ANDROID BASED LEARNING METHOD ON HUMAN BODY SKELETAL SYSTEM

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Abstract
Android is a mobile phone operating system that being used these days, from children to adults, students from high school to college. The technology of android has made the learning system easier and attractive also can be accessed anywhere and anytime. Human body anatomy especially skeletal systems were the hardest subject or field of study moreover learning with conventional way such as reading books and search for manual props. Android technology can be implemented in human body anatomy especially skeletal systems learning. User can learn the skeletal system easier because of the data and props were made into digital. Data that needed and proper applications to be used in making of this learning method application firstly being reviewed and after that make the method of building the application. This learning method built with 3D modelling application Autodesk Maya with using sculpting method. 3D modelling used to make this learning method more attractive. On the interactive side, Adobe Flash Professional is being used to made animation and the application. Android as an operating system that support this application used to be the preview at first of finishing this application. Then, after the preview is done well, the application is ready to be used in Android devices. With open-source based operating system, Android give ease access for user to develop from existing application. The development hopefully more attractive and interactive from existing application to make students from high school to college more easy to learn and knows the human skeletal systems.

Keywords: Android, Human Skeletal System, 3D Modeling, and Learning.

1. Introduction

Human body anatomy is one of the subjects that we study in high school also on college. Study of human body anatomy is one of the complicated subject because of explaining the skeletal system, organs, also circulatory system. The learning of human body anatomy with conventional ways such as reading book or being lectured can make the learner bored because the study of human body anatomy is very complex. Another thing to be concerned as a problem is students must find the literature and props in a separate ways. The use of classroom and the limited time in school and college are another thing to be concerned at this point because of students’ study of human body anatomy became minimum or limited.

Specifically that will be explained in this paper is skeletal system of human anatomy. The function of skeletal system is to protect vital organs in the body, giving the body shape and straighten the body. Study of skeletal system that complicated will be more attractive and interactive if we used nowadays technology. Study with technology is the best way to attract students nowadays from desktop, internet to smartphone technology that generally being used by most of people these days.
2. Materials and Methods

The first step is collect data. Human skeletal system and application that been used in the construction with methods literature study from books, international journal, scientific paper and online media.

Human skeletal system data took from some medical books:
   a. Sobotta : Atlas Of Human Anatomy
   b. Human Anatomy : The Definitive Visual Guide
   c. Gray’s Anatomy

![Flowchart Application Construction Method](image-url)
Application that used to construct this learning methods are:

a. Autodesk Maya
b. KeyShot
c. Adobe Flash Professional CS6
d. Adobe After Effect CS6

After completed the data that needed from resources, the construction of 3D model human skeletal system built referencing from the model or picture or example in the books or online media then being implemented using the Autodesk Maya.

3D animation built after the 3D model of human skeletal system finished. Using KeyShot to smoothing the texture of skeletal system in the application. Also Adobe After effect CS6 that being used to made the automatic rotation of skeletal system.

The construction of this learning method ended up with Adobe Flash Pro CS6. An application that unite all the data and model and animation, packaged into one form of application. As the case above that been discussed, this application referenced to the attractive and interactive application for students that can stimulate them to learn and understand the human skeletal system.

3. Result and Discussion

The results of the steps above that have been discussed will be explained.

3.1. Creating the 3D Model Skeletal System

The construction of 3D model of skeletal system uses Autodesk Maya as the supporting application and used sculpting method to shape the human skeletal system. As the first step we need the figure or picture of the skeletal system then put it on Maya and then insert the rectangular shape to be the base model.

![Figure 2. Base Modeling in Autodesk Maya](image.jpg)

Then, use the sculpting method to sculpt the base model of Rectangular form as shown above to make the skeletal system.
3.2. Smoothing the 3D Model Textures and Creating Animation

In this phase, constructed 3D model will be given smooth textures using the Keyshot application and also rendered as image as to be create the animation on Adobe After Effect.
In Adobe after effect, the rendered images from Keyshot will be put together in one frame to make a rotation animation of the skeletal model. When it is done, the result will be exported as .flv and will be used in Adobe Flash Professional.

3.3. Building the Application

Adobe Flash Professional used as the last tool to complete the application construction. The data and animation imported to the Adobe Flash Professional. As the description that the application will built to be attractive and interactive so the design of application made well done.

![Constructing Application in Adobe Flash Professional](image)

**Figure 6. Constructing Application in Adobe Flash Professional**

3.4. Implementation

The constructed application exported to .exe to be tested in desktop

![Main menu – run on desktop](image)

**Figure 7. Main menu – run on desktop**

After the test run in desktop done, the application exported to the .swf then implemented in android devices.
As could be seen, the background in the main menu is different in device. It is caused by the application background data being too big so that the background cannot be displayed correctly even though the rest of the application is working well done.

4. Conclusion

From the discussion of the application above, the conclusions are:

a. Result of the learning method of an android-based application could ease the students' learning about the human skeletal system.

b. Result of the learning method of an android-based application could be the reference for the development of future applications to make learning easier for students.

c. Result of the implemented application is not optimal yet because the data of the application is big so that the graphic cannot be displayed correctly.

References


Nusca, Andrew. 2009. *Smartphone vs. Feature phone arms race heats up; which did you buy?* ZDNet.


DESIGN MOBILE LEARNING (M-LEARNING) ANDROID ON THE INTRODUCTION OF ANIMAL AND PLANT MATERIAL FOR ELEMENTARY SCHOOL

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Abstract
The development of smartphone is getting increased that can be felt by everyone. The use of smartphone in the field of education received little attention. However, it gives much contribution for the development of education. The implementation of teaching and learning of natural sciences is sometimes difficult, particularly to elementary students who are beginning to learn about their environment. The use of smartphone in the teaching and learning process will attract the students attention and increase their motivation in learning. The design mobile learning (m-learning) android on the introduction of animal and plant material is an innovative development that is expected to benefit in the field of education. This study uses the development of the Multimedia Development Life Cycle (MDLC), this mobile learning development using the development method, starting from concept, design, material collecting, assembly, testing reached the stage where each stage distribution can be carried out if the previous stage has been completed.

Keywords: Elementary school, Introduction to Animal and Plant, M-Learning, and MDLC.

1. Introduction
School is an institution designed to do the teaching to the students under the supervision of the teacher. School basically as a means to carry out education is expected to be made public to become more advanced, therefore, the school as a center of education should be able to perform its function optimally in order to produce a good generation. Levels in an education in Indonesia starting from elementary school (SD), junior high school (SMP), secondary school (high school) and college (PT). Based RI Law No.20 of 2003 on National Education System Chapter VI Line, Study and Education Type Part Two of Article 17, paragraph 1: Basic education is education that underlies secondary education, paragraph 2: Primary education form the basic elementary school (SD) and Islamic Elementary School (MI) or other equivalent forms and junior high school (SMP) and MTs (MTs) (Universitas Padjajaran, 2012).

In Indonesia education in primary school is an institution that is managed and regulated by the government which held formal education and education lasts for six years, from grade 1 to grade 6 elementary school education in practice giving material and lessons that will be expected of students are able to understand and master it, and the provision of material provided in multiple disciplines. One of the disciplines that support the educational objectives of primary school are the subjects of Natural Sciences. Natural science subjects are given to students from grade 1 to grade 6. The learning process of Natural Sciences 1st grade elementary school is where students will learn to know and understand about the living things around them, especially in this study on the introduction of animal and plant material. On the introduction of animal and plant material, students will be taught to know about the types and names of animals and plants. The use of multimedia software in teaching and learning will improve efficiency, increase motivation, facilitate active learning, facilitate the experimental
learning, consistent with student-centered learning, and guides for better distance (M. Suyanto, 2005).

Smartphone is one of the development of information and communication technologies are developing today, where the smartphone apart from having the basic ability to call, send messages, access the Internet, the smartphone also has the ability to run certain applications that is inserted into the smartphone. Use of the software platform on which there is currently one of which is Android. Android is a Linux-based operating system designed specifically for mobile devices such as smartphone or tablet (Arif Akbarul Huda, 2013). By the nature of the android operating system as open source so anyone can develop applications in Android is based on the wishes and needs. Optimization of teaching system involves android based smartphones have been used today, where the smartphone is used as a medium of learning to optimize a process of learning and teaching. Learning with mobile learning can be used as an alternative to solve problems in the field of education, especially the problem of equitable access to educational information, quality content in the form of learning materials with text and image (Elda Belina P, Fakrudidin Rizal Batubara, 2013).

M-Learning (m-learning) or mobile learning relates to learning using mobile devices such as PDAs, mobile phones, laptops and other information technology tools for learning (Ariesto Hadi Sutopo, 2012). Currently applications on mobile learning refers to the use of mobile devices one on android smartphone application development which is designed to be useful and used in education. Learning to use mobile learning as an alternative in solving problems in the field of education, where the subject matter is formed and loaded into a content inserted into the smartphone can be a means to learn and share information.

<table>
<thead>
<tr>
<th>No</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Convenience, users can access from anywhere in the learning content</td>
</tr>
<tr>
<td></td>
<td>including quizzes, journals, games, and more.</td>
</tr>
<tr>
<td>2</td>
<td>Collaboration, learning can be done at any time in real time.</td>
</tr>
<tr>
<td>3</td>
<td>Portability, use of books is replaced with RAM to learning that can be set up</td>
</tr>
<tr>
<td></td>
<td>and connected.</td>
</tr>
<tr>
<td>4</td>
<td>Compatibility, Learning is designed for use on mobile devices.</td>
</tr>
<tr>
<td>5</td>
<td>Interesting, Learning combined with the game will be fun.</td>
</tr>
</tbody>
</table>

Applications on mobile learning refers to the use of mobile devices in the mobile phone as one can access course materials, referrals and applications related to learning anytime and anywhere (Elda Belina P, Fakrudidin Rizal Batubara, 2013).

2. Methodology

The method used in the design of mobile learning (m-learning) android on the introduction of animal and plant material for elementary school is the Multimedia Development Life Cycle (MDLC). Six stages of development using the Multimedia Development Life Cycle describes as follows.

2.1. Concept

Goals for the project are defined, and the type of application is determined. In multimedia, this stage is the stage where the procedure to decide the type of multimedia and the subject to be made.
Figure 1. Multimedia Development Life Cycle (MDLC) (Source: Ariesto Hadi Sutopo, 2012)

2.2. Design

Design is the process of determining the details of what will be done in a multimedia project and how it will be presented. This stage includes scriptwriting, story board manufacture and navigational structures, as well as some other design measures.

Figure 2. Initial Display Design Applications

Figure 3. Design Menu Applications

2.3. Obtaining Content Material

During this phase all data, audio, video, and images to the project collected in appropriate digital format. In multimedia development, the material obtained in this phase will be used at the production stage, where appropriate scene for multimedia applications set.
2.4. Assembly

At this stage, the whole project is built, as well as the programming done to create multimedia applications. At this stage the use authoring tool that comes with the capability of programming and multimedia development emulator for use on mobile devices.

2.5. Testing

During testing, the application is run and checked to ensure that multimedia development is done in accordance with what has been designed.

2.6. Distribution

In this step, the application which has been developed duplicated and given to the user. Distribution can be in various forms for presentations using a projector, as well as in the form of CD-ROMs, mobile devices, and web sites.

3. Result and Discussion

Results in the design of mobile learning (m-learning) android on the introduction of animal and plant material for elementary school created an application that can be used in the learning of Science in particular the introduction of animal and plant material on elementary school students grade 1.

Application development is done by starting the analysis phase of the material to be loaded into the application which is taken from the book Natural Sciences 1st grade elementary school, and further analysis of the existing resources of both hardware and software support in application development. Applications developed an android based applications, where the application can be used on smartphones that use the Android operating system.
The use of applications facilitated by buttons of options available on every page. The information contained in the application is also made with an easily understandable especially for children of primary school level is included with the images are loaded into mobile learning application pages.
4. Conclusion

At this android based application development has resulted in the application of learning material that contains natural science which deals with the introduction of animals and plants. This application can be used on smartphones with Android operating system.

In the design of mobile learning (m-learning) android on the introduction of animal and plant material for elementary school there are several characteristics that must be considered include the suitability of use of animation and images with the material, the appearance of the image, selecting a combination of background, as well as the adjustment of the application on the smartphone display.

The development of this application can be used as a reference for researchers and practitioners in developing media-based learning mobile learning (m-learning) and presumably for further development could be considered again and adapted to the needs of the materials to be loaded into the application and application capability would not only focus on one Just like the android operating system but can also function in other operating systems.

References


DEVELOPMENT STRATEGY LEARNING TOOLS INTEGRATED NATURAL SCIENCES SMP/MTs USING 4D MODELS (DEFINE, DESIGN, DEVELOP, AND DESIMINATE)

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Abstract
The development science/Natural Sciences (NS) separated between one concept, whereas between materials sciences lessons are interdependent relationships with each other and constitute a unified whole and can not be separated. To overcome these problems need to be integrated science teaching. This study aims to design an integrated science teaching devices for SMP/MTs Class VII. This study is the type of research and development, which is developing the learning devices according in Thiagarajan, Semmel and Semmel known as 4D models, which Define, Design, Develop, and Desiminate. The Develop learning tools tested in SMP Negeri 1 Kwandang Gorontalo Utara on odd semester academic year 2014/2015. The results of this study indicate that the development of integrated science teaching SMP/MTs using 4D models (Define, Design, Develop, and Desiminate) includes Sylabus, lesson plan (LP), Student Worksheet (SW), Instruction Material (IM), Media Learning (ML), and Test Results Learning (TRL) has met the criteria for development of appropriate validation, results, the valid and fit for use in integrated science teaching for substance characteristic material.

Keywords: Learning devices, integrated Science, 4D models.

1. Introduction
Integrated science learning in essence is an approach to learning that allows students either individually or in groups actively seek, explore and discover concepts and principles of holistic and authentic by combining multiple subjects (Puskur in Trianto, 2010: 97). With an integrated model of science learning, learners can gain direct experience that adds strength to accept, store, and apply the concepts they have learned. Thus learners find themselves trained in a variety of concepts are studied thoroughly, meaningful, authentic and active. In fact, in junior high school science teaching is still done separately between matter physics, biology and chemistry and is given by different teachers, causing the material on their own separate IPA. The achievement of standards of competence and basic competences subjects are still carried out in accordance with their respective fields of study, while the integrated IPA materials intertwined with each other, one whole inseparable. This is because the science curriculum used not describe a coherent whole, separate teacher with a background coming from different disciplines (physics, biology and chemistry) and not used to implement integrated learning and integrated learning is considered a new (Van Gobel 2011: 4). Integrated science teaching is not causing much material that is not resolved according to plan because the time is not enough that some of the material is not understood learners. Whereas implementing an integrated science teaching, some relevant concepts combined so that the use of a more efficient discussion. It is appropriate Trianto opinion (2007: 12) that integrated learning can save time. Similarly, the purpose of integrated learning (MONE, 2007: 7) are (1)
improving the efficiency and effectiveness of learning as well as interest and motivation to learn, and (2) the achievement of some basic competence as well.

In the process of learning including learning science requires planning. In Government Regulation No. 19 Year 2005 on National Education Standards Article 20, stating the planning process of learning covering the syllabus and lesson plan contains minimal learning objectives, teaching materials, teaching methods, learning resources, and assessment of learning outcomes. Ibrahim in Trianto (2010: 96) suggested learning tools are a number of materials, tools, media, instructions and guidelines to be used in the learning process. In other words, learning is a set of media devices or means used by teachers and learners in the learning process in the classroom, among others: syllabus, lesson plans, Instructional Materials, Student Worksheet (LKS), or Test Evaluation Instrument Learning Outcomes, as well as the Learning Media (Van Gobel, 2011: 11).

2. Materials and Methods

This study uses research and development to develop the science learning SMP / MTs in an integrated manner. The development uses 4-D models by Thiagarajan et al. (1974: 5) that includes define, design, develop, and disseminate the necessary adjustment. Stages of development is presented in Figure 1.

