of students, they have never studied the digestive system material, which relates to daily life and real experiences of students.
3. High school students. 1 tanete Rilau has different ethnic backgrounds, making it possible to develop social skills and work together among students in study groups, in this case the NHT learning groups.

c. Concept Analysis

Analysis of concepts is important to meet the principle of sufficiency in developing concepts of materials used as a means of achieving basic competencies and competency standards. To support the analysis of this concept, the analyzes that need to be done are: (1) analysis of Competency Standards (SK) and Basic Competencies (KD), which aims to determine the number and types of teaching materials, (2) analysis of learning resources, i.e. gathering and identify which sources support teaching material.

Analysis of the subject of the digestive system that refers to competency standards and basic competencies, based on the following content standards:

Competency standards: Explain the structure and function of certain human and animal organs, abnormalities / diseases that may occur and the implications for mutual salingtemas.

Basic competencies : Explain the interrelationship between structure, function and process as well as abnormalities / diseases that can occur in the digestive system of food in humans and animals (for example ruminants)

Based on the SK-KD, the main concepts are identified and will be arranged systematically and associate one concept with other relevant concepts, thus forming a concept.

d. Specifications Learning Objectives

The specifications of learning objectives are carried out by formulating learning objectives, which are based on task analysis. The specifications of these learning objectives are based on the basic competencies contained in the content standards and the minimum completeness criteria that must be achieved by each student in each basic

competency. The breakdown of learning indicators is a reference in designing learning tools and also in preparing evaluation tests in the subject of the food digestive system.

2. Design Stage (*design*)

a. Test preparation

The test in question is a test of learning outcomes on the material digestive food system. Determination of the number of questions in the test is done by considering the number of indicators, the scope of the material, the level of student development and the allocation of time needed to answer the test questions, so that there are 33 items in total, with 30 multiple choice questions, and 3 items for essays used as essays as a test of learning outcomes.

b. Media selection

The purpose of media selection is to determine the right media in the presentation of subject matter. The process of selecting media is adjusted to the analysis of the tasks and characteristics of students. The function of learning media is as a messenger. The selection of media is adjusted to the results of the analysis of the material and facilities available at the school. This activity is carried out to determine the right media in presenting learning material. The learning media used in this limited trial are laptops and LCDs. The choice of this media can facilitate students to understand the digestive system material.

c. Format Selection

Format selection is done by reviewing the format of existing learning tools. The RPP format is adapted to the RPP format in the SBC which includes competency standards, basic competencies, indicators of achievement of learning outcomes, time allocation, learning objectives, learning materials, learning strategies (models, approaches, and learning methods), steps of learning activities (initial activities, core activities, final activities), learning resources, and assessment instruments. The worksheet format is equipped with clear instructions for solving problems, given a column to write students' answers. Student book format (BS) contains competency standards, basic competencies, teaching material contains an outline of the chapter, objectives to be achieved after studying teaching material, and contains a description of the material to be studied, a chart or picture that supports the illustrations in the description of the material, self-test each sub subject matter in the form of questions.

d. Initial Design

• Learning Media

The results of the initial design of the learning device are the design of learning devices that involve the activities of the teacher and students in the learning process, including; lesson plans (lesson plans), student books, student activity sheets (worksheets).

The RPP is designed based on the syllabus in the SBC that contains; basic competencies, indicators, learning objectives, teaching materials, learning methods, learning steps, learning resources, and assessment instruments, the lesson plan is developed for 5 meetings with time allocation for each lesson plan is 2 x 45 minutes. Student books are designed by presenting real problems on the start page of the student's book, the material is not presented directly in the student's book because students are expected to be able to construct their own knowledge by learning to solve problems related to daily activities so students are able to make conclusions about material learned. Worksheets developed in this study, are a series of tasks that will guide students' activities organized systematically that are intended so that students are able to construct and reflect their knowledge. The worksheets designed at this stage also amounted to 5 parts for 5 meetings.

• Research instrument

1) Validity instruments

Validity instruments produced at this design stage include;

a) RPP validation format.

b) Student book validation format.

- c) LKS validation format.
- d) Format validation of observation sheet for the implementation of learning devices.
- e) Format validation of the observation sheet teacher's ability to manage learning.
- f) Format validation of student activity observation sheets.
- g) Student response questionnaire validation format.
- h) Format of learning achievement test (THB) validation.

