

The Implementation of Research-based Learning on Biology Seminar Course in Biology Education Study Program of FKIP UMRAH

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Abstract. Biology Seminar is a course in Biology Education Study Program of Faculty of Teacher Training and Education University of Maritim Raja Ali Haji (FKIP UMRAH) that requires students to have the ability to apply scientific attitudes, perform scientific writing and undertake scientific publications on a small scale. One of the learning strategies that can drive the achievement of learning outcomes in this course is Research-Based Learning. Research-Based Learning principles are considered in accordance with learning outcomes in Biology Seminar courses and generally in accordance with the purpose of higher education. On this basis, this article which is derived from a qualitative research aims at describing Research-based Learning on Biology Seminar course. Based on a case study research, it was known that Research-Based Learning on Biology Seminar courses is applied through: designing learning activities around contemporary research issues; teaching research methods, techniques and skills explicitly within program; drawing on personal research in designing and teaching courses; building small-scale research activities into undergraduate assignment; and infusing teaching with the values of researchers.

1. Introduction

According to Constitution on Higher Education in Indonesia, the functions of higher education are to develop the ability and form the character and civilization of a dignified nation; to develop innovative, responsive, creative, skilled, competitive, and cooperative academicians through the implementation of *Tridharma*; and to develop science and technology. University (college) as a provision of higher education has three duties (*Tridharma*) namely education and teaching, research and community service. Driving these functions, the synergy between lecturers and students as academicians in the implementation of *Tridharma* is needed. The lecturer as the main organizers should involve students in *Tridharma*, not just in teaching, but also in research and community service.

Based on my observation, the higher education tasks implemented in Biology Education Program, Faculty of Teacher Training and Education, University of Maritim Raja Ali Haji still partially emphasize on the implementation of education/ teaching. On the contrary, research is at a low level on quantity and quality. Research conducted by lecturers is still less nor the research involving students. Research grants won by lecturers are in the lowest category (1-3 grants in 1 year), the lecturers' motivation in conducting independent research is low, and most lecturers have not set a research roadmap. The constraints faced by lecturers to carry out research and involve students are the absence



of research roadmap, and also the duties for teaching are overloaded (lecturers teaching with the maximum number of course credits).

Biology Seminar is a course in Biology Education Study Program of FKIP UMRAH that requires students to have the ability to apply scientific attitudes, perform scientific writing and undertake scientific publications on a small scale. By considering the characteristics of Biology Seminar course, it is very possible to drive a lecture while optimizes the function of higher education academicians on research. Lecture and research can be integrated in the course by applying certain learning strategy.

Research-based Learning (RBL) is considered capable to provide opportunities for lecturers to integrate teaching and research simultaneously. RBL is one of the methods in student centered learning which integrates research into the learning process. RBL is multifaceted and refers to several methods of learning. RBL gives the students an opportunity to look for information, construct a hypothesis, collect data, analyze the data, and make conclusions from the data structure. In this activity the students are learning by doing and it is clear that RBL offers the chance for the development of methods of learning. Related to optimizing lectures and lecturers' research, [1] explain that the application of RBL will provide the following benefits: 1) Encourage lecturers to conduct specific research, then update their knowledge by reading and utilizing other research results as learning materials; and 2) Encourage the role of students more actively in the learning process, and become an active partner of lecturers in research. In addition, RBL also shapes scientific attitudes of students [2].

Research is an important means to improve the quality of learning. Research consists of: background, implementation procedures, research results and analysis. These components of research have a meaningful activities, they are: formulation of the research problem, the solution of the problem, and dissemination of the research results. These activities are closely related to learning and will improve the quality of learning. RBL is a method that uses authentic learning, problem-solving, cooperative learning, contextual (hands on and minds on) and inquiry-discovery approach guided by the philosophy of constructivism [3].

Research based learning is based on the philosophy of constructivism which has four aspects, namely learning to develop the student's understanding, learning to develop prior knowledge, learning as a process of social interaction and meaningful learning obtained through actual experience [4]. This is in line with the Lockwood opinion; "Research-based learning is a system of instruction which used an authentic-learning, problem-solving, cooperative learning, hands on, and inquiry discovery approach, guided by a constructivist philosophy. Its usefulness had been recognized for many decades, but "research in classroom" had not been adopted as a teaching method by many" [5].