In the define phase analysis includes an analysis of the needs of the front end (front end analysis), analysis of learners (learner analysis), analysis of the task (task analysis), analyzes the concept (concept analysis), and analysis of the formulation of learning objectives (specifying instructional objectives). In design to design prototype science learning device integrated in the material form of substance and amendments thereto, in the form of (a) lesson plans and teaching materials, (b) develop test criteria as the first act early to determine the ability of learners, and as a means of evaluation after the implementation of activities; (C) selecting instructional media in accordance with the characteristics of the material and learners; (D) select the shape / model of learning in accordance with the presentation of instructional media used; and (e) to simulate the presentation of material to the media and the steps that have been designed. In addition, the design phase focused on the writing and adoption of learning tools, consultation with experts, and discussions with colleagues. At this stage of develop expert appraisal carried out activities that validate or assess the feasibility of the design of the product by an expert / specialist and revise appropriate expert input, and developmental testing activities that test and revise product designs based on the test results, then the implementation of the model in the wider region. On stage disseminate implemented by way of socialization in the form of a workshop / workshops on activities Subject Teachers Council (MGMP) IPA and relevant agencies, as well as product development of learning tools is published in scientific journals.

3. Result and Discussion

3.1 Analysis of Characteristics of Students

Analysis of the characteristics of learners includes individual academic ability, attitude toward learning material, cognitive development, physical characteristics, the ability to group work, motivation to learn, use of media, the background of the students have acquired knowledge of science since elementary school, have a high motivation and a positive attitude towards science subjects, laboratory and enough media support, as well as the cognitive development of students in general are relatively the same, the speed of developments different
understanding of individual learners, students of class VII SMP / MTs are at the formal operational stage.

3.2 Analysis of Duty

Task analysis is pengidentifikakan tasks to be performed learners during the learning activities to develop the academic skills needed learners in accordance with the concepts contained in the curriculum. Tasks that do learners based learning material characteristics of concept maps substance is listening to the teacher conveying learning objectives, form cooperative groups, reading worksheets, distinguish between changes in physics with chemistry changes that will be observed later make observations, to know and mention ciri- characteristic physical and chemical changes, and may provide examples of physical and chemical changes in everyday life. Task analysis of Separation Method mixture is a means used to separate compounds that are mixed. Several methods of separation of mixtures that are often used include filtration, distillation, chromatography, and crystallization, students listen to the teacher presents the objectives of learning, experimenting filtration and distillation. Students answer the teacher's question: Which can be filtered out of water with sand or the water with salt? Why? Shiva answered questions and concluded the results of the experiment. Furthermore, students learn the concept of determining the nature of the solution, with the tasks learners to observe the soapy water in a beaker which dipped litmus paper red and blue, the students answer the teacher's question of what difference acidic solution and an alkaline solution? students listen to the teacher presents the objectives of learning, listening to the teacher about the proper way to determine the properties of acids and bases through the use of a substance called indicator pointer.

3.3 Analysis of Concept

Analysis of the concept is used to identify the main concepts to be taught and systematically compile relevant concepts in the form of a concept map.

3.4 Analysis Learning Objectives

After analyzing the concept and task analysis, structured learning objectives formulation. The formula results are presented in Table 1.

3.4.1. Stage Design (Design)

The purpose of the design stage is to prepare a prototype device learning and development of integrated science teaching materials that incorporate the concept of the characteristics of the substance, the ecosystem, and environmental preservation. This stage includes the preparation of the achievement test instrument, media selection, selection of formats and sources of learning.

3.4.1.1. Preparation of Test Instruments

Preparation of the test instrument is a step to bridge the establishment and design stage. The test is based on the results of the formulation of the learning objectives that have been set. Before the compiled test results to learn, first performed preparation of grating achievement test. The test results produced are in the form of learning achievement test product in the form of multiple choice and description.
Tabel 1. Objective of Learning

<table>
<thead>
<tr>
<th>Num</th>
<th>Basic Competence</th>
<th>Main and Sub Learning</th>
<th>Objective of learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Understanding the characteristics of the substance, as well as physical and hemical changes in substances that can be used for everyday life.</td>
<td>Characteristics of Substance: Changes in Matter</td>
<td>1. Through observation, students can explain changes in physical and chemical 2. Through studies worksheets, students skilled in experimental physics changes and chemical changes. 3. Students can explain peman-faatan physical and chemical changes in everyday life.</td>
</tr>
<tr>
<td>2</td>
<td>Perform The separation mixture based on physical and chemical properties. the mix</td>
<td>Separation of Mixtures</td>
<td>1. Through observation, the student can explain the principle of the separation of mixtures 2. Through studies worksheets, students can experiment The separation skilled in 3. Students can explain peman-faatan separation method mix in everyday life</td>
</tr>
<tr>
<td>3</td>
<td>Conduct an investigation to determine the nature of the solution that is in the neighborhood using artificial or natural indicators</td>
<td>Determining the Nature of Solutions</td>
<td>1. Through observation, the student can explain the principle of determining the nature of the solution. 2. Through studies worksheets, students can experiment skilled in determining the nature of a solution 3. Students can explain peman-faatan determine the nature of the solution in everyday life</td>
</tr>
</tbody>
</table>

3.4.1.2. Election Media

The success of the learning activities rely heavily on the use of media and learning resources selected. Diigunakan list of instructional media in integrated science learning to the material characteristics of the substances appear as in the following table.

Table 2. List of Media and Equipment / Materials Used

<table>
<thead>
<tr>
<th>No</th>
<th>Kegiatan Pembelajaran</th>
<th>Alat/ Bahan dan Media yang digunakan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RPP First Meeting</td>
<td>Laptops, LCD, white board, markers, power point, paper, lighters, cups, tablespoons, scissors, burners spritus, sugar, water.</td>
</tr>
<tr>
<td>2</td>
<td>RPP meeting was to Two</td>
<td>Laptops, LCD, white board, markers, power point, paper, lighters, beaker, erlenmeyer tube, the stand and clamp, device holder, universal clamps, hoses, tablespoon, filter, bunsen burner, sand, sugar, coloring, water.</td>
</tr>
<tr>
<td>3</td>
<td>RPP Meeting Three RPP</td>
<td>Laptops, LCD, white board, markers, power point, and blue litmus paper red, soapy water, juice, water.</td>
</tr>
</tbody>
</table>

3.4.1.3. Election Format

Selection of the format used by researchers to develop the Integrated science learning about the material characteristics of substance use existing format and developed in accordance with the indicators and learning objectives. The format used in this study adopts the format of syllabus and Learning Implementation Plan (RPP) issued by the Institute for Education Quality Assurance (LPMP) Gorontalo Province as teacher training material for the core. Development of teaching materials using IPA Book Junior Class VII Puskurbuk 2013 and Book IPA SMP / MTs bouquet Wasis and Irianto (BSE) in 2008.

3.4.1.4. Preliminary Design

In the initial design phase produced the first draft of the study include the syllabus, Learning Implementation Plan (RPP), Instructional Materials, Media Power Point, and Test Instrument Learning Outcomes.
3.4.2. Development Phase (Develop)

At this stage of development activities through the Validation Expert (Expert Validity). Validation of the expert who carried out the validation includes the content of all components of the learning tools developed at the design stage. Comments and suggestions from the experts used to supplement and menyempurkan draft I thus obtained draft II is ready to be tested in SMP Negeri I Kwandang North Gorontalo Regency Gorontalo province.

The components that are validated syllabus, Learning Implementation Plan (RPP), teaching materials and achievement test. Revised parts of the learning device is as follows:

3.4.2.1. Syllabus

Syllabus is on a learning plan and or groups of subjects / certain themes that include core competencies, basic competencies, subject matter, learning activities, indicators of achievement of competencies, allocation of time and learning resources developed by each educational unit. Syllabus is then translated into Learning Implementation Plan (RPP). The revised section on the syllabus as follows:

a. On learning activities must include in clear steps (syntax) of the learning model used.

b. In the indicator, include things that are clearly measurable.

3.4.2.2. RPP

Lesson plan is a reference for teachers in conducting teaching and learning activities, which consists of preliminary activities, core activities and cover activities (Appendix 2). Lesson plan developed in this study consists of three for three meetings, namely the meeting of 1 (one) allocation time of 80 minutes, perteman two (2) 80 minutes and the meeting of 3 (three) 40 minutes. The allocation of this time based on the time allocation of school as research objects. The parts that were revised in Pelaksanaann Plan (RPP) as follows:

a. At each Learning Implementation Plan (RPP), learning objectives should load the audience, behavior, condition and degree, so that what is expected by the teacher are clearly delineated, will further facilitate the achievement test preparation.

b. Assessment on Learning Implementation Plan (RPP) is unclear, especially for measuring the performance of learners. Remarks very like, good, average, good and should not be given descriptors or scoring rubric, so clear in their assessments.

c. In the learning materials, materials related to learning are described in more detail.

d. In the learning model used syntax must be clarified.

e. At apersepsi, if you want to give the question, the question must be written in the Learning Implementation Plan (RPP). If apersepsinya form of the phenomenon, it must be written clearly this phenomenon and through any media delivered.

3.4.2.3. Instructional Materials

Teaching materials is a study guide learners, whether learning in school and at home. Forms of teaching materials developed not like books in general, because it only contains material examples of activities, worksheets, and equipped with pictures and information science. The parts of the revised teaching materials, among others:

a. It should be added exercises, so that students can learn to discuss matters independently.

b. Activities to be carried learners is only partially available on teaching materials.

c. There needs to be additional activities / assignments so that no activities were carried out by learners at home.
3.4.2.4. Test Results Learning

At achievement test every learning objectives should be represented more than one question to measure the learning objectives. Results of the assessment of an expert validator items developed that the matter can be used with little revision. The revised learning device can be seen in Table 3 below.

<table>
<thead>
<tr>
<th>No</th>
<th>Perangkat</th>
<th>Bagian yang Direvisi</th>
<th>Revisi</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Syllabus</td>
<td>Learning activities</td>
<td>Adjusted learning activities 5M</td>
</tr>
<tr>
<td>2</td>
<td>RPP</td>
<td>indicator learning objectives</td>
<td>Using operational sentence that can be measured.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Using operational sentence and contains four things, namely learners, behavior, school conditions, and the level of development.</td>
</tr>
<tr>
<td>3</td>
<td>Teaching materials</td>
<td>Description of the material</td>
<td>Described briefly</td>
</tr>
<tr>
<td>4</td>
<td>Media</td>
<td>The shape and color</td>
<td>Rubric assessment</td>
</tr>
<tr>
<td>5</td>
<td>Tests of</td>
<td>Outcomes</td>
<td>Apersepsi should be written clearly Materi</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Images needs explanation and written exercises</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The Power point made shapes and colors that attract the attention of learners</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Learning Should Those items represent any objectives to be achieved and adjusted to the cognitive</td>
</tr>
</tbody>
</table>

4. Conclusion

Based on the results of research and discussion can be drawn the conclusion that the development of the integrated science teaching SMP / MTs using 4-D models (Define, Design, Develop, and Desiminate) includes syllabus, Learning Implementation Plan (RPP), Student Worksheet (LKS), instructional Materials, Media Study and Test results learning has met the criteria for the development of appropriate validation results, ie valid, reliable and fit for use in teaching Integrated Science for material Characteristics of substance.

References


SCIENCE EDUCATION STUDY PROGRAM DEVELOPMENT THROUGH JOINT RESEARCH AND INTERNATIONAL JOURNAL PUBLICATION

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Abstract
Continuous quality improvement in the educational activity in the Science Education Studies Program, Yogyakarta State University, is one thing that should be and is being done. Effort in that direction is not just boils down to the qualifications of national accreditation journals but also sought in order to meet international accreditation standards. To produce quality research that should be in reputable international journals (indexed Scopus, Scimago and/or Thomson Web of Science), is not easy. Therefore, joint research with institutes and universities in other countries in Asean is very important to share knowledge and learn from each other's strengths and weaknesses of each. Therefore, it has been agreed through the terms of reference of cooperation to carry out joint research with the National Child Development Research Centre (NCDRC), UniversitiPendidikan Sultan Idris, Malaysia in research on the topic, "Science for Young Student". In addition to joint research also needs to be increased professional capacity of faculty and students in the application of learning strategies student centered learning through Active Learning Workshop in Scholl (ALIS) for students of international class and Active Learning for Higher Education (ALFHE) for lecturers in cooperation with the Active Learning Facilitator Association (ALFA ) as a continuation of the cooperation program with USAID through the USAID program DBE2 and Priorities.

Keywords: Science Education Study Program, joint research, international journal publication.

1. Introduction

The University has a very important role in the success of the achievement of global commitments, particularly the field of education, which one of them is readiness in the face of competition in a free market related to the implementation of the Asean Economic Community (AEC) in 2015's. The University is home of experts in various fields of science and appropriate mission can contribute substantially to the achievement of the competence of graduates who have high competitiveness through the activities of teaching, research and knowledge in applying for public purposes.

The success of a country to compete in the era of globalization is the illustration of the success of the development of higher education, so that higher education should be able to respond to change, a commitment to build a society with a competitive nation and so has the action in a globalized world. Achievement of these commitments can be carried out in a professional manner by universities through improving the quality of education. In the field of quality, efforts to do public universities, for example through the search for solutions to the teaching of science, culture, language, skill is more effective and attractive. Competitive quality of graduates born through a good process with the support by professional staff and creative. To improve the quality of the learning process and increase the capacity of the academic staff, the joint research and publication of the international journal is the right choice and HARUYS done in order to build a conducive academic atmosphere. In terms of achieving quality in order to achieve the commitment, through a joint research scientific
development and international journal publications should continue to be pursued in view of the need to increase the capacity of research and publications that can lift leading research topics in the field of science education to be introduced in the international world.

The University does not just stop at the process of delivering lectures to students, but more than that at the center of scientific development is not merely become a pile of research but also internationally publicized so that the perceived usefulness. Therefore, continuous improvement needs to be done as a consequence to be a world class university (WCU), which must be done in order to compete in a competitive era of free competition is ongoing at this time.

Internationalization Science Education Study Program becomes very important to do through various measures systematically and strategically oriented to improving the quality and management associated with sustained improvement made by UNY order to encourage an increase in prey market and win the competition. Educational institutions are not able to manage these changes will be left behind. Because this is in line with the paradigm shift in the organization of the 'market oriented' to 'resources oriented', then one of the ways that can be taken by UNY is to reorganize its resources in order to survive in the long-term competitiveness.

Science Education Study Program although relatively new, but always seeks to continuously improve the quality of educational activities are held. Effort in that direction is not just boils down to the qualifications of national accreditation journals but also sought in order to meet international accreditation standards. Therefore, the Science Education Study Program organizes all this potential by involving all elements of the academic community in order to prepare a form that not only refers to the national quality standards such as the National Accreditation Board of Higher Education (BAN-PT), but also to the fulfillment of international standardization between Another, ASEAN University Network of Quality Assurance (AUN-QA), ISO, and the World Class University (WCU).

To achieve standardization Science Education Study Program qualified international quality standards, the internationalization program of courses is very important. In order to achieve the internationalization of the study program, Science Education Study Program has: (a) vision derived from the vision of UNY, (b) the mission of which is the translation of the vision in the form of duty and obligation to implement Tridarma College, (c) the purpose of which refer destination UNY, and (d) targets that are relevant to the mission of the study program.

This activity is based on internationalization activities Science Education Study Program through joint development research and publication international journal scopus indexed to support world class university program. The size or the achievements of these activities realized in the input indicators (qualification of lecturers, recruiting foreign students, etc.), process (joint research activities in the field of science learning, accredited national journal publications) and output (accreditation, qualification of graduates, etc. other).

2. Result, Methods, and Discussion

Science Education Study Program is trying to adapt the curriculum is tailored to the learning outcomes in the Indonesian National Qualifications Framework (KKNI-Indonesian Qualification Framework) and the National Standards for Higher Education (SNPT) adapted to vision, mission, goals and objectives of the study program and has been attentive to the needs of stakeholders, to consider input from faculty, students and prospective users.
graduates. As has been scheduled UNY, 2009, the existing curriculum has been restructured in 2014 and has been in effect in the 2014/2015 academic year, for both the Regular and Class seed program.

