

LEARNING TOOL DEVELOPMENT TO TRAIN THINKING SKILL OF BIOLOGY STUDENTS USING THE PRIMA LEARNING MODEL

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Abstract

The purpose of the research development is to produce the learning tool to train thinking skill of biology student in genetic subject by using the PRIMA learning model. The research was designed by using Dick and Carey (2005) learning development design, and it was conducted through 3 learning steps which is adapted from Carin (1993), they are: 1) guided discovery, 2) less structured guided discovery, 3) free discovery. The data was qualitative and quantitative data consist of learning tools validity, the result of the learning process by giving the formative test to the students, observation result to learning process and students thinking skill, and feedback information from the students, it was analysis after the learning process. The test result was 70% students and it was indicated that students complete in learning, they know about the concept in genetic subject after given the test. At the other said, average percentage of the learning process and students thinking skill was minimal 75%. The research was result the valid learning tool, practical and effective which can be used in learning process to train students thinking skill. The result of validation show that learning tool can be used (in valid category). The result of limited trial show that the learning tool was developed is practical and generally can be said effective if looking from the test result and student thinking skill.

Keywords: *Learning Tool, Prima Learning Model, Thinking Skill*

I. Introduction

Science and technology development have controlled the world in global manner, which giving impact in some aspect of life. It is a challenge in educational field that have been conducted some innovative effort in some level base on national education purpose. The purpose of Curriculum 2013 formed to prepare Indonesian people to have live ability as individual and citizenship believe, productive, creative, innovative, effective, and able to give contribution to citizen, nation, country, and world civilization (Kemdikbud, 2013).

To produce educational purpose, one of the important tasks in teaching is developing student thinking skill. Educational process must prepare critical and creative student in order to student not only know about concept but also have ability to solve the problems in their life. Pacific Policy Research Center in 21st Century Skills for Students and Teachers (2010) said that “Information and communication technology is transforming how we learn and the nature of how

work is conducted and the meaning of social relationships. Shared decision-making, information sharing, collaboration, innovation, and speed are essential in today's enterprises." Now, much of the success lies in the ability to communicate, share, and use information to solve complex problems, to be able to adapt and innovate in response to new demands and environmental changes. To meet these challenges the school has to change learning strategies that enable students to acquire the skills of creative thinking, problem solving, collaboration and innovative ability they need to be successful in work and life. To realize this goal, one of the most important tasks in teaching is to develop thinking skills of learners. Intellectual abilities are manifested in the ability to think is a major requirement as workers and is absolutely necessary in the 21st century learning.

The 21st century needs human take initiative, critical thinking, creative, and able to solve problem. It is the same with BSNP (2010, p. 39) statement: "21st Century national education purpose is to create nation dream, that is Indonesian society that is prosperous and happiness, in honorable position the same with the other country in the global world, through form of society consist of human resource quality, it is individual independent, have passion and ability to create nation dreams. Challenge of 21st century force us to change traditional learning manner which is "teachers have controlled decisions about what to study, how to study it, and what it all means. That students can make important curricular and instructional decision – they can be involved in posing and resolving problems in significant and meaningful ways." (Fogarty, 1997).

Genetic subject is one of the required subjects and one of the components which consist of all knowledge about genetic, genetic material, mechanism of heredity, reproduction of genetic material, expression or genetic material work, and genetic material change. According to genetic subject observation, if we see the process of learning, evaluation system, and the result is still in process according to curriculum target. It means that the learning process is not oriented to active learning which gives contribution to develop student critical thinking development. Besides that lack of attention to establishment and training to critical thinking, some learning innovation had been applied to some teacher. If it is not overcome, the students after finish their study at university have not an ability to face prosecution

of 21st century which needs skilled-human resources who are able to think creative and productive, able to solve problems, able to take initiative, and have ability to make communication with the others.

Until now, many of learning innovation does not seriously train thinking ability. So, there is no evaluation. It can be seen in Genetic subject lesson plan and in practice guide book. The learning process did not give contribution to students creative thinking skill. It is a fact that the learning process is not effective and it impact to students have no ability to apply learning concept to solve the problems in daily life. Creative thinking skills is a new way of seeing or doing things that are characterized by fluency, suppleness/flexibility, authenticity/originality, and detailing or elaboration (Munandar, 2009; Filsaime, 2008; and Usha, 2009).

