116

APPLICATION OF ' DISCOVERY LEARNING' LEARNING STRATEGY IN IMPLEMENTATION OF BASIC MICROBIOLOGY COURSE'S PRACTICE TO INCREASE 21ST CENTURY SKILL ON COLLEGE STUDENT OF BIOLOGY EDUCATION PROGRAM

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Abstrak
There was conducted Class Action Research which purpose is to increase 21st century skill on Basic Microbiology course by applying Discovery Learning learning strategy. This research took 6 months to conduct, from September 2014 to February 2015 and whose subjects are 20 college students of Biology Education Program in Academic Year of 2014/2015. The instrument of this research are syllabus, course's curriculum, student worksheets, post test, daily test, and 21st century skill's observation sheet. Result of the research discovered that the application of Discovery Learning learning strategy is able to increase students's 21st century skill. It shown by the raising of the 21st century skill score's mean from the first cycle within 86,38% to 90% in the second cycle.

Keywords : Discovery Learning, 21st Century Skill, Basic Microbiolog

INTRODUCTION

The education purposes on Undang – Undang Republik Indonesia Nomor 20 tahun 2003 regarding National Education System on Article number 3 state that national education purpose is to develop student's potentials to be a faithful and piety human, good characters, healthy, educated, clever, creative, independent, and becoming a democratic and responsible citizen. To achievethe education purpose, there is needed a regeneration on national education system.

The development of science and technology in the 21st century, demands us to adapt so we could keep moving forward along with the world. Thereby the 21st century education is not only demanding cognitive skill but also on affective and psychomotoric. Regarding to North Central Regional Educational Laboratory (NCREL) and Metiri Group partnership which formed in *en-Gauge 21st Century Skill* there are 5 elements that should be possessed on 21st century, which are digital-age literacy, inventive thinking, effecgive communication, high productivity, ethical and religious.

Basic microbiology course is teached in odd semester (semester ganjil) of Biology Education Program which worth 3 credits. The practical activities in this course is expected to be student oriented, the student should actively engaged and participate

directly in the learning process. So the students is not only got the learning material, but also could practicing in every day activities.

Based on the lecturer's observation in the class activities, there are several problem that causing the student receives less satisfying mark. It was caused by the lack of active students in the practical activities. The passive learning process causing the student lacking of complex thinking and problem analysis skills which affect the student's mark.

The active students in the learning process are more likely to ask several questions to get various informations from the lecturer and other learning source so they possessed higher understanding level than the rest of the students. Passive students are less active to look for the learning source, they are more likely to get one information from the lecturer without further research on the subject. Based on those problems, it is important to develop another learning strategy that could increasing the whole student's participation so the power learning is not only dominated by several students. If student learns science inquiry-based, student could deal with their surrounding scientifically (Syam,2007)

The discovery learning strategy is one of severals learning strategy which encourage student to discovered relevant information for their knowledge such as concepts, formulas, patterns, etc. So, the application of this strategy is expected to stimulate the students to more actively engage in the learning process. Meyer's research (2010) shows that the discovery process in learning could help student to understand and analyze the creativity process and making choice in their discovery.

The research on Basic Microbiology course on Biology Education Program, Faculty of Teacher Training and Education Riau University academic year 2014/2015 was held on September 2014-February 2015. The research subject on this research is 20 Biology Education Program's students.

This research is a Class Activity, (CAR) Wardani (2002) state that class activity research is a research by the lecturer in the class activity by self-reflecting to improve lecturer's performance, so the student learning result is increasing.

This research parameter is the 21st century skill elements which are (a) digital-age literacy,(b) inventive thinking, (c) effective communication, (d) high productivity, and (e) religious.

The research instrument are syllabus, course's curriculum, student worksheets, post test, daily test, and 21st century skill's observation sheet. These class activity research procedures for each cycle includes few phases, which are planning phase, activity implementation phase, observing phase and activity reflection phase.

This research operation is in two cycles and each cycle consist of phases, which are (1) planning phase, (2) activity implementation phase, (3) observing phase and (4) reflection phase.

- Planning Phase

1. Determining the cycle, which is two cycles, each cycle for each lesson.
2. Determining the research class which are students from the course.
3. Reconstructing sets of *Discovery Learning* strategy learning suitable equipments.
4. Preparing 21st century skill marking guide and observation sheet.

5. Divide students in several study group

- Activity Implementation Phase

Observation Phase/ Evaluation

Observation/Evaluation is done along with class activity to observe students' activities in practical class.

Analysing and Reflection Phase

Each lesson on the first cycle's result datas are analyzed by the whole research team members, and the result is being the reference to improve the activities on the second cycle.