Although new, the education department of the IPA has excellent infrastructure such as classrooms, laboratories, library, board space Prodi still fused with some professors, seminar rooms and meeting rooms. Science Education Study Program also had a supporting lecture equipment and adequate administration, such as OHP, LCD, notebook, computer and audio-visual equipment. Computers are available in sufficient quantity and quality (40 computers in one room) so that each student can carry out the lab with one computer. However, some shortcomings still encountered, including the IT laboratory is not equipped with internet network and the books in the library Prodi is still minimal, but students can take advantage of existing libraries in the environment such as a library department Faculty of Biology, Chemistry, Physics and Mathematics and Library Unit UNY, The perpuskaan bebearpa available in a variety of books supporting learning activities that can be used by the student Science Education Study Program.

Associated with the learning process, learning mission of this study program is organized learning program to produce a superior undergraduate science education in the mastery of science and technology learning, as well as prepared to continue their studies at a higher level. By using the existing funds, has strived to improve the quality, relevance, and life skills of students. Such efforts include: (1) Improving students' skills in developing learning technologies IPA SMP / MTs which has been integrated in every subject related to the intensification of practical ways of making props / media science learning SMP / MTs; (2) Improvement of English language skills of faculty and students through the activities of English Mini Seminar, holding classes in English (bilingual classes), and training TOEFL test-Like; (3) Improved student learning independence by organizing lectures with on-line system and the development of various models of the lecture.

Teaching learning processes monitoring results by the students who held regularly every semester revealed that faculty commitment to teaching with a grade high enough, as evidenced by the average percentage of professors in lecture attendance is high enough, use a pretty good lecture time, and use a variety of strategies and variations teaching methods in accordance with the purpose of the lecture.

Academic atmosphere in Science Education Study Program built very conducive. There are many activities that support the creation of good relations between lecturers, professors and students, and between students, namely: learning research activities, development of media, Lesson Study, research professor with students, organization of scientific activities such as seminars, English Mini Seminar, Science Olympiad, workshop, field studies, dialogue, sporting events, and community service activities.

Related to information systems, starting in 2005 FMIPA UNY has implemented SIAKAD (Academic Information System) uses the internet. Students can use SIAKAD to fill the Study Plan Card (KRS) and see the results of the study, and every faculty Academic Advisor (PA) may obtain academic information of students who dibimbingnya through SIAKAD (http://siakad.uny.ac.id). The environment UNY also available hot spots, so that faculty and students can access the internet 24 hours free of charge.

Quantity of research and publication of scientific articles lecturers are good enough, but the quality needs to be improved. Publication of scientific papers in international journals lecturers still minimal. Currently Prodi has subscribed international electronic journal
"Science Education Review", while the university has subscribed electronic journals through "www.proQues.com" by giving a password and username on each environmental study programs at UNY. Internal quality management is done with planning and executing the delivery staff for further studies, English course and participated in various training/ Workshops for the field of expertise by considering the needs of program development.

Based on the planning that has been done, then the department of Science Education Study Program internationalization in 2014 has been successfully implemented with a series of activities as follows:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Result of activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop writing scientific article for the International Journal for</td>
<td>Establishment of three scientific articles published in international journals ready</td>
</tr>
<tr>
<td>lecturers in order to increase the number of international publications</td>
<td></td>
</tr>
<tr>
<td>Workshop on Benchmarking and translation of science education curriculum</td>
<td>All the indicators of success is reached (achieved 100%), namely the drafting</td>
</tr>
<tr>
<td>based KKNi and SNPT (National Standards of Higher Education) into English</td>
<td>curriculum standards Pendidikan IPA 2014 KKNi and SNPT and in English</td>
</tr>
<tr>
<td>Academic Training Presentation Presentation Materials for lecturers as in</td>
<td>• 100% of participants already present in the workshop</td>
</tr>
<tr>
<td>seminars and forums International.</td>
<td>• 80% of participants were able to talk or presentation using the English language,</td>
</tr>
<tr>
<td></td>
<td>by acting as presenting a paper, participating in a discussion and moderating</td>
</tr>
<tr>
<td>Workshop on Model Development and Implementation of Integrated Science-</td>
<td>Lecturers in science education study program are able to develop a device-course</td>
</tr>
<tr>
<td>Based Local Wisdom in the Setting of Outdoor Learning System as Form</td>
<td>lectures on the subjects of science and implement the integrated model of science-</td>
</tr>
<tr>
<td>Pioneering Cooperation Prodi Science Education with Learning Resources</td>
<td>based local wisdom in learning outdoor setting.</td>
</tr>
<tr>
<td>Society and provisions introduced in Indonesia.</td>
<td></td>
</tr>
</tbody>
</table>

The results of various efforts to enhance the quality that has been implemented over the last two years is the trend: (1) an increase in average cumulative GPA of graduates, (2) an increase in the average score of TOEFL-Like students. Besides such strength such exposure, also identified weaknesses Prodi, namely: (1) the publication of scientific papers lecturer in international forums minimal, (3) not all qualify as a lecture hall lecture hall for prospective teachers.

Several opportunities are exploited Prodi to improve the quality of teaching and learning, are: (1) the existence of Act No. 14 Year 2005 on Teachers and Lecturers and PP 19 of 2005 on National Education Standard, strongly supports the opening of the Science Education Program (S1) to prepare prospective science teachers that have been derived from biology or physics graduate education, (2) the opportunity to study program to take part in efforts to improve the quality of teachers through a program of academic qualification, certification and competency testing program, (3) a growing number of institutions that establish international schools in Indonesia, provide opportunities for self-study program to internationalize in order to prepare graduates who are capable of teaching in international schools, (4) chance after cooperation with various agencies, such as local government and the Department of Education to improve the quality of science teachers.

It is a threat to the study program is to compete with other universities. Science Education Study Program must compete in getting qualified prospective students as well as to obtain block grants, research funds, and funds from the Higher Education PPM. Based on the
analysis of strengths, weaknesses, opportunities, and threats such as these, then Prodi has formulated a number of strategies to achieve the targets that have been set. The targets are: (1) At the end of 2014: an average GPA of 3.25 graduate, the average score of TOEFL-Like for 425 students, and (2) there are at least five scientific papers published lecturer in international journals or seminar in English speaking forum.

3. Conclusion

Continuous quality improvement (continuous development) in the educational activity in the Science Education Studies Program Faculty of Mathematics and science, Yogyakarta State University, is one thing that should be and is being done. Effort in that direction is not just boils down to the qualifications of national accreditation but also sought in order to meet international accreditation standards. Therefore, the Science Education Study Program organizes all this potential by involving all elements of the academic community in order to prepare a form that not only refers to the national quality standards such as the National Accreditation Board of Higher Education (BAN-PT), but also to the fulfillment of international standardization between Another, ASEAN University Network of Quality Assurance (AUN-QA), ISO, and the World Class University (WCU).

Asean Economic Community (AEC) which came into force in 2015 is to be anticipated by academics as the opportunities and challenges to improve the quality of its research. To produce quality research that layah entered in reputable international journals (indexed Scopus, Scimago and / or Thomson Web of Science), is not easy. Therefore, joint research with institutes and universities in other countries in Asean is very important to share knowledge and learn from each other's strengths and weaknesses of each. Therefore, it has been agreed through the terms of reference of cooperation to carry out joint research with the National Child Development Research Centre (NCDRC), Universiti Pendidikan Sultan Idris, Malaysia in research on the topic, "Science for Young Student". (Letter attached cooperation).

In addition to joint research also needs to be increased professional capacity of faculty and students in the application of learning strategies student centered learning through Active Learning Workshop in Scholl (ALIS) for students of international class and Active Learning for Higher Education (ALFHE) for lecturers in cooperation with the Active Learning Facilitator Association (ALFA ) as a continuation of the cooperation program with USAID through the USAID program DBE2 and Priorities. This activity is also expected to be increased capability of scientific publications through a workshop publication of research articles in international journals.

Acknowledgements

Author would like to Office of International Affairs and Partnertship, Yogyakarta State University, who have contributed in the internationalization Science Education Study Program and for supporting the activity.

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Read more: [http://www.referenceforbusiness.com/encyclopedia/Con-Cos/Continuing-Education.html#ixzz3hLXFZASx](http://www.referenceforbusiness.com/encyclopedia/Con-Cos/Continuing-Education.html#ixzz3hLXFZASx)
THE DEVELOPMENT OF SCIENCE EDUCATION UNDERGRADUATE CURRICULUM WITH IQF/KKNI ORIENTATION

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Abstract
The aim of the study is to develop science education undergraduate curriculum oriented on Indonesia. Qualification Framework (IQF/KKNI). The curriculum was developed using define, design, and develop stages, i.e. Evaluating Curriculum CIPP Model, Constructing Graduate's Competence Standards, Mapping competencies and subject matter to determine the name and credits of the course, Constructing course identity, Constructing semester course plan, Constructing learning materials, as well as Validating, and Revising. Data of the study involved data of curriculum evaluation collected from lecturers, students, graduates, stakeholders, and curriculum validation data from curriculum experts. Techniques of data collection were conducted through documentation, interview, and questionnaire. The data was analyzed descriptively. The result of analyze and evaluation of the study showed that it is needed to develop curriculum of science education undergraduate program balancing technique as science teacher and general skills required in a variety of occupations. The result of validation analyze of curriculum draft showed that using feedback from the experts, the curriculum of science education department developed is high quality to implement on the students of science education department.

Keywords: Curriculum development, science education, Indonesia Qualification Framework (IQF)

1. Introduction

Existing curriculum of Undergraduate (S1) Programs of Educational Science, Faculty of Mathematics and Natural Science, State University of Surabaya (Unesa) was developed based on Ministry of National Education’s Decree Number 232 / U / 2000 on Guidelines for Higher Education Curriculum Development and Assessment of Student Learning Outcomes and the National Curriculum Undergraduate Program, as well as the number 045 / U / 2002 on Higher Education Core Curriculum. The curriculum was first set in 2007, so that up to now has been implemented over 5 years. Curriculum evaluation conducted was formative evaluation, in the sense of evaluation to increase the effectiveness of the implementation of the curriculum.

In accordance with the recent developments, there are rapid changes in world and education, among others: (a) developments in science, technology, and art rapidly, which requires updating of curriculum content; (b) the Presidential Decree No. 8 of 2012 on the Indonesian National Qualifications Framework (IQF/KKNI) which requires the adjustment of curriculum at all levels of education; (c) a review of the existence of a competency-based curriculum (KBK); (D) the results of the National Convention of Education in Jogjakarta Indonesia in 2012, which mandates the preparation of the golden generation of Indonesia in 2025 through character education; and (e) the need to accommodate the 21st century skills into the curriculum.

Especially for educational higher education (LPTK), curriculum which will apply should be based on: (a) changes in the orientation of S1 curriculum to academic orientation as a
consequence of the rise of professional teacher education program (PPG); (b) the development of the curriculum at primary and secondary levels of education requires adjustments to the curriculum content of S1 educational programs; (c) the re-orientation of S1 educational programs based on community needs, such as dual degree, double degree, as well as the recognition of students’ qualifications. The shifted paradigm requires an evaluation of the current (on-going) curriculum, whether it accommodate these needs. Results of the evaluation of the curriculum is used to re-build the curriculum. Based on the above description, the manuscript describes curriculum development on Undergraduate Science Education Programs, Unesa, which starts from the evaluation of the on-going curriculum.

There are various models of curriculum evaluation, one among of these is CIPP model. This evaluation model developed by Stufflebeam, et al (1967) at Ohio State University. This evaluation model was originally used to evaluate the ESEA (the Elementary and Secondary Education Act). CIPP is an acronym, context evaluation: an evaluation of the context, input evaluation: an evaluation of the inputs, process evaluation: evaluation of the process and product evaluation: an evaluation of the results. Fourth abbreviation of the CIPP that is the evaluation component. CIPP model is oriented at a decision (a decision-oriented evaluation structured approach). The goal is to help administrators (principals and teachers) in making a decision. According to Stufflebeam, (1993) "the CIPP approach is based on the view that the most important purpose of evaluation is not to PROVE but improve." The concept offered by Stufflebeam with the view that the essential purpose of evaluation is not to prove, but to improve.

Curriculum development in higher education is a complex activity, which involves a lot of references. Some of them are Indonesian benchmark Quality Framework (IQF), National Standards for Higher Education (SNPT), as well as numerous other references. In Unesa, additional reference is The Manuscript of Study Programs’ Curriculum Development (Unesa, 2014). In general, the stages of curriculum development includes the steps of: on-going curriculum evaluation, formulation of Competency Standards (SKL) or Learning Outcome (LO), competence-core subject matrix formulation to formulate subject (courses), credits formulation, formulation of the identity of the subjects, preparation of Semester Lesson Plan (RPS), validation and revision, public testing and revision, and implementation (Unesa, 2014).

2. Methods

This research is the development reseach, following the steps define, design, develop from 4D models (Thiagarajan et al, 1974) with various adjustments. At the define stage, analysis needs of curriculum development be made. This stage in the form of on-going evaluation of the curriculum using CIPP models. Formulation of Competency Standards (SKL) or Learning Outcome (LO), competence-core subject matrix formulation to formulate subject (courses), credits formulation, formulation of the identity of the subjects, preparation of Semester Lesson Plan (RPS) are held on design stage. The develop stage includes validation of curriculum draft and revision.

The data of the study include documents on-going curriculum, feedback from faculty, students, alumni, and stakeholders on the current curriculum on process and product aspect, as well as validation data on draft curriculum from three experts. The data are gathered by questionnaires and interview guidelines. The data analysis using descriptive analysis.
The stages of curriculum development can be seen in figure 1.1 below:

![Diagram of curriculum development stages]

**Figure 1.1. Stage of Undergraduate Science Education curriculum development**

### 3. Results and Discussion

#### 3.1. Curriculum Evaluation Results

The on-going curriculum evaluation on aspects of context aims to determine the suitability of the curriculum, course descriptions, syllabi, and SAP with Learning Outcome (LO) which is required by: (1) The Indonesian National Qualifications Framework (IQF), (2) National Standards Higher Education (SNPT), (3) Competency Teachers, (4) Curriculum 2013 (K-13) on Secondary School, and (5) National Sciences Education Standards (NSES). Evaluation of the curriculum for input aspects include: 1) the suitability of the curriculum with student input capability in the form of a score of TEP (according to student input Raw), 2) the suitability of the curriculum with the infrastructures at the study program, 3) the suitability of the curriculum with the qualifications of educators and educational staff at the study program, and 4) the suitability of the curriculum with the study program budget. The process evaluation include the learning process, assessment/evaluation, and other academic services. The product evaluation includes the competence of graduates associated with the real world (work places).

Results of the on-going curriculum evaluation were as follows:

1. There are incompatibility/mismatch between on-going curriculum with the Learning Outcome (LO) that is contained in IQF, SNPT, Master of Professional Competence, Curriculum 2013, and NSES;
2. The on-going curriculum was not entirely fit with the process and assessment standards contained in the IQF and SNPT document;
3. The subjects-courses listed in the curriculum structure has not fully support the achievement of the Learning Outcome (LO);
4. Description of the course has not been fully describe the achievement of the Learning Outcome (LO). The descriptions need to be fixed in accordance with the dimensions of competence on the LO to be developed on the subject, eg, problem solving, use of science and technology, decision-making, and a variety of soft-skills;
5) Graduates felt less/insufficient competence, in the aspect of knowledge, skills, and attitudes in the real work, included competencies required of teachers/educators in the form of pedagogical, professional, personal, and social competences. They said that curriculum should be rebuild/developed.

According to the students, the on-going curriculum in general was perceived and judged appropriate, but several aspects need to be improved. It is shown (a) the limited ability of students to plan an interesting learning; (b) the depth and breadth of the material has not been evenly distributed in each course/subject; (c) the presentation of material on several courses less profound, structured and systematic; (d) a lot of the material is presented repeatedly in several subjects; (e) the activity of the learning process is less effective; (f) not all lecturers convey syllabus and learning contract; (g) the unballancing course load in each semester; (h) the provision of value is still less objective and transparent; (i) Not all of the tools and materials used; (j) there is still overlapping payload or content on several subjects.