Base on the problems shown before, there was no learning tool which focus on thinking skill. Thus it is important to develop learning strategy to help students in thinking skill and motivated them in learning, to know the concept, to avoid a mistake concept, to make joyful learning in daily life by developing of learning base on project learning model to conduct scientific activity in a research form and solve the problem. Bell (2010) suggested "Project Based Learning is an innovative approach to learning that teachers a multitude of strategies critical for success in the twenty-first century. Students drive reviews their own learning through inquiry, as well as work collaboratively to research and create projects that reflect reviews their knowledge. "Several other studies have been conducted to report that the implementation of project-based learning can improve the quality of student learning, improve learning motivation and confidence, as well as the creativity of learners, improve the ability to develop ideas, skills, and work in groups" (Thomas, 2000; Gulbahar, 2006; Alacapinar, 2008; Baumgartner, 2008; Bas, 2010; Movahedzadeh, 2012; Ravitz, 2012). PRIMA learning model is a learning model oriented to project based learning which is giving activity to scientific activity in a research form and solve the problem conducted in collaborative manner. It the same with curriculum of 2013 which is focus to scientific approach and 21st century which is focus to critical thinking, creative, able to solve the problem, and have communication skill.

The research development purpose is to result learning tool to train Biology students thinking skill in genetic subject by using PRIMA learning model, and the benefits are, give reference and knowledge about the important of learning strategic which can train the students thinking skill at Biology field, improve lecture quality at biology education major through improving ability to solve the problem by using learning model, as a literature, suggestion, and comparison to other researcher who will conduct learning tool research development.

II. Method

This research is designed into learning development design. It is developed by Dick and Carey (2005) (see figure 1), and it is conducted in 3 educational steps and it is adapted from Carin (1993), they are: 1) *guided discovery*, 2) *less structured guided discovery*, and 3) *free discovery*.

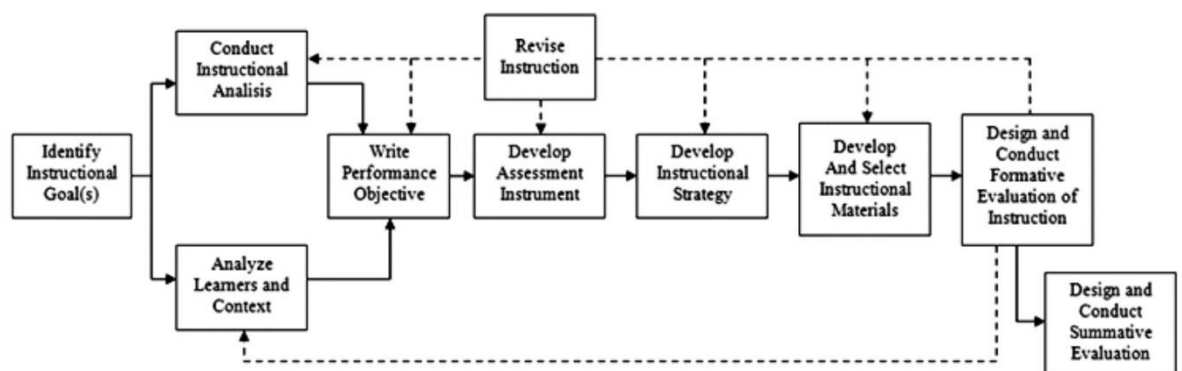


Figure 1. Step of Learning Design Development

(Source: Dick and Carey, 2005)

After learning tool is formed, the next step is validation process to produce learning tool draft to use in trial. Validation conducted by the expert to ask suggestion whether content of the learning tool is feasible. Empirical validation is trial limited was conducted to learning tool and instrument to collect the data by looking to all aspect as learning process or learning achievement base on indicator and instrument.

In this research, the data was collected by observation to students activity, thinking skill and test of mastery concept.

The collected data is qualitative and quantitative, consist of learning tool validity, learning result by giving formative test to student, observation result to activity, student thinking skill, and feedback information from the student. Analysis is done after the learning process. The test result showed that 70% student complete in learning and know about concept in genetic subject. The result of the test is measured by using *N-Gain Score*. Besides that, percentage activity and student thinking skill in learning average minimal 75%.

