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## CLASSIFICATION OF BACTERIA IN A VIRTUAL LABORATORY BASED ON CHARACTER BUILDING

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### ABSTRACT

Virtual laboratory (virtual lab) is one of the flagship product results and laboratory information technology advances, given the virtual lab contained in the blend between the development of computer software that is designed to represent an alternative to the laboratory so that it can be implemented practical implementation directly. Virtual lab-based learning can be used as an alternative to eliminate the limitations of laboratory devices. Through KD 3.4. Applying the principle of classification to classify archaeobacteria and eubacteria based on the characteristics and shape through rigorous and systematic observation, selected materials on the Gram staining process in bacteria which aims to find groups of bacteria including Gram Positive or Negative groups are important in the classification process through a virtual the lab. Regard to the study of media influence on the learning process, then it is possible that the virtual lab is also used as a means to internalize the values of character. This research aims to produce instructional media virtual biology lab oriented form of character building through the development process. The research method is a research and development refers to the flow of Borg and Gall (1989). The result of this research is a form of virtual learning media lab material classification of bacteria is still in the realm of development.

Keywords: Classification of Bacteria, Virtual Lab

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### INTRODUCTION

Virtual laboratory can be called he term Virtual Labs are a series of laboratory equipment in the form of software (software) computer-based interactive multimedia, which is operated by computer and can simulate the activity in the laboratory if user on the actual lab. Potential of virtual laboratories to provide a significantly improved and more effective learning experience. Development of a virtual laboratory is expected to solve the problems of learning experienced by learners and overcome problems in the procurement of equipment and the cost of materials used to conduct practical activities for schools that are less capable. With multimedia learning in the form of a virtual laboratory, in case the benefits can be obtained is the learning process more interesting, more interactive, the amount of teaching time can be reduced, the quality of learning can be improved and teaching learning process can be done anywhere and anytime. In addition, through virtual laboratories, research cost savings can be made, as well

as research that previously was not possible, and the limited conditioning system can be done (mazguru.wordpress.com/2012/04/.../ayo- advantage of laboratory-virtu-..)

The bacteria can be found in almost every type of environment on earth, from the sea floor, in the rocks, and the mainland. Because the effect of small size and its ability to reproduce very quickly, the bacteria became the most abundant living things on earth. According to Campbell, at.al., (2006), bacteria are divided into two major groups, namely archaeobacteria and eubacteria.

Archaeobacteria is a primitive bacteria that are prokaryotic. Archaeobacteria also known as the ancient bacteria. These bacteria live in habitats with extreme conditions, such as hot springs and high salinity areas. Archaeobacteria have special features as follows. 1) the cell walls do not contain peptidoglycan., 2) cell membrane lipids consist of bond. 3) Ribosomnya contains several types of RNA-polymerase.

Eubacteria (True Bacteria) is a bacteria with prokaryotic properties. There are normal habitats with special features as below.1) containing peptidoglycan cell

wall. 2) plasma membrane lipids containing ester bond. 3) Ribosomnya contain one type of RNA-polymerase. Eubacteria are known as true bacteria or bacterial indeed. Eubacteria were divided into five groups, namely Proteobacteria, gram positive bacteria, Spirochetes, Chlamydias, and Cyanobacteria.

Bacteria can be classified by gram staining method into 2 major groups, namely gram-positive and gram-negative bacteria. This staining distinguishes bacteria based on the physical and chemical characteristics of its cell wall. Gram stain covers 3 main processes, namely staining with crystal violet, decolorization (deletion color) with ethyl alcohol or acetone, and counterstaining or administration of contrast dye fukhsin water uses (Hadioetomo, 1985).

Learning character who implemented the teacher gives the students a chance to get to know, feel and perform the character's behavior in the learning process. This is in accordance with the opinion of Megawati (2003) that the character education through three stages: the stage of moral knowing, or knowing whether the behavior of the characters, stages of moral feeling or sense of character and moral behavior or action stage of implementing the behavior of characters.

The purpose of this study is to produce a form of learning media-oriented virtual biology lab character building through the development process.

Biology lesson materials inserted in the media virtual learning biology lab is expected to be more interested in motivating students to learn the lessons that allow students to mensarikan, the characters are highlighted and moral messages are delivered. The assessment was conducted during the learning process and to determine the extent to which students know the concepts of matter and the integration of the expected character.

## METHODS

### A. Material

Computer equipment and software.