According to the graduates users (stakeholders), the on-going curriculum in general needs to be improved. It is shown: (1) acquisition of knowledge competence (mastery of the concepts and principles of learning) and skills (design, implement, and evaluate) owned graduates still inadequate; (2) graduate’s insuffience to apply the concepts and theory subjects on learning; (3) the mastery of English language skills, especially in listening and speaking ability is still inadequate.

3.2. Results of Curriculum Development

The developing new curriculum referred the results of evaluation on-going curriculum. Besides that, the developing new curriculum referred to: 1) The Manuscript of Study Programs’ Curriculum Development (Unesa, 2014); 2) Learning Outcomes (LO/SKL) using a formulation of the learning outcomes developed by consortium of seven higher education which hold science education programs.

In the define phase, the initial draft curriculum developed consists of: 1) formulation of the vision, mission, and goals of Undergraduate Science Education Programs; 2) Formulation SKL/ LO of Undergraduate Science Education; 3) Formulation of matrix competency versus core subject to determine subjects/courses; 5) Formulation of credits; 6) Formulation of Curriculum Structure; 7) Formulation of subjects/course identity; and 7) Semester Lesson Plan (RPS).

Review and validation of the draft curriculum of Undergraduate Science Education Program held on 13 - 14 November 2014 by three experts in science education. Results of review of the draft curriculum was in generally the draft is a good in quality and in accordance with IQF, but need some improvements. Suggested improvements include: 1) Suggestions for improvement to the mission statement and objectives Science Education Programs; 2) Suggestions for formulating the subject; 3) Suggestions for improvement in curriculum structure: to add some subjects, i.e. Analysis of Science in Secondary School as well as some optional subjects; and 4) Advice on the identity of subjects (advancing and newing the references).

Workshop to revised and finalized of the curriculum draft held on 26 November 2014 -8 in December 2014. In addition to the direct discussions (face to face), the discussion was also conducted via email and whatsup between curriculum development team members. Results of these activities is new curriculum of Undergraduate Educational Science Programs, which is ready to be public testing and will be implemented on 2015/2016.
4. Conclusion

A good curriculum should accommodate the various demands and developments in the real world. The on-going Undergraduate Educational Science Programs curriculum evaluation results showed that the curriculum needs to be revised, and developed new curriculum as demanded by the needs of balancing technical ability as a teacher and the skills needed in various fields of work. With steps define, design, and develop as well as in the atmosphere of IQF ideas and other documents, the new curriculum was generated. This curriculum should be examined in a wider forum, in the form of public testing. Related research can be done on development of teaching materials that integrate content with IQF mandated skills, especially the use of ICT, problem solving, and decision making.

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DEVELOPMENT OF BASIC CHEMISTRY COURSES PROGRAM BASED PROBLEM SOLVING TO IMPROVE STUDENTS’ CRITICAL THINKING SKILLS

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Abstract
This study is a research and development that aims to produce of Basic Chemistry Courses Program to improve Students’ Critical Thinking Skills. This research was used Thiagarajan Research and Development model which consists of four stages: define, design, develop, and disseminate phases. The basic chemistry courses program include of syllabus, lesson plan, work sheet, hand book, and critical thinking skills test. Limited trial conducted in science education program of UNM. The instrument used to collect validation data consists of: 1) sheet validation learning device (syllabi, lesson plan, textbook, students work sheet (LKM), and critical thinking skills test), 2) research observation device sheets, 3) learning management observation sheets, 4) student activity observation sheets, 5) questionnaire responses of students, and 6) critical thinking skills test. The program was validated by expert judgment. The problem solving step in chemistry adopted by Polya, there are: 1) understanding problem, 2) devising plan, 3) carrying out the plan, and 4) looking back. The critical thinking skills indicator was identified with the following abilities: 1) basic clarification, 2) the basis for decision, 3) inference, 4) advanced clarification, 5) supposition and integration, and auxiliary abilities, not constitutive of critical thinking. The results showed that the Basic Chemistry courses model based on problem solving to improve the students critical thinking skills is valid category. The limited trial results showed that the learning device that have been developed are in practical category and effective in terms of the results of students' critical thinking skills test.

Keywords: Basic Chemistry, problem solving, critical thinking skills.

1. Introduction

In the Science Education programe, Basic Chemistry lecture given in the first semester as a foundation of Advanced Chemistry lectures such as Solution, Analytical Chemistry and Organic Chemistry. Basic Chemistry provides knowledge of the chemical content that will be used by students in understanding and teaching integrated science in science programe. In studying Basic Chemistry, students need to use their critical thinking skills of their entirety in order to resolve the chemical problems in learning and critical issues related to daily life. The fact shows that the problems of chemical given to students can not be completed correctly. It is evident from the average of chemistry student learning outcomes at the Basic Chemistry of Science Education Program students FMIPA UNM subject in 2012 and 2013 were moderate.

The impotance of critical thinking skills test in science learning standard has mentioned in teaching science which suggests that the activity in teaching science should be included of critical thinking and creative, and not to limit the routine or rote learning. By critical thinking, allowed students to study the problems systematically, facing immense challenges in organized manner, formulate questions and devise solutions (Johnson, 2012).

Improved critical thinking skills of learners into learning process is one of the very important efforts, due to their critical thinking skills, students can understand the concepts of learning...
which can be applied to solve the problems. Critical thinking is reasonable and reflective thinking focused on deciding what to believe or do (Ennis, 2011). The critical thinking skills can be identified with the following abilities: 1) basic clarification, 2) the basis for decision, 3) inference, 4) advanced clarification, 5) supposition and integration, and auxiliary abilities, not constitutive of critical thinking (Ennis, 2011).

Critical thinking skills can be trained through problem solving model, because in this learning model the students are trained to solve problems by using the concepts that have been mastered. Through conceptual and critical questions given through lecturing process encourage the students to use the skills intellectual disposition to identify the problems, analyze, and devise the problem. Problem solving is the highest level of type of study and complex compared to the other types of learning (Gagne in Martinis, 2009), because the students can only solve the problem if it has a lot of concepts, rules, or specific rules on various aspects (Thoifuri, 2008). According to Polya (1957), teaching model of problem solving, the students are required to be able to identify problems, devise plan, implementation planning solutions, and look back / evaluation. The steps can be only done by the students if they can think critically.

The problem of the research about how is the process of development Basic Chemistry lecture program based problem solving to improve students' critical thinking skills in science education programe of UNM that valid, practical, and effective?

2. Materials and Methods

2.1. Research Types

The research is a development research (Research and Development), it is course development Basic Chemistry Program Based on Problem Solving which can improve students' critical thinking skills in science education programe.

2.2. Procedure of Device Development

The development of the lecture program using 4-D models developed by Thiagarajan et al. (1974). The development research consists of four stages: definition stage, design stage, development stage, and disseminate stage.

2.2.1. Stage I Define

The define stage is the stage for establishing and defining the terms of the learning. Define phase includes five main steps, namely a preliminary analysis of the end (front-end analysis), analysis of learners (learner analysis), analysis of the task (task analysis), analyzes the concept (concept analysis) and formulating learning goals (specifying instructional objectives).

2.2.2. Stage II Design

The design phase aims to design a learning device. Four steps that must be done at this stage, namely: (1) Constructing criterion-referenced test, (2) media selection in accordance with the material characteristics and learning objectives, (3) format selection, which examines the formats of existing teaching materials and teaching materials set the format that will be developed, (4) initial design, according to the selected format. An initial draft that purpose of this research is the design of the syllabus, lesson plans, Textbook, worksheet, and Critical Thinking Skills Test.
2.2.3. Stage III Develop

The development phase is the stage to produce a product development conducted through two steps, namely: 1) expert appraisal followed by a revision, and 2) development testing. The purpose of this development phase is to produce a product learning device final form Basic Chemistry lecture program based problem solving to improve students' critical thinking skills of science education.

2.2.4. Stage IV Disseminate

Dissemination phase aims to get input, corrections, suggestions, assessments, to enhance the development of the final product to be ready to be adopted by the users of the product.

2.3. Research Instruments

The research instrument was developed to obtain information about the quality of the research product. Instruments developed in this study were: 1) sheet validation learning device (syllabi, lesson plans, textbook, students worksheet (LKM), and Critical Thinking Skills Test), 2) research observation device sheets, 3) learning management observation sheets, 4) student activity observation sheets, 5) Questionnaire responses of students, and 6) Critical Thinking Skills Test.

2.4. Method of Collecting Data

The data collected in this research are the validation result of feasibility learning device and research instruments, the data of Basic Chemistry based problem solving learning device implementation, and students’ critical thinking skills test results.

The assessment of all learning device format based on assessment criteria by using 1-4 scale, as the details which are not good (score 1); less good (score 2); excellent (score 3); and very good (score 4). This assessment was given to each indicators: feasibility content, language, and grain.

2.5. Data Analysis

The data have been collected by using research instrument, further analyzed qualitatively to determine the validity, practicality and effectiveness.

2.5.1. Data analysis of validity learning device.

The step to determine the validity is recapitulate of assessment results about: a) the aspect (Ai), b) criteria (Ki), c) the results of the assessment validator (Vij); so make the average of the results of assessment for each criterion, using the formula:

\[ \bar{K}_i = \frac{\sum_{j=1}^{n} V_{ij}}{n} \]

With: \( \bar{K}_i \) = the average of criteria i
\( V_{ij} \) = scores the results of a study of criteria to-i by Assessor to-j
\( n \) = the number of assessors

The average of each aspect according to the formula:

\[ \bar{A}_i = \frac{\sum_{j=1}^{n} \bar{K}_{ij}}{n} \]

With: \( \bar{A}_i \) = the average of aspect i
\( \bar{K}_{ij} \) = the average for all aspects of i criteria i to j
\( n \) = the number of assessors
Looking for the average total (\( \overline{X} \)) with the formula:

\[
\overline{X} = \frac{\sum_{i=1}^{n} \overline{A}_i}{n}
\]

With:
- \( \overline{X} \) = total average
- \( \overline{A}_i \) = average of i aspect
- \( n \) = the number of aspect

Determining the validity for each category, or mean aspect \( \overline{A}_i \), or mean total \( \overline{X} \) with a predetermined validation category.

Validation Category (Nurdin, 2007) as follows: 
- \( 3.5 \leq \overline{X} \leq 4 \) (very valid);
- \( 2.5 \leq \overline{X} < 3.5 \) (valid);
- \( 1.5 \leq \overline{X} < 2.5 \) (quite valid);
- \( \overline{X} < 1.5 \) (invalid).

2.5.2 Data analysis practicality

The data practicality learning device obtained the result observations of the feasibility research. Data analysis steps: 1) to recapitulate the observations research devices include: aspects (Ai), and criteria (Ki); 2) calculate the average every aspect of observation for each meeting; 3) look for total average \( \overline{X} \); 5) determine the category of the overall feasibility of each aspect or all aspects; \( 1.5 \leq \overline{X} \leq 2 \) (implemented entirely); \( 0.5 < \overline{X} < 1.5 \) (implemented partially); \( 0.0 \leq \overline{X} < 0.5 \) (not implemented).

2.5.3. The effectiveness of data analysis.

To determine the effectiveness of the learning device analysis; 1) the result of learning outcomes; 2) the activity data of learners; 3) the response of learners; and 4) management of learning data.

3. Result and Discussion

3.1. Result

3.1.1. Validity of Learning Device

Validity of Lesson plan (RPP) includes of the aspects of objectiveness, content and learning activities, language, time, facilities and teaching aids. Validator scoring average is four (4) of valid categories.

Validity of students work sheets (LKM) includes of format, language, the content of LKM, and time. The average assessment validator equal with 4 (four) of valid category.

Validity of Textbooks includes of textbooks format, content, language, and the benefit or usefulness of the book. The average result is 3.89 of valid category.

Validity of Critical Thinking Skills Test consist of the material aspects, language, construction, and time. The average assessment result is 4 (four) of valid category.

In addition of validation device, also conducted by validation of the entire instrument that will be used in this research. The tests showed that the student questionnaire responses instruments, research sheet observation devices, observation sheet student activities, and instrument validation of all the devices in a valid category.
3.1.2. Practicality Learning Device

Practicality of Basic Chemistry based problem solving learning devices, assessed from the observations of the feasibility lecture which consists of several components: 1) learning syntax that includes feasibility of each phase in lesson plan (RPP); 2) social system that consist of interaction or multidirectional communication, active learners and provide the opportunities for learners to be active in learning process; 3) The principle reactions include: lecturer ability to create conducive atmosphere, provide and manage the learning resources, guiding students, and provide positive reinforcement; and 4) support system that includes of learning device. Scoring average learning device of the research is 1.90, the category is entirely implemented.

3.1.3. The effectiveness of learning device

The learning device effectiveness assessed on the activity of learners. The observer wrote the keypad category of student activity in the group dominant appear in learning activities on the model of learning based on problem solving. The average percentage of agreement about 80.84 %. This shows that the basic chemistry based problem solving learning device are at good category.

The effectiveness of learning device also assessed the ability of the lecturer to manage learning process. The average of the observations obtained the value included in the height of 2.90. The components are assessed the management of the early activity, the core activities, the activities, and the atmosphere in the classroom.

The analysis of student learning response based on the implementation of the problem solving obtained 90.80 % students give a positive response. Student response to the textbook and students work sheet (LKM) is 9730 % and 95.63 % respectively give positive response.

The analysis results obtained students’ critical thinking skills is 69.56 % of students achieving complete category.

3.2. Discussion

The result of validity, practicality, and effectiveness analysis of Basic Chemistry based problem solving learning device are in valid, practical and effective category based on the result of some instrument assessment. Basic Chemistry based problem solving learning device can improve students’ critical thinking skill because in solving problems, the student using the ability of analysis in order to solve given problem.

The following example are given about chemistry test and its completion on Table

<table>
<thead>
<tr>
<th>Problem Solving</th>
<th>Critical Thinking Skills Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Example 1</strong></td>
<td></td>
</tr>
<tr>
<td>Ascorbic acid (vitamin C) cures scurvy. It is composed of 40.92 percent carbon (C), 4.58 percent hydrogen (H), and 54.50 percent oxygen (O) by mass. Determine its empirical formula. (Chang, 2008)</td>
<td>• Keep the question and situation in mind</td>
</tr>
<tr>
<td><strong>First Principle: Understand the problem</strong></td>
<td>• Follow problem solving steps</td>
</tr>
<tr>
<td>In a chemical formula, the subscripts represent the ratio of the number of moles of each element that combine to form one mole of the compound. How can we convert from mass percent to moles?</td>
<td>• Identify or formulate</td>
</tr>
<tr>
<td><strong>Second Principle: Devise a Plan</strong></td>
<td></td>
</tr>
<tr>
<td>If we assume an exactly 100-g sample of the compound, do we know the mass</td>
<td></td>
</tr>
</tbody>
</table>
of each element in the compound? How do we then convert from grams to moles?

Third Principle: Carry out the plan
If we have 100 g of ascorbic acid, then each percentage can be converted directly to grams. In this sample, there will be 40.92 g of C, 4.58 g of H, and 54.50 g of O. Because the subscripts in the formula represent a mole ratio, we need to convert the grams of each element to moles. The conversion factor needed is the molar mass of each element. Let \( n \) represent the number of moles of each element so that:

\[
\begin{align*}
\text{mass of C} &= \text{molar mass of C} \times n \\
\text{mass of H} &= \text{molar mass of H} \times n \\
\text{mass of O} &= \text{molar mass of O} \times n
\end{align*}
\]

we arrive at the formula \( \text{C}_{3.407} \text{H}_{4.54} \text{O}_{3.406} \), which gives the identity and the mole ratios of atoms present. Chemical formula

Because \( 1.33 \times 3 \) gives us an integer (4), we multiply all the subscripts by 3 and obtain \( \text{C}_6 \text{H}_8 \text{O}_6 \) as the empirical formula for ascorbic acid.