Considering that Research-based Learning is very much inherent in *Tridharma* duties as a lecturer, it is necessary to apply Research-based Learning in a course in Higher Education, in this case in Biology Education Study Program. In universities that have orientation to be a research-based university like University of Gajah Mada, RBL has been applied widely in teaching aspect in all study programs, even this university has compiled guidelines on applying RBL as teaching innovation. UMRAH, although not yet specifically oriented to be a research-based university, has initiated the implementation of RBL even though it has not been holistic in all courses in the Study Program.

Considering the importance of integrating research into learning, the author applied RBL in Biology Seminar courses and conducted a study to describe the RBL implementation. The research question that would be answered was: *How to implement RBL in Seminar Biology course?*

2. Method

Research-based Learning was applied to Biology Seminar course in the even semester of 2016/2017 (March to June 2017), in Biology Education Study Program, Faculty of Teacher Training and Education, University of Maritim Raja Ali Haji. The samples of this research were 19 students from 71 students in the Biology Seminar course. The Course schedule was designed for 14 classroom meeting. Observations on the implementation of RBL were conducted at each meeting, with researchers as the key instrument.

Researchers have collected data from various data sources to gain visualization of the RBL implementation process. These data sources were photographs of learning activities, questionnaires, student portfolios, and interviews. The data were analyzed in descriptive-explanative to obtain a comprehensive description about the application of RBL. Analysis of RBL implementation is done by referring to Good Practice Guide of Research-based Learning [6].

3. Results and Discussion

Based on study, it was known that RBL can be implemented in the overall Biology Seminar course consists of 13 sessions (one session was not included because it was a lecture contract session). From the research, obtained the descriptions of the RBL implementation approach as seen in Table 1.

Table 1. RBL strategies applied in Biology Seminar course

Weeks	Learning Outcomes	Students' activities	RBL Strategies Applied
1	<ul style="list-style-type: none"> To apply the rules set out on the lecture contract To understand the orientation of the lectures 	<ul style="list-style-type: none"> Discussing the lecture contract Discussing the orientation of the lectures 	-
2	<ul style="list-style-type: none"> To understand the basic rules of scientific writing 	<ul style="list-style-type: none"> Reviewing the rules of scientific writing Discussing the basic rules of scientific writing 	Designing learning activities around contemporary research issues
3, 4	<ul style="list-style-type: none"> To understand the research methodology of biology education 	<ul style="list-style-type: none"> Discussing research biology education methodology Reviewing the research results focused on the method used 	Teaching research methods, techniques and skills explicitly within program
5	<ul style="list-style-type: none"> To obtain, understand, and analyze scientific publications of biology education 	<ul style="list-style-type: none"> Finding examples on scientific publications Discussing the research methodology in scientific publications Analyzing the article content in scientific journals 	Drawing on personal research in designing and teaching courses
6-10	<ul style="list-style-type: none"> To formulate research proposal To apply scientific work steps To report the results of the study To apply scientific attitudes and values 	<ul style="list-style-type: none"> Conducting preliminary observation Asking research questions Designing research proposals Preparing research instruments Taking the data Analyzing research data Drawing up conclusion Writing research reports 	Building small skill-research activities into undergraduate assignment Infusing teaching with the values of researchers
11	<ul style="list-style-type: none"> To create scientific writing by applying the rules of writing 	<ul style="list-style-type: none"> Writing scientific writing based on research reports 	Infusing teaching with the values of researchers
12,13, and 14	<ul style="list-style-type: none"> To conduct an oral presentation in the seminar 	<ul style="list-style-type: none"> Conducting seminar 	Infusing teaching with the values of researchers

Based on the lecture conducted, there were 5 of 8 RBL strategies applied in the Course, namely; designing learning activities around contemporary research issues; teaching research methods, techniques and skills explicitly within the program; drawing on personal research in designing and teaching courses; build small-scale research activities into an undergraduate assignment; and Infuse teaching with the values of researchers. Each strategy was applied to the lectures as follows.