The practicality instrument produced at this design stage was the observation sheet of the implementation of cooperative learning tools based on the NHT type CTL approach.

Instrument of effectiveness

The effectiveness instruments produced at this design stage include;

- 2) Observation sheet teacher's ability to manage learning.
 - a) Observation sheet for student activities.
 - b) Questionnaire student responses to learning activities.
 - c) Learning Outcomes Test (THB).

2. Development Stage (*develop*)

a) Validation results

Based on the validation results of 3 validators, the instruments in this case are lesson plans, student books, worksheets and research instruments consisting of observation sheets of device implementation, observation sheets of teacher's ability to manage learning, observation sheets of student activities, Questionnaire of student responses to learning activities and tests learning outcomes (THB), are in the valid category, with a number of minor revisions made to devices and instruments.

b) Analysis of trial results

After the initial draft was revised based on the results of the validation of the 3 validators, the results of the revision were then tested using learning tools in the school where the trial was conducted. The purpose of this trial is to gather information and input from students and observers about the quality of the design of learning tools that will be used in the field. The results of the trial are then analyzed, and the results of the analysis are then taken into consideration to make revisions to the learning kit. Based on the results of the analysis of the instruments and research instruments are in the good category and implemented entirely.

4. Dissemination Stage (*Disseminate*)

Disseminate phase (disseminate) is the stage of using tools that have been developed after testing in class XI. Nega Science High School. 1 Tanete Rilau, Barru district. The draft learning device III, which was ready, was then disseminated to biology teachers through schools in Barru District. Disseminate activities are carried out by giving questionnaires to teacher responses to the learning tools developed. The response to the NHT cooperative learning device CTL approach is shown by the acceptance of learning devices to be applied in each school in the 2011/2012 school year.

DISCUSSION

1. Validity of learning devices

According to Rochmad (2011) the validation stage is a technique for obtaining suggestions for improving teaching materials or instructional materials.

A number of experts were asked to evaluate instructional materials and in terms of technique. Based on feedback, the material is modified to be more adequate, effective, usable, and technically of high quality.

One of the main criteria for assessing whether a learning device is feasible or not to be used is based on the results of validation by experts. Based on the analysis of 3 validators, the results were obtained that the entire components of the learning tools and instruments (prototype I) developed had met the validity criteria.

2. Practicality of learning devices

The results of the prototype II trial in this case the device has been revised based on the assessment and suggestions by experts who have met the practicality criteria. The practicality of the learning device is obtained from observers' observations of the implementation of the learning devices in the classroom during the trials carried out.

3. Effectiveness of Learning Tools

learning tools are said to be effective if they meet the four effectiveness criteria, namely; (1) teacher's ability to manage learning is adequate if the minimum KG value is in the high category, (2) ideal student activity, if five of the seven tolerance criteria for achieving the ideal time used are met, namely group discussion and presentation / presentation of discussion results are met (because is a core activity of cooperative learning based on NHT type CTL approach), (3) students' positive responses to activities learning, student books, and worksheets, where more than 50% of students respond positively to a minimum of 70% of the number of aspects asked, and (4) students succeed in learning if students have mastered learning individually at least 68 and classically a minimum of 85% of minimum completeness standards.

Based on a comprehensive review of cooperative learning tools based on the NHT type with the CTL approach, it has been through a development procedure, of the three general criteria established namely valid, practical and effective have been met as a whole. Thus, the NHT-based cooperative learning tool CTL approach can be said to achieve valid, practical and effective quality.

CONCLUSION

After going through a number of procedures for developing learning tools that have been carried out using the 4D model (define, design, develop and disseminate), and based on the results of the development and discussion described in chapter IV, the quality of the learning tools developed can be concluded that, based on the results of the validation sheet data analysis by three validators that the NHT type cooperative learning device CTL approach is in the valid category. Based on the results of data analysis the feasibility of the learning tool is in the category of being implemented entirely and is declared practical, so that it can be applied in real terms in the field.

The effectiveness standard for cooperative learning tools (RPP, student books and worksheets) based on the NHT type CTL approach to digestive system material in class XI SMA has been met, by meeting the effectiveness quality criteria, namely (1) the ability of teachers to manage learning, (2) activities students who reach the level of achievement for the ideal time, for all activities, (3) student responses, with 100% of students giving positive responses to learning activities and also to student books and worksheets, (4) test results are met with complete mastery of the material thoroughly classical 85%.

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