Fourth Principle: Look Back
Examine the solution obtained. Can you check the result? For example, We can check the formula of ascorbic acid is \( \text{C}_6 \text{H}_8 \text{O}_6 \), the number of atoms in an empirical formula is half of the number of atoms in the molecular formula.

4. Conclusion

Basic chemistry based problem solving lecture courses (syllabus, lesson plans, students work sheet, textbooks, and critical thinking skills tests) that can improve students critical thinking skills have a valid category, practical, and effective.

Acknowledgements

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References


MODEL DEVELOPMENT OF LEARNING EARTH AND SCIENCE SPACE BASED LABORATORY GENERIC FOR IMPROVED SCIENCE TEACHER CANDIDATES

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Abstract
The research aims to produce a Learning Model of Earth and Space Sciences Laboratory-Based (MP-IPBA-BL) to enhance the ability of generic science (KGS) prospective teachers. Using the Research and Development of design with a mix method, from Gall et al. (2003) consists of four stages, namely: (1) preliminary study, (2) design study model, (3) developing the model, testing the model and the finalization of the model, and (4) validation of the model. The study involved students of sixth semester in Bachelor Studies Program Elementary School Teacher a Workforce Education Institutions in Pontianak thirty students. Results of the first year following the study: 1) The instrument has been enhanced include: assessment performance, test the ability of generic science, observation sheets, and student questionnaires, 2) The structure of MP-BL-IPBA began with exploration of the simulation program, drafting lab independently and groups, making the tool / media lab is simple, and perform appropriate lab approved design lecturer, made a presentation results in class discussion, and to develop practical reports individually, 3) the ability of generic science perspective Profile (KGS) students is still low, the average percentage of 33.33%. From twice observations on rock material and system earth movement against the sun, only three KGS-looking with a percentage of 50% each, i.e. direct observation, indirect observation, and causality. While KGS another aspect, namely awareness of the magnitude scale, symbolic language, logic inference, modeling, and developing the concept does not appear in the IPBA lab activity. Year research plan to implement the MP-2-IPBA using instruments that have been tested in the study year 1 on a larger scale involving 30 students each control class and experimental class.

Keywords: Learning model IPBA, laboratory, science generic capabilities, and prospective teachers

1. Introduction

The challenge of learning a new paradigm of Earth and Space Sciences (IPBA) demanded further develop higher order thinking skills (high order of thinking) is one component in intelligence issues of the 21st century (the issue of 21st century literacy). According Bafadal (2006) high order of thinking with regard to: ability to solve new problems and unexpected, the ability to perform activity, analysis, synthesis, evaluation systematically, and the ability to perform a variety of useful predictions against natural phenomena and social life of the community. Learning IPBA loaded with high-level thinking activities can be developed through nine kinds of capabilities generic science (KGS) proposed by Brotosiuswoyo (2000), include: (1) direct observation, (2) indirect observation, (3) awareness of the scale of magnitude, (4) symbolic language, (5) the logic framework obey the principle, (6) inference logic, (7) the law of cause and effect, (8) mathematical modeling, and (9) establish the concept.

Remembering the importance of generic ability IPBA in science learning, so the curriculum in higher education must be designed to give students the opportunity to expand and develop their generic skills (Dearing, 1997). However, the research found that IPBA learning in schools and in universities have not been fully conducting laboratory (Pujani & Liliasari,
Learning IPBA dominated by lectures, discussion and assignment. Lecturers and teachers never taught IPBA through laboratory activities. In line with these findings, Ministry of Education (2005), also found that learning science in school generally includes IPBA is theoretical, through lectures, discussions, and problem solving. This case relates many common reasons put forward, such as the absence of laboratory space, no tools, and teacher / lecturer was never trained to implement laboratory activities.

The main problem in this research is: How can IPBA laboratory-based learning model that can improve the ability of generic science teacher candidates in Pontianak? To answer these problems, put forward the following research questions.

1. How does the structure of MP - BL - IPBA that can improve the ability of generic science teacher candidates?
2. How is the topic of laboratory activities that can improve the ability of generic science teacher candidates?
3. What is the profile of science perspective generic ability teacher candidate?
4. What is the profile of faculty performance in Learning IPBA?
5. How is the learning environment that supports the upgrading of generic science teacher candidates?

Learning Strategies based IPBA laboratory to develop scientific skills, understanding of concepts, cognitive ability, creative thinking, and scientific attitude (Gangoli & Gurumurthy, 1995). Further explained that another benefit of the activities of the laboratory are: (1) to motivate students and stimulate interest and talent, (2) teach skills that must be done in the laboratory (3) assist the acquisition and development of concepts, (4) developing an understanding of concepts and develop skills in carrying out these activities, (5) inculcate a scientific attitude.

Wollnough in Rustaman et al. (2005) suggested that the types of effective laboratory activities, namely: (1) the type of exercise, to develop the basic skills and techniques such as the use of tools, measure and observe; (2) the type of experience, to improve the mastery of concepts by providing real experiences directly to the students to a natural phenomenon. Example: understanding the movement of the sun-earth system-moon, can be either verified or inductive; (3) the type of investigation, inquiry model implementation can be used. Example: The investigation of the factors that influence the greenhouse effect.

2. Material and Methods

This type of research is the development of research (Borg and Gall, 1989), in four stages, namely the preliminary study phase, design, design development, and testing phases. This study is a preliminary study (first year) of the planned research development two years, held on Graduate Studies Program Elementary School Teacher Faculty of Teacher Training and Education Tanjungpura University, which has passed the sixth semester IPBA subjects to test as many as 30 students and 50 students to the questionnaire. Data collection is done by testing the ability of generic science multiple choice, questionnaires, and interviews. Methods of data analysis done by using triangulation mixed-methods design (Creswell, 2008) that simultaneously analyze the data with quantitative and qualitative data and consolidated data.
3. Results and Discussion

3.1. Structure Learning Model of Earth and Space Sciences Laboratory -Based (MP-IPBA-BL) Generic Ability to Improve Science (KGS) prospective teachers

The results of the literature review and expert assessment (expert) that have to be obtained MP - BL - IPBA as the following Figure 1.

![Figure 1. Structure of the MP - IPBA - BL (Modification of Stasz 2001 & Pyle, 2008)](image)

3.2. Topics IPBA laboratory activities which can improve teacher candidates KGS

In addition to compliance with the curriculum, also consider the recommendations of the experts, as well as the equipment available in the laboratory, laboratory activities set 12 topics, each of the six topic and six topics terrestrial space as shown in Table 1.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Basic Competencies</th>
<th>Learning Objectives</th>
<th>KGS Development</th>
<th>Necessary equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock</td>
<td>Identify the physical properties of various types of rocks</td>
<td>Through investigation, students can conclude that different types of rocks found in nature have different physical properties</td>
<td>PL, PTL, KSB, IL, and HSA</td>
<td>LCD, video, laptop Different types of rocks that are available in the Lab and in the environment around students</td>
</tr>
<tr>
<td>Exoge-nous power</td>
<td>Identifying the processes of erosion and weathering of rocks</td>
<td>Through investigation, students can conclude that the process of erosion and weathering of rocks affected by fluctuations in climatic factors: temperature, precipitation, wind, and humidity</td>
<td>PL, KSB, IL, HAS, and P</td>
<td>LCD, video, laptop Tools/materials artificial simple experiments students about modeling erosion and weathering of rocks</td>
</tr>
<tr>
<td>Hidrosfer</td>
<td>Mengidentifikasi factors that support the water cycle</td>
<td>Through investigation, students can conclude that the water cycle dipengarbi by several factors, namely: water resources, solar radiation, evaporation of cloud formation and rainfall</td>
<td>PL, BS, IL, HSA, and P</td>
<td>LCD, video, laptop Tools / materials modeling simple experiment (Terrarium) water cycle</td>
</tr>
<tr>
<td>Rainfall</td>
<td>Know the rain gauge manual / digital and how to use it</td>
<td>Through Field Work Lecture students know and can use a graduated tool rainfall manual and automatic</td>
<td>PL, BS, KSB, IL, HSA, and KKL</td>
<td>LCD, video, laptop Visits and observations directly to BMKG Pontianak, and equipment / materials simple experiment a graduated tool rainfall</td>
</tr>
</tbody>
</table>
### Atmosfer

| Identification of the greenhouse effect and global warming | Through investigation, students can conclude that the greenhouse effect and global warming caused by greenhouse gas concentration of CO2 in the atmosphere | PTL, BS, IL, HAS, and P LCD, video, laptop Tools / materials modeling simple experiment (Terrarium) greenhouse effect |

### SPACE SCIENCE

| Earth rotation and revolution | Through investigation, students can conclude that the earth rotates and evolves towards the sun which causes some natural phenomena such as the presence of the time difference in different locations, seasons, day and night, etc. | PL, PTL, BS, IL, HAS, and P LCD, video, laptop Model Panetarium, Globe, flashlights, markers, rulers, etc. |

| Rotation and revolution | Through investigation, students can conclude that the moon rotates and evolves towards earth and the sun which causes some natural phenomena such as the presence moon phases, tide, etc. | PL, PTL, BS, IL, HAS, and P LCD, video, laptop Model trial motions of the Sun - Earth-Moon, moon phase software |

| Sky ball | Through group work, students can perform experiments on the observation coordinate system horizon and the equator | PL, PTL, BS, IL, HAS, and P LCD, video, laptop Tools / materials: Stelarium, Sextant, clock, compass |

| Star | Through group work, students can practice on the various constellations and zodiac | PL, PTL, BS, IL, HAS, and P LCD, video, laptop Tools / materials: Sky maps, software Stellarium |

| Universe | Through group work the students can practice with regard to the observation of interesting objects in the night sky | PL, PTL, BS, IL, HAS, and P LCD, video, laptop Tools / materials: Telescopes, sky maps, compass, flashlight, JPS |

Source: Tjasyono, 2006

### 3.3. Profile of Generic Science Perspective Capability (KGS) Prospective Teachers

Profile perspective KGS teacher candidates indicated by the percentage of student involvement in laboratory activity, based on observations obtained from the data as shown in table 2

Table 2 shows that the profile of prospective teachers KGS perspective is still low with an average percentage of 33.33%. From twice observations on the rock material and the motion of the earth's rotation and revolution, only three KGS looking with a percentage of 50% each, i.e. direct observation, indirect observation, and causality. While KGS another aspect, namely awareness of the magnitude scale, symbolic language, logic inference, modeling, and developing the concept does not appear in the learning IPBA. KGS low student faculty less likely due to the dominance of facilitating and lecturer in learning activities.
Table 2. Profile Generic Capability Perspective Science (KGS) Prospective Teachers

<table>
<thead>
<tr>
<th>No</th>
<th>Generic ability Science (KGS)</th>
<th>Learning IPBA</th>
<th>Percentage activity of each aspect of KGS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Obs 1</td>
<td>Obs 2</td>
</tr>
<tr>
<td>1</td>
<td>Direct observation</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Indirect observations</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Awareness of the magnitude scale</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Symbolic language</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Inference logic</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Obey the principle of logic framework</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>A causal relationship</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Modeling</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>Developed the concept</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total (%)</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: 1 = appeared, 0 = not appeared

3.4. Profile of faculty performance in Learning IPBA

Performance profile lecturers who studied in this preliminary study is divided into two profiles of performance in the implementation of learning in general as well as in developing the performance profile KGS students. Based on observations of the lectures IPBA in the second semester 2014-2015, obtained information that the general faculty performance of some aspects of the observed scores are varied.

Aspects that have the highest score (score 3 = good) include: 1) acquisition of learning materials, 2) use of media and other learning resources effectively, 3) the suitability of the strategies used by student characteristics, (4) openness to student responses, and 5) clarity in answering questions.

Aspects that have the lowest scores (score 1 = less) include: 1) open the lesson and do apperception, 2) the delivery of learning objectives, 3) develop learning materials by proposing problems, 4) distribution of stimulants to make students more active, and 5) involvement students in each learning activity.

3.5. Learning Environment IPBA

Preliminary study of the learning environment committed against the physical and non-physical environment. The results of observations of the physical environment shows that inadequate conditions. The observed aspects of the environment include the ratio of the number of students spacious room, room temperature, lighting, ventilation, seating condition, cleanliness, tranquility class, availability of media and learning resources.

Results of observation on the non-physical aspects of the environment shows fairly good condition. As in the aspect of attitudes and conditions of lecturers as well as students, faculty and student communication, communication between students, classroom atmosphere. From the observation in the learning environment IPBA showed that the learning environment is generally sufficient support for the development of laboratory activities, for example: the area of laboratory space with a sufficient number of students as well as a comfortable classroom atmosphere allows it to perform group activities.
4. Conclusion

Learning Model structure of Earth and Space Sciences Laboratory-Based (MP_IPBA_BL) are implemented in this study consisted of three phases, namely: (1) modeling and collaboration, the introduction and simulation modeling by faculty and discuss the questions referring to the MFI; (2) training and reflection, in groups of students to practice drafting lab activity (practicum) and collaborate to enhance the draft; and (3) exploration, the students presented the results of activities in class discussions and make practical reports individually.

Profile perspective the ability of generic science teacher candidates still low with an average percentage of 33.33%. The low KGS less likelihood facilitated prospective teachers and lecturers dominance in learning activities.

Lecturer in learning performance profiles IPBA still low, almost all lecturers never carry out laboratory activities IPBA both terrestrial field and the field of space. Some of the obstacles faced by lecturers, for example: small portion of the material than the material IPBA IPA others, the lack of supporting facilities, the lack of skills of faculty to conduct laboratory activities, and professors are less motivated to make props/media IPBA.

The condition of the learning environment is generally sufficient support for the development of laboratory activities, for example: the area of laboratory space with a sufficient number of students as well as a comfortable classroom atmosphere allows it to perform group activities.

References


A HYPOTHETICAL LEARNING MODEL TO PROMOTE CREATIVE THINKING SKILL OF JUNIOR HIGH SCHOOL STUDENTS: CDR HUMOR-BASED LEARNING MODEL

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Abstract
This paper is part of a research to find a learning model that can improve students' ability to think creatively, as well as to improve academic achievement through science process skills. The first objective is to conduct theoretical and empirical studies regarding several models of learning that can promote creative thinking of students. The second objective is to propose an alternative learning model that can be implemented widely. This hypothetical learning model that targets an increase in creative thinking skills in junior high school students is called CDR Humor-based learning. Learning models such as Inquiry Based Learning (IBL), Problem Based Learning (PBL), and Creative Problem Solving (CPS) can activate creative thinking abilities. The weakness of these three models is that they could not ensure the creation of a constructive atmosphere for the improvement of students' creative thinking skills. CDR Humor-based learning model is a humor-rich learning process consists of three important stages, namely Construction (C), Deconstruction (D), and Reconstruction (R). Creative thinking technique uses the technique of provocation. This learning model consists of six phases, namely: preparing creative thinking condition, constructing a concept/idea, deconstructing the concept/idea, finding ideas, reconstructing concepts, and determining the idea. Theoretically, CDR humor-based learning model can meet the requirements of a learning model, namely: valid, effective, and practical.

Keywords: Learning models, creative thinking, and CDR humor-based learning.

1. Introduction

Globalization eliminates the virtual boundaries of countries in the world. This creates more intense competition for jobs and every other aspects of life. This situation compels educational institutions to be able to produce graduates who are able to compete for the challenges brought about by the globalization. One of the anticipating efforts is the formulation of 21st century framework for skills that any graduate must have (Partnership, 2012). In this framework, innovation and study skills have been formulated to include these three skills: Creativity and innovation, critical thinking and problem solving, and communication and collaboration.