Analysis and Success Rate Criterias

The successful rate of the research is measured by:

1. The students could do the Student Work Sheet correctly
2. The student succcessfully done the post test
3. The 21st century skill's student score for each lesson on the observation sheet
4. Students learning results' achievement measured by doing a test on each lessons' end and every ends of the first and second cycle, and students' worksheet score.
5. The interperation of students activities degree on learning, determined by these following criterias:
6.

1. 21st Century Skill

Students' 21st century skill in the course measured using this formula:

P = F / N X 100%

Description :

P = students' activities percentage

F = emerging activities frequency

N = amount of students (Sudijono, 2008).

The 21st century skill is determined by these following criterias :

No	Interval	Categories
1.	85 – 100	Outstanding
2.	71 – 84	Good
3.	65 – 70	Acceptable
4.	< 65	Unacceptable

Table 1. Students' 21st Century Skill Categories in Basic Microbiology Practice

2. Students' Study Results

The students' learning result is measured from each cycle ends. The success rate criterias determined by the scores interval based on the normal scoring reference which based from the Riau University Dean's Decree.

Quality Grade	Numerical Grade	Score	Description
A	4,00	>91	Outstanding
A-	3,75	85 – 90	Good
B+	3,5	76- 84	Good
B	3,00	71 – 75	Acceptable
B-	2,75	66 – 70	Acceptable
C+	2,50	61 – 65	Unacceptable
C	2,00	51 – 60	Unacceptable
D	1,00	45 – 50	Unacceptable
E	0	<45	Failed

Table 2. Range Interval of Basic Microbiology's Score

In tabulating and analyzing data this research used descriptive strategy which describe the real fact. Data Analysis descriptively to get interpretation of planning students' assessement, group cooperation, presenting assessment and study results.

RESULT AND DISCUSSION

General Description

Before this research conducted, the researcher was doing a pre-research. The pre-research was conducted to introduce the data taking process and the researcher explain the purpose of this research.

a. Research Description

This class activity research is taken on 20 outstanding class' students from the hird semester Biology Education Program, Mathematics and Science Education Teacher Training, academic year 2014/2015. This research conducted in 2 cycle, including 4 lessons. The first cycle is Microorganism Isolation Technic and Bacteries Coloring & Observation, after the course held, the post test and daily test conducted to examine the students ability to understand. On the second cycle, there is 2 course lesson and 1 daily test. The second cycle course was about Bacteries Measurement & Growth and Bacteries Metabolism Biochemical Test. The research conducted once a week.

The class activity was conducted by the lecturer according to the Discovery Learning learning strategy. Lecturer first formulating sufficient problems that would be given to the students, the formulating should be precise, so the students would understand. From the lecturer's data, the students arrange, organize, process, and analyze the data. In this case, lecturer should only give a little guide. Then the students arrange the hypothesis of their analyzed data. Then they processing the data to prove their hypothesis, and so the students could discover the conclusion of the study material by themselves. After the students discover the problems, lecturer shall provide them additional questions to examine the discovered problem.

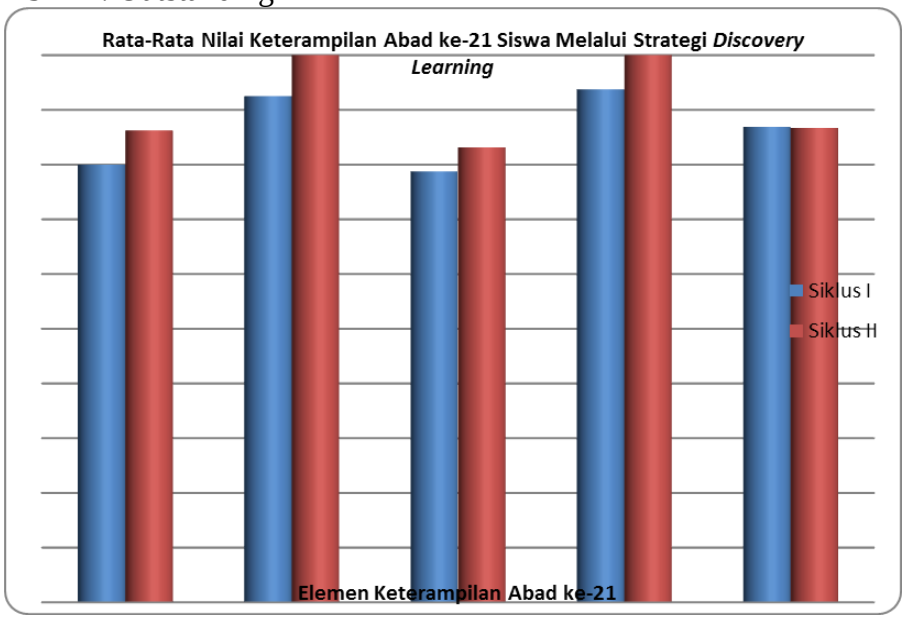
Result Analysis and Realisation Disscuss

a. 21st Century Skill

Based on 21st century skill in Discovery Learning data, the 21st century skill's scores for each elements on the first and second cycle could be seen on Table 1 and Figure 1.