III. Result and Discussion

Result of the expert evaluation to lesson plan, student worksheet, test of concept achievement, Activity observation sheet in learning process, student skill thinking, and feedback of information from the student, can be shown at Table 1, Table 2, Table 3, Table 4, Table 5 and Table 6.

Table 1. Expert Evaluation to Lesson Plan by using PRIMA learning model

No	Lesson Plan Evaluation	Validator Evaluation					Average	Percentage	Note
		I	II	III	IV	V			
1	I	84	83	80	84	78	81.8	93%	
2	II	84	87	80	84	78	82.6	93.9%	
3	III	84	87	80	84	80	83	94.3%	

Table 2. Expert Evaluation to Student Worksheet by Using PRIMA Learning Model

No	Student Worksheet Evaluation	Validator Evaluation					Average	Percentage	Note
		I	II	III	IV	V			
1	I	37	40	40	39	40	39.2	98%	
2	II	37	40	40	39	40	39.2	98%	
3	III	37	40	40	39	40	39.2	98%	

Table 3. Expert Evaluation to test question about concept achievement in learning by using PRIMA learning model

Validator	Decision	Comment/Suggestion/Revise
I	Can be Used	1. Check the key answer. Some keys answer do not complete. 2. In the grating test, put the indicator.
II	Can be Used	1. Revise the key answer for the question number 6 and 7.
III	Can be Used	1. Adjust learning process with the question. 2. Adjust level of cognitive ability in learning purpose with level of cognitive ability in the question. 3. Complete some keys answer.
IV	Can be Used	1. Put learning indicator.
V	Can be Used	1. Put learning indicator

Table 4. Expert evaluation to student observation sheet activity in learning by using PRIMA Learning Model

Validator	Decision	Comment/Suggestion/Revise
I	Can be Used	Nothing
II	Can be Used	1. Need <i>coaching</i> for observer 2. Need consideration for observer to observe the student 3. Need consideration student activity accuration for each learning steps
III	Can be Used	Review formulation of observation category.
IV	Can be Used	Nothing
V	Can be Used	Nothing

Table 5. Expert evaluation to observation sheet of student critical thinking in learning by using PRIMA Learning Model

Validator	Decision	Comment/Suggestion/Revise
I	Can be Used	Nothing
II	Can be Used	1. Improve use guide. 2. Better to use in learning process.
III	Can be Used	Improve some sentences on reaction of problem

IV	Can be Used	Nothing
V	Can be Used	Nothing

Table 6. Expert evaluation to student information feedback in learning by using PRIMA learning model

Validator	Decision	Comment/Suggestion/Revise
I	Can be Used	Nothing
II	Can be Used	Nothing
III	Can be Used	Word “anda” better using the capital letter in front of the word. Like this: “Anda”.
IV	Can be Used	Nothing
V	Can be Used	Nothing

Activity and student critical thinking skill during the learning process was measured by using observation sheet who conducted by two observers. Student activity aspect which observe consist of 18 aspects, and critical thinking aspects consist of 10 aspects. Observation conducted to 10 students as research sampling. Result of observation shown in table 7 and table 8.

Table 7. Observation Result of Student Activity in Learning by Using PRIMA Learning Model

Number of Present	1	2	3	4	5	6	7	8	9
Sum of Active Students $\geq 75\%$	5	6	4	6	7	7	9	8	9

Table 8. Observation Result of Student Thinking Ability in Learning by Using PRIMA Learning Model

Number of Present	1	2	3	4	5	6	7	8	9
Sum of Students Thinking Skill Ability $\geq 75\%$	4	4	4	7	7	7	7	7	7

Student result learning process data at Table 9 show the good result. There are 10 students who follow test, and only 3 students did not complete in learning process.

Table 9. Result to Student's of Mastery Concept Test by using *N – Gain Score*

STUDENT NAME	A	B	C	D	E	F	G	H	I	J
<i>N-GAIN SCORE</i>	0,98	0,69	0,94	0,86	0,48	0,96	0,63	0,72	0,93	0,88

Students feedback information data at table 10 show a good result.

Table 10. Result of students response in learning by using PRIMA Learning Model

No	Observation Aspects	Average (Students)	Percentage
1	Students perceive to learning	9	90%
2	Students perception to something new in learning	8	80%
3	Student interest to learning	10	100%
4	Student question to learning model	10	100%
5	Student question to student worksheet and learning media	9	90%

Result of the five expert validator to lesson plan, students activity, concept examination test, observation sheet activity in learning, students thinking skill, and feedback information from the students shown that learning tool development can be used to train student thinking. Suggestion, comment, correction from validator used to revise content of learning tool.