### B. Method

The steps performed in this study refers to Borg and Gall (1989) in (Syaodih 2009), as follows:

#### 1. Previous Study

##### a. The collection of data and information.

In this phase, the researchers collected information on issues related to learning used the laboratory, students' views on the character and virtual media lab in schools Semarang, especially senior high school, the information obtained by means of surveys, interviews (students and teachers) as well as literature. Of the information used as the basis of research to determine

what types of products that will be used by researchers in solving problems.

##### b. Planning research

In this step the researcher choose schedule of the research, product knowledge will be resulted and development step.

## 2. Development steps

### a. The Development of Draft Products

The results of extracting information used as the basic to determine the learning products in the form of virtual media lab that character integrated.

### b. The Expert Validation

In the expert validation, the draft submitted by an expert to get advice and suggestion for giving correction.

### c. The First Revision

The first revision will be submitted by an expert which is used as the basic of the completion virtual media lab that are planned.

### d. The Limitation of Trial

The correction results of the product that are planned, then it tested in the limited scope or small classes, for example, one of Semarang high school.

### e. The Second Revision

The result of limited test is used to correct the virtual media lab that are planned. So, it is used to do the trial in large scale.

### f. The Large Scale Trial

In the large-scale trial, the virtual media lab is tested to aim for getting the information about the effect of that virtual media lab to get character buildings and the result of students' learning.

## C. The Data Analysis

### a. Validity

To produce the learning set and a valid observation instrument that is performed the content and construct validation. The validation is done by involving the professional experts in their field.

$$r_{xy} = \frac{N\sum_{xy} - (\sum_x)(\sum_y)}{\sqrt{\{N\sum_x^2 - (\sum_x)^2\} \{N\sum_y^2 - (\sum_y)^2\}}}$$

(Arikunto, 2002)

Specification:

rx y = correlation coefficient between x and y

N = number of students

x = the item score

y = total score item

The value of  $r_{xy}$  obtained were compared with  $r_{table}$ . If  $r_{xy} > r_{table}$  the item will be valid and it can be used as the instrument of the research.

**b. Reliability**

The reliability measurement was conducted to determine the accuracy of the instrument evaluation to measure the accuracy of the students answer that tested once. The objective formula used the formula KR 21 as follows:

$$r_{11} = \left( \frac{k}{k-1} \right) \left( 1 - \frac{M(k-M)}{kVt} \right)$$

Specification:

k: the item number

M: average total score

Vt: total Variance

r11: Reliability Instruments

r11 value obtained were compared with  $r_{table}$ . If  $R11 > r_{table}$  test item will be reliable and it can be used as the instrument research.

**c. Feasibility of Virtual Media Lab**

To determine the feasibility of virtual media lab analysis performed in this study by the formula:

$$N: \frac{K}{NK} \times 100\%$$

Criteria:

83.5-100% = very feasible

63.5 to 83% = worth

44.5 to 63% = less feasible

25-44% = worthless

**d. Character Analysis and Study Result**

To determine the extent of the effectiveness of using the virtual media lab for the character and the students' study result, then the calculation is done with the g-factor (N-gains).

$$g = \frac{Sp_{post} - Sp_{pre}}{S_{max} - Sp_{pre}}$$

Specification:

Sp<sub>post</sub> = post-test scores

Sp<sub>pre</sub> = pre-test scores

S<sub>max</sub> = maximum score

Gain level criteria are:

$g \leq 0.30$ : Low

$0.30 < g \leq 0.70$ : being

$0.70 < g$ : high (Wiyanto, 2008)

**RESULTS AND DISCUSSION**

Virtual lab as an innovation product based on computer instructional media is very useful as a media for safe and cheap teaching. Meanwhile, Suyatna (2009) states that because the product the virtual computer lab is delivered with this technology effectively to teach the concepts of abstract. Computers are used effectively as a tool for the simulation lab.

The limitations infrastructure's school in the implementation practicum can be circumvented by using

of instructional media such as virtual labs. According to Saleh (2010), because of the virtual lab is combined between the development of software computer that is designed to represent a laboratory, can be conducted as the other alternative practical implementation directly. Virtual lab-based learning can be used as an alternative to eliminate the limitations of laboratory devices.

Abstract learning materials include bacterial material. **Antonie Van Leeuwenhoek** (1632 -1723), in Campbell, et.al., (2006) is a Dutchman, who the first succeed to see these tiny creatures called animalcules currently known as bacteria. The term is derived from the bacteria which means bacterion rods. Bacteria are living groups is very small, single-celled.