No	Aspect	CYCLE I Mean (%)	Categories	CYCLE II Mean (%)	Categories
1	Digital-Age Literacy	80	B	86,25	BS
2	Inventive Thinking Effective	92,5	BS	100	BS
3	Communication	78.75	B	83,13	B
4	Religious	93,75	BS	100	BS
5	High Productivity	86,88	BS	86,69	B
Mean(%)		86,38	BS	91	BS
Categories		BS		BS	

Table 3. Century Skill in Discovery Learning Strategy Students' Scores' Mean
Description:
B : Good
BS : Outstanding



FIigure 1. The Students' 21st Century Skill Scores' Mean Through Discovery Learning Strategy

The students element percentage's mean is increasing in each cycle. The digital-age Literacy, the students' mean increasing from 80% to 86,25% which is outstanding. The digital-age literacy elements are the students have another learning source such as from media, could stand on their arguments in group discussion, and could reciting and redescribe the media shown by the lecturer. According to a research by Yuniyanti, et al (2012) the reading comprehension ability affecting the cognitive aspect performance, a student with high reading comprehension ability has a better performance than the one with lower ability. Along with Frandsen's statement in Suryabrata (2002), the presence of curious nature would influence someone to learn. Curious nature could be the pushing point of students to follow the learning process.

The inventive thinking element's mean is 92,5% which is Outstanding increasing to 100% in the second cycle. The indicators of the inventive thinking element is how the students could solve every problems in learning process. The observation from the first cycle could be seen on students answers in class discussion and problem-solving in students' worksheet.

Effective communication element consisting students cooperation during practice and group discussion. The average percentageof this element shows Good category. This element score is lower than the others, because the students are more likely to work individually.

The religious element shows a rather outstanding score. The indicators of this element is students' characters, students' behaviour in the learning process and their honesty.

High productivity element is measured by students' creativity during the practical activity, they have to produce something in limited time and according to lecturer's order. The mean in the first cycle is 86,38% and increasing to 91% which is outstanding in the second cycle.

It shown that every element experiencing some improvement on each cycle. This is actually predictable, according to Sanjaya (2006) states that the excellence of emphasizing learning development on cognitive, affective and psychomotor equally.

b. Study Results

In easch research on Basic Microbiology course in 2014/2015 could be seen on students study result which consisted of the ability to absorb information and the standard-mastery from each student individually based on post test and daily test scores on the first and second cycle.

No	Interval (categories)	Cycle I			DT I	Cycle II			DT II
		Lessons				Lessons			
		1 (Jlh(%))	2 (Jlh(%))	Mean (%)		1 (Jlh(%))	2 (Jlh(%))	Mean (%)	
1	91-100 (outstanding)	0 (0)	11 (55)		3 (15)	0 (0)	3 (15)		
2	76-90 (good)	16 (80)	9 (45)		12(60)	20 (100)	17 (85)		
3	66-75 (acceptable)	4 (20)	0 (0)		4 (20)	0 (0)	0 (0)		
4	<65 (Kurang)	0 (0)	0 (0)		3 (15)	0 (0)	0 (0)		
Mean (%)		**79,3**	**90,55**	**84,9**	**79**	**84,85**	**86,8**	**85,8**	**83**
Categories		**B**	**BS**	**B**	**B**	**B**	**B**	**B**	**B**

Table 4. Students Ability to Absorb in the First and Second Cycle Based on Post Test and Daily Test of Basic Microbiology Course 2014/2015

The average number of students absorption ability from the pst test score on the first cycle is 84,9% in good category and experiencin decreasing to 83% in the second cycle. On the First lesson, the average score of the students post test is 79,3% (good), and increasing significally on the second cycle to 90,55% (outstanding). In the first cycle it shown that there is an improvement on students absorption ability based on the post test scores. In the daily test scores the average scores shows the student absorption ability's improvement. It shown on the first lesson their average scores is 84,45% and increasing to 86,8% in the second lesson which categorized as good. The improvement of students scores is along with Ratnadi and Suanda research (2011) which concluded that the implementation of contextual learning approach have a positive influence to science study's achievement, it means that the implementation of contextual learning on science study is tends to more succesfull than the other conventional approach to study science.