Creativity is an attempt to produce something new and valuable. Creativity is the general ability to create something new, to provide new ideas that can be applied in problem solving, or the ability to see new relationships between preexisting elements (Munandar, 1999). Sternberg et al. (Holyoak & Morrison, 2005) added that in addition to the ability to produce new product, the product must be original, of high quality and useful. Thus, creativity is the ability to produce something new, unique and useful. Creativity has received serious attention in the school curriculum in many countries. In Indonesia, creativity is one of the must-have capabilities to comply with the objectives of education mentioned in the Basic Framework and Curriculum Structure of SMA/MA, Curriculum 2013. This is important because, globally, creativity in Indonesia is still relatively poor. Data released in 2011 by the Martin Prosperity
Institute (Florida et al., 2011) showed that Indonesia ranks 81st in the global creativity index (GCI) as illustrated in Table 1 below:

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Country</th>
<th>GCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sweden</td>
<td>0.923</td>
</tr>
<tr>
<td>2</td>
<td>USA</td>
<td>0.902</td>
</tr>
<tr>
<td>3</td>
<td>Finland</td>
<td>0.894</td>
</tr>
<tr>
<td>4</td>
<td>Denmark</td>
<td>0.878</td>
</tr>
<tr>
<td>5</td>
<td>Australia</td>
<td>0.870</td>
</tr>
<tr>
<td>6</td>
<td>New Zealand</td>
<td>0.866</td>
</tr>
<tr>
<td>7</td>
<td>Canada</td>
<td>0.862</td>
</tr>
<tr>
<td>8</td>
<td>Norway</td>
<td>0.862</td>
</tr>
<tr>
<td>9</td>
<td>Singapore</td>
<td>0.858</td>
</tr>
<tr>
<td>10</td>
<td>Netherlands</td>
<td>0.854</td>
</tr>
<tr>
<td>79</td>
<td>Vietnam</td>
<td>0.102</td>
</tr>
<tr>
<td>80</td>
<td>Pakistan</td>
<td>0.053</td>
</tr>
<tr>
<td><strong>81</strong></td>
<td>Indonesia</td>
<td><strong>0.037</strong></td>
</tr>
<tr>
<td>82</td>
<td>Cambodia</td>
<td>0.020</td>
</tr>
</tbody>
</table>

Source: Martin Prosperity Institute (2011)

The data is confirmed by the Global Innovation Index 2014 published by the World Intellectual Property Organization (Dutta & Wunsch-Vincent, 2014) in which Indonesia's position is still low at the rank 87 in terms of innovation, which is one important part of creativity.

The essence of creativity is creative thinking. According to Torrance (Roskos-Ewoldsen, et al., 2008) creative thinking is the ability to solve problems, make predictions, formulate new ideas, and communicate the results. Creative thinking activities include the following: 1) use a variety of idea generation techniques, 2) create new and valuable ideas, and 3) elaborate, define, analyze and evaluate one's own ideas in order to improve and maximize the creative effort (Partnership, 2012). In the developed countries, the ability of creative thinking has become a topic of interest. United States periodically measures creativity and concludes that despite the increase of IQ since 1990, ability to think creatively are decreasing (Kim, 2011). The study was comprehensively conducted with samples consists of kindergarten students to adults (272,599 people). In Indonesia, although such comprehensive research is nowhere to be found, some sporadic studies and particular education level studies indicate that the ability to think creatively is still low, as measured using pre-test (Noer, 2011; Hasti et al., 2012; Waluyo & Mintohari, 2013; Idrisah, 2014). Meanwhile, recent studies (Ogunyemi, 2010) showed that thinking intelligence, academic degrees and other achievements can not guarantee a successful in life. Instead, creative thinking skill is one of the keys to achieving success in life.

Global learning framework of the 21st century accommodates the enhancement of creative thinking through core subjects learning, including Chemistry. According to Fisher (2006), any subject can develop creative thinking, as long it involves students in generating and expanding ideas, making hypotheses, applying imagination and discovering new or innovative products. Descriptive study on high school students (Harahap, 2013) revealed a great support from the students to think creatively if practiced together with the learning of teaching materials. Research on creative thinking in science/Chemistry learning in Indonesia is still very limited. The main cause is presumed to be the nature of Chemistry course materials, which like any other science content, supposedly contain structured problems, the answer is already known, and there is only one way to get the correct answer (McWilliam in DeHaan,
2011). In addition, science process skill that is expected to develop in science teaching-learning is more of convergent thinking, while creative thinking requires divergent thinking. Some studies have shown that there is a link between cognitive intelligence with the ability to think creatively. It has been known that there is a positive and significant relationship between academic achievement of students with the ability to think creatively, where students with high academic achievement could potentially have higher ability to think creatively than students with low academic achievement (Wang, 2011; Jabean & Khan, 2013).

Based on the above-mentioned background, there is an urgent need for effort to develop a model of learning that can enhance creative thinking skills and increase academic achievement through science process skills.

2. Materials and Methods

This descriptive study uses data collection techniques through literature studies. This study focus on learning models that promote student’s creative thinking skills such as alternative hypothetical learning model CDR Humor-based learning.

2.1. Inquiry-Based Learning (IBL)

IBL model is a learning model that emphasizes continuous problem-solving processes that often is implemented on learning of science. This learning model helps students learn important content and simultaneously learn about the process of thinking and reasoning processes related to the content (Arends, 2012). Theoretical support for learning model IBL include Piaget’s and Bruner's theories of cognitive development (Arends, 2012). According to Piaget, people are always trying to understand the environment, undergoing biological maturity, interacting with the environment, and acquiring social experience which then all come together and affect the way they think. When someone has a new idea or a new situation, at first one will try to comprehend the new information using the existing schemata. If it does not fit to the existing schema, one must develop new concepts or schemata. In this case the individual will always adapt to its environment using prior knowledge and existing schemata. According to Bruner, students should be able to develop their intellectual and sensitivity to solve problems through investigation that is based on the scientific method, ie formulating problems and hypotheses, testing hypotheses, and getting solutions to problems. The teacher's role is mainly to facilitate the inquiry phase and helps students to focus and be reflective about their thinking processes. Assistance given to the students so they are able to solve problems that surpassing their normal development is called scaffolding, which is a supporting framework which can enhance students' inquiry and intellectual development. The IBL model consists of six phases (Arends, 2012), namely: 1) getting attention and explain the process of inquiry, 2) presents a problem of inquiry or unusual events, 3) ask students to formulate hypotheses to explain the issues or events, 4) encourage students to collect data to test the hypothesis, 5) formulate an explanation and / or conclusion, and 6) reflect on the situation of the problem and the thinking processes used in the inquiry.

2.2. Problem-Based Learning (PBL)

Model PBL is a learning model that focuses on issues on life that are meaningful to students. The essence of PBL is the presentation of a variety of actual and meaningful problem situations to students, who can serve as a springboard for investigation (Arends, 2012). The focus of PBL is not on what students can do, but on what they think during the process of PBL. The most important role of the teacher is to provide scaffolding. The theories supporting the PBL model are primarily cognitive learning theory and social constructive learning theory.
(Arends, 2012). According to Dewey’s cognitive learning theory, education with schools and classes as a reflection of larger society would be a laboratory for efforts to solve problems in real life. Therefore, teaching in schools should be meaningful and not too abstract. Meaningful learning and problem-centered vision in PBL models is in line with the views of Dewey. Piaget’s cognitive theory perceives that children have an innate natural curiosity and continuously trying to understand the world around them. This curiosity motivates them to actively construct representations in the brain about the environment. Knowledge is not static but evolving and constantly changing. In constructing new experiences, based on existing knowledge, individuals must modify these knowledges. According to Piaget, good pedagogy must involve the provision of situations where children can experiment, ie by trying out a variety of things to see what happens, manipulating objects and symbols, asking questions and finding out for his/herself, to reconciling what he found at one time with what he found at another time, and compare the findings with the findings of other children (Duckworth in Arends, 2012). Vigotsky’s constructivist learning theory states that intellectual abilities develop when individuals face a new and confusing experience, and when they are trying to overcome mismatches posed by this new experience. In this stage, individuals connect new knowledge with prior knowledge and construct new meanings. Vigotsky also believes that social interaction with other people accelerate the constructions of new ideas while as well as improving the intellectual development of students (Arends, 2012). In relation to this social interaction, Vigotsky believes that there are two different levels of development, namely the actual development level and the potential development level. The zone between the two levels of intellectual development above referred to by Vigotsky as zone of proximal development. Learning occurs through social interaction between students and teachers and peers. With challenges and appropriate assistance from teachers or more capable peers, students move into their zone of proximal development where the new learning occurs. PBL models consists of five phases (Nur, 2011), namely: 1) orient students to the problem, 2) organize the students to learn, 3) assist in both the individual and group investigations, 4) develop, present and exhibit the work, and 5) analyze and evaluate the problem solving process.

2.3. Creative Problem Solving (CPS)

CPS model is a special form of problem solving learning model. Problem solving learning model is the learning activities to train students to face various problems both personal and group to find a solution. In the CPS model, solution is created independently and later studied with assistance (Al-Khatib, 2012). The process of the CPS always use divergent thinking and convergent thinking (Vidal, 2006), which starts with defining the issues and generate ideas for solutions. Keys to successful implementation of this strategy is to generate as many ideas as possible, so that there should be no evaluation of the initial ideas, as this will prevent various possible exploration. Divergent thinking will produce as many problems / ideas in a specified period. Students have to get all the ideas generated and registered. Furthermore, students do convergent thinking in an evaluative discussions to choose the best option. CPS is based on cognitive theory which adopts the concept of cognitive structure, namely the mental process of creating a solution to a problem. In addition, it is supported by constructivist theory with the establishment of social interaction with other students. There are six phases in the implementation of CPS (Vidal, 2006; Jao & Nwafl in Al-Khatib, 2012), namely: 1) define the problem, 2) find information, 3) formulate the problem, 4) find ideas, 5) find solutions, and 6) accept the idea. Included in the first phase is to find a disorder or dilemma, find the data, and finally define the problem.
2.4. Hypothetical Model: Humor CDR-based learning

Tsai (2013) states that there is no single model of learning that can cover all aspects of a complex process of creativity. Each of IBL, PBL, and CPS learning models has a weakness in its implementation if it is not supported by conducive classroom conditions. The condition should be the same as the conditions that support the improvement of the ability to think creatively. Shallcross (Afshari et al., 2013) states that the most conducive condition for creative thinking of students is the mental and emotional climate that is open in the classroom. This condition calls for the important role of teachers as facilitators of creative thinking of students. Teachers play a role in enhancing the creative thinking and encourage students to express innovative ideas (Barry & Kanematsu, 2006), by setting up the environment and the strategies of learning (Howard-Jones, 2008). Teachers should not just want to make students understand the concepts in the content of the subjects taught, but also to enjoy learning time in the classroom with joy (joyful learning). The advantage gained is the emergence of enthusiasm of students to the concepts being taught (critical thinking), and the creation of an atmosphere that supports the emergence of creative thinking abilities. One of the proposed hypothetical learning models that can be offered to enhance the creative thinking of students in learning Science is CDR Humor-based Learning. This humor-rich learning model teaches the concepts of science by convergent, divergent, convergent and back to convergent thinking process. Teaching strategies that stimulate both convergent and divergent thinking is essential to stimulate creative thinking and challenges students to be creative (Karnes et al in Fasco, 2001). The process of convergent-divergent-convergent thinking sequence is in line with three important phase in concept learning in this model, namely Construction (C), Deconstruction (D), and Reconstruction (R). Humor is implemented at the early stage and at the stage of deconstruction to stimulate student’s divergent thinking. In the early stages, the role of humor is primarily intended to create open mental and emotional climate in the classroom, which can open the student’s tap of creative thinking. At the stage of deconstruction, humor implemented together with provocation technique, which is a thinking technique that move the thinking process way out from the mindset that used to be used to solve problems, thought to think that moving out of the mindset that has been formed that is used to used to deal with a problem. This provocation requires lateral thinking (Ogunyemi, 2010), which can be a starting point for creative thinking. Techniques of provocation humor in the CDR humor-based learning model is the form of disruption to the concept that has been set in the previous stage (construction phase), by provoking with humor. The selected humor must be an adaptive humor (Liu, 2012; Dick & Holtzman, 2013), which is a positive humor.

Syntax and theoretical support learning model hypothetical Humor CDR-based learning are as follows:

2.1.4. Phase 1. Preparing the condition of creative thinking

Teacher activity in this phase is to give humor to the class, to setup a conducive condition for student’s creative thinking. To be creative, students need to feel that they are safe to share unusual ideas with other students. Teachers need to encourage students to take risks and express their divergent thinking, to ensure that the classroom will appreciate any idea and perspective, and to create activities where students do not need to be evaluated (Moreno, 2010). Creating a safe learning environment is important in efforts to improve students’ creative thinking strategies. Creativity occurs in the interaction between an individual and his environment (Holyoak & Morrison, 2005; Munandar, 1999). This is in line with the principles of cognitive learning theory which asserts that people learn by direct interaction with the environment. Sternberg and Lubart, and Torrance claimed that the environment can stimulate
creativity through three ways, namely: 1) Triggering creative ideas, 2) Encouraging follow-up to creative ideas, and 3) Evaluating and rewarding creative ideas (Fasco, 2001). Humor is part of the cognitive process. According to McGhee (Lovorn, 2008) humor involves two mental activities, namely identifying the nature of something odd, and then trying to understand it. Although humor is not considered as a strategy to enhance the students’ understanding of the content, the user can provide a sense of comfort and relax for students. This condition is likely to accelerate efforts to stimulate creative thinking of students. Laughter caused by the humor is a way to release tension and express ideas (McGhee in Lovorn, 2008).

2.4.2. Phase 2. Constructing a concept / idea

Teacher activity in this phase is to teach concepts / knowledge about the content. One of the prerequisite conditions for the development of creative thinking of students is a mastery of the knowledge domain. Without mastery of the domain, a prominent divergent thinking in creative thinking will not lead to creative products (Moreno, 2010). The better the students’ understanding of a discipline, the more able the students will be in creating. Students need to learn the facts, concepts, and generalizations before working on creative projects. It is important to place these creative building blocks the early phases of learning. Science is based on scientific method which requires a definite and serious answer and not based on unaccountable imagination. Complete mastery of the concepts of content (sense of mastery) is a must before the students could be let to wander in their imagination in order to induce and develop their creativity process. Tharp (Lau, 2012) states that the lack of concept / knowledge of the students could result in a failure to bring out creative thinking abilities because new ideas emerge based on past knowledge. As in models of information processing, creativity does not necessarily happen in a vacuum (Lau, 2011). Imagination often depends on what is already known previously. If someone only has a little knowledge, then it can only combine a few ideas to get new ideas. As knowledge increases, the combination of new ideas increases exponentially. Cognitive processes of assimilation and accommodation are the ways students adapt to their environment (Arends, 2012). Creative thinking involves the integration of learning in the past to generate and organize new ideas. Accordingly, the constructivist theory also views thinking as a constructive process (Houtz & Krug in Fasco, 2001) that is by thinking an individual constructs his/her base of knowledge. In this phase, the teacher acts as a model (social learning theory), who could ensure that the students are interested in doing the learning objectives. This can be done by presenting the lesson content in a clear and interesting ways by activity demonstration.

2.4.3. Phase 3. Perform deconstruction of concept/idea by using humor-provocation.

Teacher activity in this phase is to provoke by using humor. Humor is believed to increase the creativity of the students (Gazit, 2013). This humor provocation has function similar to discrepant events (a situation when the results are unexpected and surprising). At this stage the teachers also act as a model to create unconventional ideas (social theory Bandura), and expect the students to be open to the singularity and otherness that can trigger their creative thinking abilities. This is in line with the cognitive theory that learning is a relatively lasting change in mental structures, which occurs as a result of the interaction of individuals with the environment (Moreno, 2010). This stage is also supported by Vigotsky constructivist learning theory which states that the intellectual ability develop when students face a new and confusing experience, as well as trying to overcome disparity posed by this new experience. It is in this stage the students connect new knowledge with prior knowledge and construct new
meanings. Vigotsky believes that social interaction with other people trigger the construction of new ideas as well as improve the student’s intellectual development (Arends, 2012).