The material of bacterial taught for high school students of class X which is at the odd semester. Generally associated with the implementation of learning material of bacteria that are abstract, students are not too enthusiastic to learn, supported the condition of the school is still limited completeness laboratory device, then through a 3.4 KD. Applying the principle of classification to classify archaebacteria and eubacteria based on the characteristics and shapes through rigorous and systematic observation, selected materials on the Gram staining process in bacteria which aims to find groups of bacteria including Gram Positive or Negative groups are important in the classification process with the media virtual lab. In addition to the Gram staining process known bacterial groups based on the color, while it is known that bacteria form. Forms of bacteria are often used as one basis for bacterial identification. Because the bacteria are very small size, which is only a few microns which is equivalent to 0,001 mm of which the smallest is approximately 1/10 - 100 mm then to see him have to use a microscope with a magnification of at least 1600 times.



Figure 1 Bacterial Cells (Anonymous, 1995)

Structure of a bacterial cell is composed of cell walls and cell contents. The outermost surface of the capsule is protected by a layer of mucus that also serves as a food reserve. However, for disease-causing bacteria, this capsule works to infect its host (virulence power). As the layers of the cell wall in which there is a very rigid so that it can provide a form of the bacteria itself, also serves to protect the cell contents. The cell walls do not contain cellulose, but is composed of hemicellulose and pectin compounds containing nitrogen and closer to animal cells than plant cells. Based on the cell wall, bacteria are divided into two, namely *gram-positive*

bacteria (color arises when colored with ink) and *gram-negative* bacteria (does not appear when stained with ink color).

For the purposes of observation of bacteria that require equipment such as microscopes with high specification and introduction of bacteria for classification purposes dipelukan materials such as crystal violet (primary stain), lugol solution (to fix the crystal violet in the cell wall), ethyl alcohol, acetone, alcohol 96% (for decolorization), Air fukhsin or safranin (contrast staining) are not cheap price, then the virtual media lab be an alternative solution.

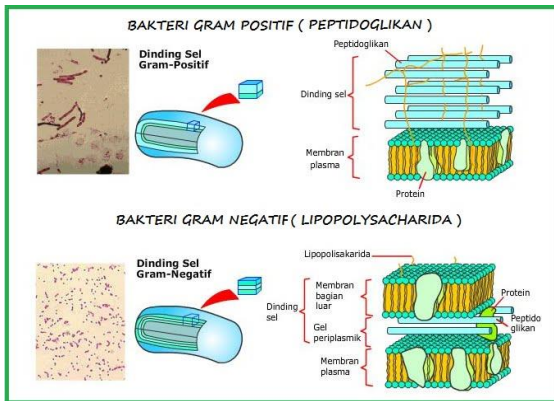
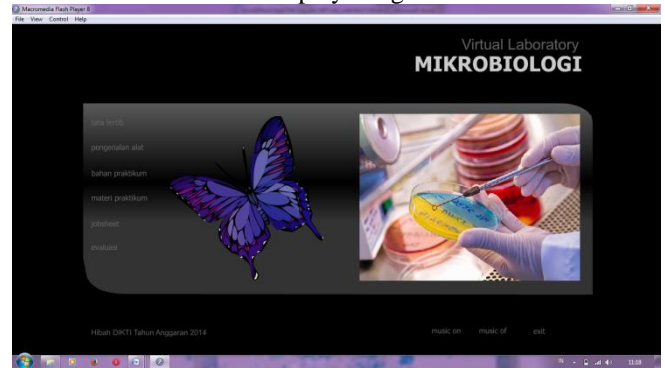


Figure 2 Main Structure in the Outer Cell Wall (Anonymous, 1995)

Anatomical conditions bacteria can be displayed in the virtual media lab clearly so as to attract the students to learn the material better than before. The characters that will be developed in the media is the responsibility of, care in observation and experimentation and collaboration in accordance Core Competency 2 Living and practicing honest behavior, discipline, responsibility, caring (mutual assistance, cooperation, tolerance, peace), polite, responsive and proactive and demonstrate behaviors as part of the solution to various problems in interacting effectively with the social and natural environment as well as in placing itself as a reflection of the nation in the association world. 2.1 Basic competency. Scientific behave: conscientious, diligent, honest fit the data and facts, discipline, responsibility, and care in observation and experimentation, daring and polite in asking questions and arguing, caring environment, mutual cooperation, collaboration, peace-loving, argue scientifically and critically, responsive and proactive in every action and in making observations and experiments in the classroom / lab and outside the classroom / lab.

## Virtual display image lab



## CONCLUSIONS

Learning with character-oriented virtual biology lab is expected to encourage students to be more interested in the material being taught and that internality character values.

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