The improvement of the average number of students ability to absorb information in each lessons is along with Setiawan (2008) research that state a lesson which set on group work to solving problems is capable to show a good result. It caused by the knowledge construction process was done in a group, replacing the classical lecturing system where the knowledge construction was done individually based on what individual has absorb.

The standard-mastery on students learning process is not only based on the absorpation ability but also from passing the course individually. The students' standard-mastery was obtained from the daily test I and II. Based on daily tests' scores after the application of Discovery Learning strategy, the students standard-mastery could be seen on Table 3 and Figure 2.

No	Categories	Cycle I	Cycle I
		Sum(%)	**Sum(%)**
1	Passed	13 (65)	20 (100)
2	Not- Passed	7 (35)	
Mean (%)		**79**	**83**

Table 5. Standard-mastery on First Cycle's Daily Test on Basic Microbiology Course Academic Year 2014/2015

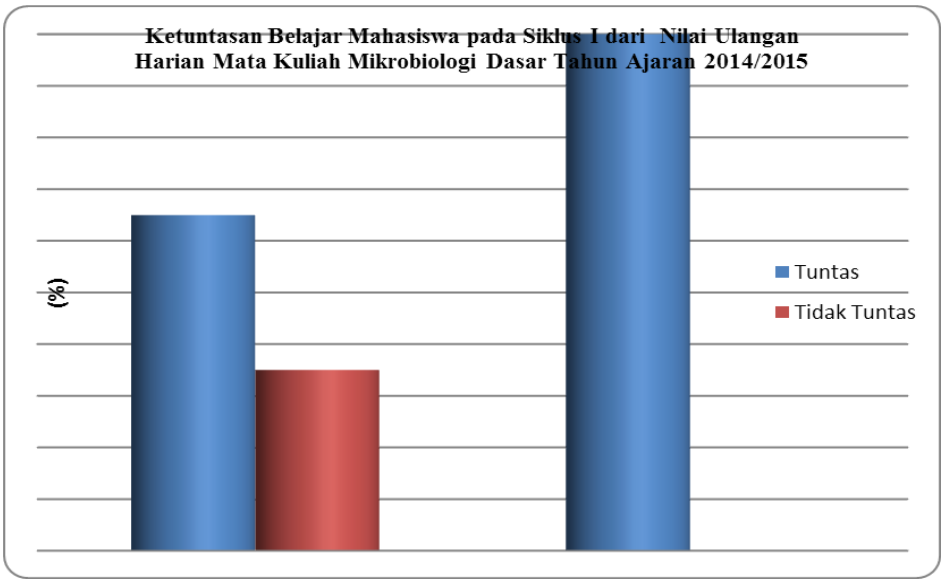


Figure 2. Standard-mastery on First Cycle's Daily Test on Basic Microbiology Course Academic Year 2014/2015

The students' daily test results mean on the first cycle is 79% (good). There are 7 students that couldn't pass the acceptable score on 76. Based on the data, it could be concluded that the number of passing students is increasing after the application of Discovery Learning strategy. According to it, Erdawati (2008), found that there is an increasing in the students' comprehension by using the approach. By using Discovery Learning as one of learning process strategy, learning is not only based on one source and much more interesting because the students discovered information by themselves and could conclude the knowledge.

The improvement could be seen on the second cycle successed study rate, whereas the students' daily test's mean is 83% (Good). The whole students passed the second cycle daily test. The application of Discovery Learning demands students to solve a problem given by the lecturer and it is increasing the students ability to think that shown on the students ability to sought information's mean. According to Anderson and Krawtwohl (2010) that learning which meaning as presenting knowledge and cognitive processes that students need to solve problems. The problem solving

happened when the student could make a way to achieve the unachieved goal, which is know how to change the current situation to the expected ones. Otherwise, the learning focus that stated learning as constructing knowledge, which the students try to understand their experiences. From the class activity result in the first and second cycle shows that the application of Discovery Learning strategy could increase the students' 21st century skils and the study results which consisting absorption of information and passing the test.

To achieve a maximum result by applicating this strategy, the lecturer needs to actively give an interesting problem construction to increase the inventive thinking element.

CONCLUSION

The application of Discovery Learning strategy could improve the students' 21st century skill. It shown on the increasing of 21st century skill students mark's mean on the first cycle was 86.38% to 90% on the second cycle.

The application of Discovery Learning strategy also could increase the students' ability to sought information. It shown on the post test marks' mean which increasing from 84,93% in the first cycle to 85,83% in the second cycle and the daily test marks' mean from 79% to 83% in the second cycle.

Based on this research, we expected that the lecturer applicate the Discovery Learning strategy on the learning process to increase 21st century skill. For further researchs are expected to design more varies and complex problems.

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