2.4.4. Phase 4. Finding ideas

Teacher activity in this phase is to respond positively and accept all the student’s ideas. Teachers should not judge the idea and treat all ideas as if all potentially have their own uses. It is important in this phase to remember that knowledge does not come from the outside, but is formed by individuals themselves in their own cognitive structure (Piaget’s theory of cognitive development). Creative thinking is basically a mental process that generates ideas. In other words, the cognitive theory supports creative thinking because basically thinking continuously creates, particularly if it leads to the creation of ideas. In this phase self-directed skills develops in which students actively construct new knowledge based on existing knowledge. According to Lau (2011), a new idea is just old ideas which are combined in a new way. After students collected enough data, they can offer an explanation in the form of hypotheses, testing hypotheses, and solutions. Teachers should support and model the exchange of ideas freely and when necessary provide more intensive scaffolding on the matter. The goal is for students to gather enough information to create and build their own ideas. Students begin high-level thinking involving self-regulation (self-regulated learner) in the thinking process. The role of teachers in this phase is not to move ideas / knowledge, but to create an autonomy-supporting learning environment that allows students to build their own ideas / knowledge. Creating an environment that supports learning autonomy make students more motivated. In this kind of learning environment the teacher gives them choices and gathers their input. In contrast, controlling the class will give a message that the opinions of students are irrelevant and disrupt creative thinking of the students (Amabile in Moreno, 2010).

2.4.5. Phase 5. Reconstructing the concept.

Teacher activity in this phase is to reconstruct the concept that has undergone deconstruction through humor-provocation in the previous phase. In this phase the students were brought back to the concept as in the teaching content which is taught using convergent thinking process. In the view of cognitive constructivity, individuals have a natural tendency to seek comprehension while interacting with the environment. Munandar (1999) states that the individual influences and is influenced by the environment in which he/she lives. Thus both variables in the individual and in the environment can support or hinder the creative effort. The implication is that creative ability can be improved through education. In the implementation, in the class of students interact with teachers and other students to create cognitive conflict that motivate students to reconstruct his/her structure of knowledge. Piaget stated that students interact with other students and the environment to build knowledge through the organization, assimilation, and accommodation of new information in the cognitive structure (Moreno, 2010). Science process skills are trained to students in this fifth stage.

2.4.6. Phase 6. Determining the idea

Activities in this phase is the teacher asks the students to determine the ideas, explanations and conclusions based on the data that has been collected by students. It is important in this phase to receive all the explanations and conclusions given by student. On this last phase the students are given the opportunity to represent the idea in front of the class and participate in evaluative and positive discussions that social interactions occur (constructivist theory).
Although convergent thinking is needed in this stage, it is very important that the teacher told other students that do not pass any judgment (good-bad or right-wrong) to the idea.

This hypothetical model adapts the IBL, PBL and CPS learning models. All four models in their implementation require teacher's role in providing scaffolding, focusing attention on the creation of ideas, and involving divergent-convergent thinking. Models develop mainly from IBL models, with an emphasis on the presentation of the peculiar problems (phase 2) similar to the stages of concept / idea deconstruction by using humor-provocation (phase 3) in the CDR humor-based learning.

3. Result and Discussion

3.1. Inquiry-Based Learning (IBL)

The strength of IBL strength in improving students' creative thinking especially lies in phases 2 and 3. In the second phase the students are being exposed to problem that they are curious about and making them ready to participate in the learning process. It is important to get the attention and motivate students to engage in the planned learning activities. In the model of inquiry, learning motivation easily obtained through the provision of provocative problem situations or events that deviate from the usual circumstances (Arends, 2012). In the third phase, the students conduct the data collection based on the presented problem for verification or formulating problems and hypotheses. During this phase, students are encouraged to ask questions and formulate hypotheses that could help explain what happened. It is very important in this phase to accept all ideas (Arends, 2012). IBL is a model of excellence to encourage students to think scientifically, creatively, and intuitively, and works on the basis of their own initiative. Additionally, IBT can foster an attitude of objective, honest, and open. Some studies indicate that inquiry model can improve students' ability to think creatively (Risnansanti, 2009; Idrisah, 2014). IBL weaknesses are that the model requires a long time, not all course materials containing the problem, require regular planning and well-thought plans, and ineffective if there are some students who are passive. This model will develop in a classroom environment that is characterized by open communication and conversation in which the students show respect to one another and feel involved (Arends, 2012). Therefore, if the classroom environment is not supportive, the implementation of the model becomes inefficient.

3.2. Problem-Based Learning (PBL)

PBL supports in improving students' creative thinking are especially in phase 1 and 3. In the first phase, the teacher motivates students to engage in problem solving activities of their own choosing. Students are given the widest opportunity to produce corresponding verbal issues that exist in their belief that moment. Phase 3 teachers encourage students to collect appropriate information, carry out experiments, looking for explanations and solutions. In this phase, students can generate a lot of ideas to resolve the issue. PBL models have advantages in terms of can develop students' thinking skills, including critical thinking skills and creative thinking. Starko (2010) states that PBL is one of the strategies which organize the science content which supports the creativity and the process of science. Bredderman (Arends, 2012) conducted a meta-analysis of 57 studies and found that PBL is very good in terms of creativity and students' understanding of the scientific method. Several studies show a significant relationship with the PBL model of creative thinking abilities of students. Quasi-experimental research on 60 students of Civil Engineering Polytechnic in Malaysia showed that the model PBL better in improving the skills of creative thinking than using conventional learning (Awang & Ramly, 2008). Eldy & Solomon (2013) found that PBL role in improving
the ability of creative thinking in physics learning in students, and can generate a lot of ideas. Measurements using this TTCT showed that there is an improvement for fluency and flexibility aspects, but there is no increase in aspects of originality. In addition to physics, the model PBL can improve the ability to think creatively in learning Mathematics (Noer, 2011) and Biology (Puspitasari, 2012). The weaknesses of PBL model are that this model is less appropriate when implemented for the purpose of increasing the ability of creative thinking in students in the low education level. Many studies about creative thinking of students using PBL in high school students and the lower level showed that the improvement is different from the improvement gain no gain in the college level. Teaching by using the PBL at a lower level of education generally involves the cooperation of students in groups. This is often done in the teaching of Science because of the limitations of school facilities, for example, lack of laboratory facilities. Hillman (Gomez, 2007) states that an emphasis on cooperative learning can contribute to lowering the creation, imagination and individual production. Learning group also can weaken intrinsic motivation, hinder the development of problem-solving and decision-making capabilities, as well as inhibit personal freedom to be creative. Although PBL can generate a lot of ideas, but it is less able to generate new or unique ideas (Eldy & Solomon, 2013). In the Bredderman study above, PBL does not show the achievement of science content better than other traditional approaches (Arends, 2012: 402). PBL will not be effective if the teacher does not create a classroom environment in which there is an exchange of ideas open and sincerely (Arends, 2012: 396), which is part of a prerequisite to trigger creative thinking of students.

3.3. Creative Problem Solving (CPS)

The strength of CPS model is in training students to design an invention, to think and act creatively, solve problems realistically, identify and conduct an investigation, interpret and evaluate the results of observations, stimulating the progress of students' thinking to solve problems encountered, and can make school education more relevant to life, especially the job employment world. In many descriptions of problem solving, there is always a step search for alternatives that implies stage that requires creativity (Awang & Ramly, 2008). As well as learning models problem solving, models CPS has weaknesses in its implementation, because not all subjects can use this model. Limitations of laboratory facilities may make it difficult for students to see, observe, analyze and conclude an event. In addition, the CPS model implementation requires allocation of time that is longer than using other learning models. In relation to creative thinking, problem solving is effective for higher education level, but not so for high school students and the lower level. Leikin & Kloss (2009) examined the ability of creative thinking using mathematics problem solving in completing multiple tasks solution (MSTs). Research on high school students showed lower earnings for the third aspect of creative thinking (fluency, flexibility and originality) for all students. Hamza and Griffith (2006) found that the model of problem solving can lead to creative thinking of students only if it is constructed with the creation of an open classroom atmosphere, comfortable, relaxing, challenging, safe, supportive, trustworthy, energetic, collaborative, and full of humor.

3.4. Hypothetical CDR Humor-based Learning

The strength of CDR humor-based learning lies in the use of humor and the use of provocation techniques. Humor is the greatest creative tool, which can be an efficient tool for the development of creative thinking (Garner, 2012; Roeckelein in DeMichiell & Manning, 2005). Several studies have shown the important role of humor in the classroom. Ford, Ford, Boxer, & Armstrong (Gazit, 2013) found that students who were given adult cartoons funny show Math test results better than the control group who were not given poems contain any
humor or not given. According to Makewa et al., (2011), the use of humor in teaching attract the attention of students, very well motivate them, reducing anxiety in the classroom and stimulate their minds. The use of humor is good and effective as continuous learning strategy will enhance the understanding of content, increase retention of material being taught, and creating a more comfortable learning environment (Garner; Cooper, McMorris, Lin, and Torak in Makewa et al., 2011). Results of research on the integration of humor in the teaching of Mathematics stating that humor can make the class fun atmosphere, reduce anxiety, can increase motivation and interest in learning Mathematics, and can increase creativity (Gazit, 2013). Although not always produce good ideas that are relevant, provocation frees the mind to bring new ideas and original. Provocation is particularly relevant in the fields of science where ideas have become obsolete over time (Jabean & Khan, 2013), and very good to explore aspects of creative thinking flexibility (Vidal, 2006). Provocation encourages people to think about ideas or concepts that have never been thought of before. Questions provocation will open a situation towards a broader and deeper than the thought that there had been impossible. According Jabean and Khan (2013), there is a significant influence on the level of provocation engineering creativity.

A learning model must meet three criteria, namely products valid, practical and effective (Nieven, 1999). Learning model is valid if it can reflect the state-of-the-art (content validity), and if the components are consistent with one another (construct validity). The validity of the model is determined based on the assessment of experts and practitioners, and include validation: models, learning tools, and supporting devices. Theoretically this hypothetical model has four characteristics that must be present in the model of learning, namely: 1) Having the support of the theory of learning, 2) have a premise of what and how students learn and learning objectives to be achieved, 3) the existence of a structured activity educators to implement the model with success, and 4) for regulating learning environment necessary for learning objectives can be achieved. The model is practical if it can be used. The validity of the model is determined by feasibility assessment models in the field as well as the teacher's ability to manage learning; and based on the assessment of experts and practitioners. Theoretically, the proper implementation of this model begins to junior high school students to consider the development of the theory of Piaget, where at the age of 11 years old student entered the stage of formal operations that can develop abstract thinking skills. Students need the confidence to ask many questions, and humor is the builder confidence is very good. Using humor approach to communicate and interact with the students can encourage critical thinking skills and creative thinking (Lovorn, 2008). The model is called effective if in accordance with the objectives set previously. Effectiveness is determined based on the assessment keaktivhan into learning, the positive response of students to the implementation and achievement of students according to assessment: science process skills, learning outcomes, and creative thinking skills. Theoretically, according to the constructivist view of learning objectives will be achieved when students actively construct knowledge in learning. According to Eggen & Kauchak (2006), learning is said to be effective when students are actively involved in organizing and knowledge discovery and linkage information given knowledge. In this hypothetical model students not only passively receive knowledge given by the teacher, so that it can give an indication of the effectiveness of the model can meet.

The weakness of hypothetical CDR Humor learning model is empirically not been obtained. Theoretically, this model is in desperate need of teachers’ effort to explore the potential of his own sense of humor and find humor adaptive from a variety of audio-visual sources. Selection of humor also be wise to consider several aspects, such as the degree of maturity of the students, as far as possible related to the lesson content, and using adaptive humor.
4. Conclusion

Based on the results of this literature study models IBL learning, PBL and CPS can be used to enhance the students' ability to think creatively with classroom atmosphere conducive setting. Theoretically, the hypothetical CDR Humor-based learning model gives an indication that it can be used as a learning model to improve creative thinking ability of students in junior high school level. However, further research and input suggestions on this hypothetical model is needed to get a really valid, practical, and effective model.

References


A STUDY OF ELEMENTARY SCHOOL OF SCIENCE LEARNING ALL BATUDAAN DISTRICT OF GORONTALO

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Abstract
The purpose of this study was to determine: (1) how to design learning science teacher at elementary school all the District Batudaa, (2) the availability of instructional media science in elementary school all the District Batudaa, (3) the efforts of teachers to increase the interest of learners in elementary school Sub district Batudaa. The research was conducted on teachers elementary school science subjects all the District Batudaa, Gorontalo district, by taking a sample of 36 people. The approach in this study is a qualitative approach with case study. Based on the analysis, it is concluded, (1) the condition of the teacher as the sole source of information for learning, (2) most of the elementary school all the District Batudaa not have a media availability maximum learning science, (3) a teacher at elementary school all the District Batudaa increased interest in learning science learners pursuing several things, namely: a) support and productive learning environment, b) learning environment that fosters improvement of independence, collaborative, and self-motivation, c) the needs of the student, the student's perspective, reflected in the study program, d) students are challenged and supported to develop critical thinking skills, and e) learning to connect students with the community and practices that are beyond the classroom.

Keywords: Teacher designing learning, instructional media, interest in learning

1. Introduction
One of the subjects that also play an important role in the educational insights, skills, and scientific attitudes from an early age for children is teaching science. Science teaching in primary schools is shown basic learning to train students to think critically and logically in scrutinizing every phenomenon that occur in the environment around it. Samatowa (2003: 5) suggest some important aspects that need to be considered by the teacher in terms of empowering children in learning science, among others: (1) the importance of understanding that when you start learning activities, the child has had a variety of concepts, (2) the activities of children through various activities the real nature becomes the main thing in learning science, (3) in any science learning activities that ask an important part, even into the most important part of learning.

1.1 Background
Selection of learning strategies based on the principles of efficiency and effectiveness in achieving the learning objectives and the level of involvement of learners. In connection with these ideas, the researchers have made observations regarding science teaching in elementary schools as well as the population in this study. Based on preliminary observations made can be argued that the implementation of science teaching in elementary schools all the District in Batudaa still faces a number of obstacles. The problems appear to still dominant among teachers in the learning process, the availability of props and practical implementation in
science teaching is not optimal in all subjects in elementary school given by the class teacher, the teacher's ability to use props / media is still limited.

1.2 Research Objectives

The purpose of this research is to obtain information about: (1) Overview of designing learning science teacher at elementary school all the District Batudaa, (2) description of science teaching media availability at elementary school all the District Batudaa. (3) description of the efforts of teachers to increase the interest of learners in elementary school all the District Batudaa.

2. Review of Literature

2.1. Elementary School Science Lessons

2.1.1. Itself of Science

Judging from the physical science is the science that his study is a natural object with all its contents, including the earth, plants, animals, and humans (in Winataputra, 1992: 122). Winataputra (1992: 122) describes several roles science, namely: (1) provide sufficient knowledge to students to know and love the world at the time of their lives, (2) gives stock of practical knowledge, (3) instill attitudes to be applied in life everyday, and (4) gives stock of skills in addition to knowledge about science itself. Related to this, then Paolo and Marten (in Samatowa, 2003: 7) imposes limits on science teaching as observed activity, trying to understand what is observed, using new knowledge to predict what happens.

2.1.2. Learning Science Concepts in Elementary School

The elementary school expected Mutual learning emphasis Temas (science, environment, technology, society) is aimed at learning experience to design and create a masterpiece through the application of science concepts and competencies scientific work wisely. according Ma'mun (in Iskandar, 2009: 100) explains that the learning process is a series of interactions between students and teachers in a series of goals.

2.2. Media Learning Science of Elementary School

Instructional media is everything that people use to distribute roles. Susilana and Riyana argued that the media is an integral part of the learning system and therefore calls for changes in the other components in the learning process. Gagne (in Rahadi, 2003: 10) defines the media as a kind of environmental component that can stimulate their students to learn.

2.3. Interests of Students Learning Elementary to Science

Based on the descriptions, then in this research interest in learning science is a source of motivation that will direct students on what they would do if given the freedom to choose in learning science. Therefore, the efforts of teachers to increase the interest of students should be directed to that, a) develop an attitude of learners are ongoing which gave patterns on selective attention so as to make himself the object of interest, b) floating feeling learners stating that a work activity or object is valuable or meaningful, especially for her and other efforts.
3. Research Methods

3.1. Place and Time Research

This study was conducted in all elementary school of district Batudaa Gorontalo district in 2009/2010 school year even three feet. All elementary school of Batudaa amounted to 12 school districts.