The result of limited trial to 10 students shown that each classroom activity, student presentation activity and student thinking skill in learning, minimal average is 75%. Classroom activity conduct in 3 steps scaffolding through guided discovery

(classroom activity 1, 2, 3), *less structure guided discovery* (classroom activity 4, 5, 6), and free discovery (classroom activity 7, 8, 9).

The posttest result that from 10 students who follow test, 7 students get 70 in minimal score. It mean that the test result shown 70% minimum is complete in learning and students know about genetic concept.

The result of the students feedback shown that 10 students as research sampling, average the students give good response to PRIMA learning model in classroom activity.

IV. Conclusion

The research result learning tool by using PRIMA learning model is valid, practical, and effective, to use in learning to train student thinking skill. Result of the validation showed that learning tool can be used (in valid category). Result of limited trial also showed that the tool developed is practical, and in general, effective based on the learning test result and student thinking skill.

V. References

- Alacapinar, F. (2008). "The Effects Of Project-Based Learning (PBL) On Cognitive And Psychomotor Achievements And Affective Domain." *Eurasian Journal of Educational Research*, 32, 17-35.
- Bas, G., Beyhan, O. (2010). "Effects of Multiple Intelligences Supported Project-Based Learning On Students' Achievement Levels and Attitudes Towards English Lesson." *International Electronic Journal of Elementary Education*, Vol. 2, Issue 3.
- Baumgartner, E., Zabin, C. (2008). "A Case Study Of Project-Based Instruction In The Ninth Grade: A Semester-Long Study Of Intertidal Biodiversity." *Environmental Education Research*, 14(2), 97-114.
- Bell, S. (2010). "Project-Based Learning for 21st Century: Skills For The Future." *The Clearing House*, 83. [On Line] diakses 17 Oktober 2012.
- Carin, A. A. (1993). *Teaching Science Through Discovery 7th Edition*. New York. Macmillan Publishing Company.
- Dick, W., Carey, L., Carey, J. O. (2005). *The Systematic Design Of Instruction 6^{ed}*. United States. Addison Wesley Educational Publisher Inc.
- Filsaime, D. K. (2008). *Menguak rahasia berpikir kritis dan kreatif*. Jakarta: Prestasi Pustaka.

- Fogarty, Robin. (1997). *Problem Based Learning and Other Curriculum Models for The Multiple Intelligences Classroom*. SkyLight Training and Publishing, Inc.
- Gulbahar, Y., Hasan T. (2006). "Implementing Project-Based Learning And E-Portfolio Assessment In an Undergraduate Course." *ISTE (International Society for Technology in Education. Volume 38, Number 3*.
- Kementerian Pendidikan dan Kebudayaan. (2013). *Salinan Lampiran Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 69 Tahun 2013 tentang Kurikulum SMA-MA*
- Movahedzadeh. F., Patwell. R., Rieker. J. E., and Gonzalez. T. (2012). "Project-Based Learning to Promote Effective Learning in Biotechnology Courses." *Education Research International Volume 2012, Article ID 536024, 8 pages, May 2012*.
- Munandar, S. C. R. (2009). *Pengembangan Kreatifitas Anak Berbakat*. Jakarta. Rineka Cipta.
- Pacific Policy Research Center. (2010). *21st Century Skills for Students and Teachers*. Honolulu. Kamehameha Schools, Research & Evaluation Division.
- Ravitz, J. (2012). "Using Project Based Learning to Teach 21st Century Skills: Findings from a Statewide Initiative." *Paper Presented at Annual Meetings of the American Educational Research Association*. Vancouver, BC. April 16, 2012. [On Line] diakses 28 September 2014.
- Thomas, J. W. (2000). A Review Of Research On Project-Based Learning. *This Research Review and the Executive Summary are Available on the Web at http://www.bie.org/research/study/review_of_project_based_learning_2000* , diakses 27 Februari 2012.
- Usha, L. MD. (2009). "Creative Thinking In Medicine: Can We Learn It From The Masters And Practice It?" *Hektoen International. A Journal Of Medicine Humanities*, Volume 1, Issue 4.