3.2. Approach and Types of Research

The approach used in this research is quantitative descriptive approach. This research is a case study to illustrate and analyze on (1) how to design learning science teacher at all elementary school of districts Batudaa, (2) the availability of instructional media science in all elementary school of Batudaa districts.

3.3. Data and Data Sources

Data in the study consisted of: (1) Data about the image of teachers in designing learning (2) data availability science teaching elementary media.

3.4. Data Collection Procedures

1. Observation (Observation) Learning Process direct general conditions all elementary school of Batudaa district and observe the learning situation.
2. Interviewing some of the principals, science teachers, and students in several elementary school districts throughout Batudaa.
3. Technical questionnaire / questionnaire is the principal instrument used to collect research data.
4. Documentation in the form of cameras, walkman, and diaries.

3.5. Data analysis

Technical analysis of the data used in this study is technically qualitative data. The steps in analyzing this data is

a. Presentation of data. In this section the data made into a set of structured information and providing the possibility of drawing conclusions and taking action.

b. Withdrawal Conclusion. Inference is made to interpret the data descriptive analysis.

4. Results and Discussion

4.1. Results

4.1.1. Data Research

Crawl data from respondents using questionnaires as the main instrument, in addition to the data obtained from observations and interviews.

4.1.1.1. Teachers Designing Science Learning.

As for the draft to be prepared teachers are as follows: (1) Identify the general purpose of learning (2) Implement the learning analysis (3) Identifying the behavior of inputs and characteristics of learners (4) to formulate performance objectives (5) Develop test items reference benchmark (6) Develop a learning strategy (7) Develop and select learning materials (8) Design and implement formative evaluation (9) Revise learning material (10) Designing and implementing summative evaluation. Based on the above indicators, 53% of
teachers stated are always designing learning science, 30% of teachers stated often, 11% of teachers stated occasionally, 5% of teachers stated sparse, and 1% never. This shows that the majority of all teacher in elementary school of Batudaa districts have the ability in designing learning science although there are also teachers who have not been designing science learning.

4.1.1.2. Availability Media Learning Science

From the results obtained that 23 respondents or 63.89% stated that learning is used adequately increase the ability of learners. Instead, 7 respondents or 19.44% stated inadequate and 16.67% or 6 respondents said inadequate. Statement of 18 respondents stated adequate any learning activity undertaken sufficient to effectively utilize instructional media, 16 respondents said inadequate and 2 others declared inadequate. The third statement 27.78% stated that the contents of adequate instructional media already qualified in explaining any subject matter presented, 61.11% of respondents said inadequate and 11.11% said inadequate. The fourth statement 75.00% of respondents said inadequate that any media that is used to attract the attention of learners in the learning process and the implementation of the 25.00% of respondents said inadequate. Based on the percentage of over 45% of teachers expressed the availability of adequate media for learners in learning science, 42% of teachers stated inadequate, and 13% of teachers stated inadequate. This shows that the majority of all public elementary school districts Batudaa not have the availability of adequate media for learners in learning science.

4.1.1.3. Efforts to Increase the Interest of Learners

Based on indicators that have been determined 59% said always working to increase the interest of students in learning science, 33% of teachers stated frequent often, 7% of teachers stated sometimes, 1% of teachers stated sparse and no teacher said never. This shows that the majority of elementary school teachers Batudaa districts throughout the country have the ability in an effort to increase the interest of students learning science.

4.1.2. Research Findings

4.1.2.1. Teacher Designing Learning Science of Elementary School

Most public elementary school teachers all Batudaa districts have identified a common goal in designing the implementation of learning science teaching.

4.1.2.2. Availability Media Learning Science of Elementary School

Most public elementary school districts all Batudaa not have the availability of adequate media for learners in learning science.

4.1.2.3. Teacher Efforts to Increase the Interest of Learners

Teacher Efforts to Increase the Interest of Learners that students develop an attitude that makes him the object of interest selectively, develop feelings of students who express a worthwhile activity and develop a motivational state that requires direction behavior.
4.2. Discussion

4.2.1. Teacher Designing Learning Science of Elementary School

In the process of designing the learning, the teacher connects learning with the world, students are invited to think and act scientifically. Where students meet with new vocabulary, a new term, a new experience, formulas, and so on.

4.2.2. Availability of Elementary Science Teaching Media

Good learning media must meet several requirements, among others: should increase learner motivation, should stimulate learning to remember what they have learned in addition to providing stimulus to learn.

4.2.3. Efforts to Increase the Teachers' Interest in Learning Learners

Internal factors affecting the interests and learning activities, as well as a learning experience. This is an initial capital for students in further learning activities.

5. Conclusion and Implication

5.1. Conclusion

1. Learning in elementary school was designed to explore the world of the learners to use the language, the way of thinking, experience and knowledge of learners.
2. Most of the elementary school of Batudaa not have a media availability maximum learning science.
3. Can increase the interest of students in science learning.

5.2. Implications

1. Implications for science teaching in elementary school. The implication is that (a) setting a preliminary design study (b) learning orientation (c) Adjustment teaching materials (d) availability of instructional media science.
2. Implications for the learning environment of students. The implication is that (a) Perspective on learners (b) Management of the class.
3. Suggestions. The elementary science teachers are encouraged to design a learning process that takes into account the competence of learners. Science learning so laden with concepts that require higher reasoning, in order to accomplish learning outcomes in optimal.

References


THE IMPACT OF SELF EFFICACY ON STUDENTS’ LEARNING AUTONOMY

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Abstract
The present study was aimed to investigate the impact of self efficacy’s on students’ learning activity and autonomy. All grade XI science students of SMAN 2 Balige, Sumatera Utara, were totally sampled as study subjects. Data were collected with three different questionnaires: self efficacy scale by Zimmerman, learning activity and autonomy. The data were then analyzed with independence t-test. Data analysis indicate that there is a positive and significant effect of students’ self efficacy on learning autonomy, but no effect on learning activity. The results revealed a significant differences between high or low level of self efficacy on learning autonomy. It is suggested that students’ academic achievements can be improved by increasing their self efficacy through applying appropriate training methods, learning media and enriching educational environment.

Keywords: Learning activity, learning autonomy, self efficacy.

1. Introduction

Bandura (1997) debates that self efficacy is a constructive power which effectively organizes the cognitive, social, emotional and behavioral skills of humans to achieve different subjects. In his opinion, having knowledge, skills and forgone people's achievements are not appropriate predictors for their future performance, but the people's beliefs about their abilities influence the quality of their performance.

Pajares (2002) believes that the people who have weak self-efficacy see the duties and jobs difficultly, so they are more stressful while powerful self-efficacy beliefs cause calmness and success. Thus, self-efficacy can be a powerful predictor for people's achievements. Self-efficacy also is effective on learning and development. Students who have high self-efficacy are more successful than those who have low self-efficacy.

The research on academic performance variable is taken into consideration during the late three decades by experts of education and training. The different research findings show that academic achievement is effected by knowledge structures and environmental and positional elements such as motive orientation and learning method. Academic achievement points to a manifestation of conditions which this manifestation may academic students' show the grade of one term, the average of grades for a set of terms in one course or the average of different terms grades. Powerful self efficacy beliefs in students and university students refer to a judgment about their ability to do their duties and learning necessary educational subjects in order to get good grades. People who have high self efficacy try more andmore to do their duties and spend more time to get better grades.

Studies conducted by Shaw (2008) which showed that there was not a significant relationship between self-efficacy with academic grade of students. Based on the information obtained by the students did not show efficacy himself in the learning process, students are hesitant, unsure of himself " others can why can not I " and also students felt scared or anxious when
faced with exercises or told to do problem on the board. According to Bandura (1995) factors that influence the efficacy of the process of the formation of a person should have no direct experience, physiological circumstances that influenced and verbal persuasion. Indirect experience with seeing the success of others who have in common with him, will be able to increase the efficacy of her expectations, students can assess themselves have such capabilities possessed by others.

Additionally, Zahra (2010) studied the effect of learning skills of problem solution on self-efficacy. Their findings revealed that the rate of students' self efficacy who have been trained in learning solving problems skills are more than the student who haven't received them. Also the rate of students' self efficacy benefits from an appropriate consistency during time. Abbasiyan (2010), as well, in studying the relationship between self-efficacy and students' motivation for development have shown that self efficacy correlates with their development motivation in four aspects of self leadership, self fertility, self exciting and self regulating such as learning autonomy is how is the way to manage the learning time and activity independently.

Factors that affect learning autonomy in biology lesson come from within the students and the factors that come from external factors of students. Factors that originate from within the students includes psychological factors such as self-efficacy, motivation, attitudes, interests and learning habits. External factors such as natural environmental factors, socio-economic factors, teachers, teaching methods, curriculum, subjects, facilities and infrastructure.

One of the factors that affect the learning autonomy is self-efficacy. Self-efficacy is the belief and expectations regarding the ability of individuals for new duties. The various studies have shown self-efficacy can affect motivation, perseverance in the face of difficulty of a task, and learning achievement. Individuals who have low self-efficacy don’t have confidence that they can complete the task, so he tried to avoid the task. Therefore the existence of self-efficacy will push students to carry out all activities independently. Steinberg states that learning autonomy as self governing.

Abolghasemi (2012) in studying the role of social desirability, mental health and self-efficacy in predicting students' academic achievement have shown that approximately 12% of variance which related to learning activities of students was explicaded by social desirability, mental health and self efficacy variables. Ryan & Stiller (2000), moreover, have shown that in their researches that there is a powerful interconnection among the innermost motivation, academic achievement and enjoying learning activities. Increasing positive feelings will increase self-efficacy, and the atmosphere of sadness can also reduce self-efficacy (Kavanagh & Bower in Bandura, 2009). Students who have high or low self-efficacy just having perception about their ability. It is caused by a lack of students experiencing actual circumstances to feel alone learning experience which was considered difficult, or failures that occur during the process of learning, which eventually succeeded in previous learning activities.

Students' self-efficacy is less developed because students are familiar with the pattern of teacher-centered learning, which is not encountered any difficulties or challenges are enough to make the students feel confident to master the psychology of the situation and provide positive retention. Schunk in Stanrock (2009) states that self-efficacy thrive if students face challenges in the learning process, so that students with low self-efficacy will avoid challenging task while students with high self-efficacy would be otherwise, these students will face the task of learning with high desire.
Considering the studies conducted as mentioned above, the main purpose of this study is to investigate the impact of self efficacy on students’ learning activity and autonomy. This study follows two hypotheses: (1) There is not significant effect of self efficacy with different levels (low and high levels) on student’s learning activity, and (2) There is significant effect of self efficacy with different levels (low and high levels on student’s learning autonomy.

Self efficacy measures focus on performance capabilities rather than on personal qualities, such as one’s physical or psychological characteristics. Respondents judge their capabilities to fulfill given task demands, not who they are personally or how they feel about themselves in general.

2. Materials and Methods

2.1. Subjects

This research was conducted at SMAN 2 Balige in Jalan Kartini Sopo-surung Balige, Sumatera Utara, Indonesia. The population in this research was all grade XI science students (n = 180) in the school of interest, consisted of 6 different classes. All students were totally sampled as the subject of study.

2.2. Instrument

The research instruments used for assessing the learning activity and autonomy in this study were three questionnaires: self efficacy scale by Zimmerman, learning activity and autonomy. The criteria on the results of questionnaire were determined by Likert scale. The collected data was also analyzed by independence t-test.

2.3. Research Design

Quasy experimental was used to investigate the effect of self efficacy on students’ learning activity and autonomy. The variables used in this study were the different levels of self efficacy (high and low level) as independent variables. High self efficacy was determined by percentage range 0-70%, low self efficacy was over than 70%. In the other hand, students learning activity and autonomy as the dependent variable.

2.4. Data Analysis

Requirement testing for data analysis used validity, reliability, normality, and homogeneity test. The collected data was also analyzed by independence t-test.

3. Result and Discussion

3.1. Results

The results showed that students’ learning efficacy with high category (66.14 ± 8.03) and efficacy of students who are low category (67.32 ± 8.60) did not give the significant effect toward the student's learning activity (p = 0.34). The average value of students’ self-efficacy with low category give effect of 1.75% (67.32 : 66.14) is higher than the value of self-efficacy of students with high category as presented (Figure 1A).
Students' learning efficacy with high category (65.22 ± 7.12), and self efficacy of students who are low category (63.21 ± 4.47) did give the significant effect toward the student's learning autonomy ($p = 0.02$). The average value of students’ self-efficacy with high level is 3.17% (65.22: 63.21) is higher than the value of self-efficacy of students with low category (Figure 1B).

3.2. Discussion

Students' self-efficacy is less developed in this study because subject students are familiar with the pattern of teacher-centered learning, which is not encountered any difficulties or challenges are enough to make the students feel confident to master the psychology of the situation and give positive results. Schunk in Stanrock (2009) states that self-efficacy thrive when faced with challenges in the learning process, so that students with low efficacy would avoid challenging task while students with high self-efficacy would be otherwise, these students will face the task of learning with a great desire.

Carver and Scheier (1981) claiming that other motivation theories did not deal adequately with an effect, and that effect would be a function of the rate at which discrepancies are reduced but not of current goal–outcome discrepancies. Not only is perceived self-efficacy an extraneous implant in perceptual control theory, but Powers (1991) and Vancouver et al (2002) did not seem to agree on how it debilitates performance. Powers believed that it does so by shrinking the discrepancy (reduces the apparent shortfall), whereas Vancouver et al (2002) believed that it does so by predicting speedier goal attainment (reaching the goals sooner). Discrepancy shrinkage and speed are by no means the same processes, because for any level of goal discrepancy, one can have speedy or slow realization of it.

In addition, factors that affect the independence of learning biology are originated from both internal and external side of the students. Internal factors include psychological factors such as self-efficacy, achievement motivation, attitudes, interests and learning habits. External factors including natural environmental factors, socio-economic factors, teachers, teaching methods, curriculum, subjects, facilities and infrastructure.

Self-efficacy can affect motivation, perseverance in the face of difficulty of a task, and learning achievement. Individuals who have low self-efficacy was not to have confidence that
they can complete the task, so he tried to avoid the task. Low self-efficacy is not only experienced by individuals who do not have the ability to learn, but allows experienced by gifted individuals. Confidence in completing the task required in biology subject with high self-efficacy to achieve the expected learning independence. This impulse is closely related to the work that directs a person to achieve as an attempt to achieve success, successful in competing with a size advantage, it can refer to the achievements of others or their own accomplishments achieved previously. Self-efficacy and achievement motivation into internal factors most strongly suspected to affect the independence of study subjects of biology, especially in the digestive system material.

Many problems arise in a cybernetic model of human motivation and action. Machines are not conscious. They operate automatically and nonvolitionally. People are not nonconscious organisms locked in negative feedback loops driven automatically to reduce disparity between sensed feedback and inner referents. They can and do respond with a wide variety of possible reactions to performance shortfalls. They act proactively and can choose and change the standards they aim for, use multiple and even conflicting standards, make judgments about their capabilities for different options, process feedback in many different ways, use various methods of developing task strategies, use diverse combinations of conscious and nonconscious knowledge, engage in many types of problem-solving activities, and operate across many different time spans. The connections between sensing and action are not mechanical. The cybernetic model of self efficacy ignores the vast knowledge of cognitive self-regulation of human motivation and action. Studies conducted by Vancouver (2008) which showed that there was not a significant relationship between self-efficacy with learning activity of students if there is not tension and direct experience in learning. In other hand, the internal factors that affect the independence of learning biology is self-efficacy. Self-efficacy is the belief and expectations regarding the ability of individuals for managing their time independently.

4. Conclusion

There is a positive and significant effect of students’ self efficacy on learning autonomy and but not on students’ activity. The results revealed a significant differences between high or low level of self efficacy on learning autonomy. It is then suggested that students’ academic achievements can be enhanced by increasing their self efficacy through applying appropriate training methods, learning media and enriching educational environment.

References