1. *Designing learning activities around contemporary research issues*

This strategy applied by comparing the research results with the news report obtained by society. Students prepared a scientific research result and a popular writing that could be obtained in the campus library, or through the internet. Furthermore, the two writings were compared to gain an understanding of the basic rules of scientific writing.

2. *Teaching research methods, techniques and skills explicitly within program*

One of the subjects that must be completed by the students before taking the Seminar Course was Research Methodology. However, lecturers had to provide reinforcement and affirmation of educational research methods that would be the main provision for students to achieve the course outcome. Lecturers facilitated students to master the concept of research methodology through group and class discussions and reviewed research methods from existing research reports.

3. *Drawing on personal research in designing and teaching courses*

To facilitate the students to understand and analyze the existing scientific publications, the lecturer provided an example of her own scientific publications, namely scientific publications on ICMD seminar proceeding, the journal of Pedagogi Hayati, and other research reports.

4. *Building small-scale research activities into undergraduate assignment*

In the process of learning, students were assigned to conduct mini research which aims to strengthen the mastery of scientific work, next to achieve the outcome of the course. Lecturer acted as mentor and validator who validate student research instruments. Students conducted research in the field of education in junior and senior high school. There were 13 students conducted descriptive research, 5 students conducted research and development, and 1 student conducted experimental research.

5. *Infusing teaching with the values of researchers*

Integrating scientific values had actually been done from the 2nd meeting, but more emphasized when conducting mini research and seminars. In these assignments, students were directly required to apply scientific values and scientific attitudes namely; critical thinking skills, curiosity, objective, honest, diligent, systematic, open to criticism, and responsible. The guidance process by lecturer during the process of researching and preparing scientific publications, was aimed to guide students who were constrained, more importantly to ensure students continued to implement scientific attitudes and maintain scientific values.

Based on the results of the lectures, the implementation of RBL facilitated students to achieve learning outcomes, namely; understanding the basic rules of scientific writing; understanding the methodology of educational research; acquiring, understanding, and analysing scientific publications of biology education; formulating research proposal; applying scientific work steps; reporting on research results; applying scientific attitudes and values; creating papers by applying the rules of writing; and conducting oral presentation in the seminar. Based on the product of lectures (scientific publications: seminars and/ or articles), 17 students were able to complete scientific publications, while 2 students only completed the research proposal. Based on the final result of the lecture, it could be concluded that the application of RBL facilitated the students to complete the lecture product and achieve learning outcomes.

Based on the questionnaires, it was known that the students could follow lectures well. Students stated that they got several benefits of RBL implementation, that were; RBL improved the quality of lectures; RBL drive students more active; RBL provided real experience for students in conducting research; RBL enforced students' insights more developed; and mini research task on RBL was able to

provide experience in doing thesis. Obstacle experienced by students in conducting lectures related to the time to complete the product of the Course.

4. Conclusion

RBL can be implemented in the overall Biology Seminar course by applying certain strategies, namely: designing learning activities around contemporary research issues; teaching research methods, techniques and skills explicitly within program; drawing on personal research in designing and teaching courses; building small-scale research activities into undergraduate assignment; and Infusing teaching with the values of researchers. The application of RBL facilitates the students to complete the lecture product and achieve learning outcomes. The students can follow lectures well and can feel the benefits of RBL implementation.

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References

- [1]. Dafik 2016 Pengembangan PBR (Pembelajaran Berbasis Riset) dalam Mata Kuliah. Lembaga Pembinaan dan Pengembangan Pendidikan University of Jember Retrieve on Sept 2nd 2017 from www.dafik-fkip-unej.org/download.php?file=Hand%20Out%20PBR%20UNEJ.pdf
- [2]. Firdaus and Darmadi 2017 Shaping Scientific Attitude of Biology Education Students Through Research-based Teaching. AIP Conf Proc 1868 100004-1–100004-5 doi 10.1063/1.4995214.
- [3]. Roach M Blackmore P Dempster J 2000 Supporting High-Level Learning Through Research-based Methods: Interim Guideline for Course Design. TELRI Project-University of Warwick Retrieve on Sept 1st 2017 from <http://citeseerx.ist.psu.edu/viewdoc/download>
- [4]. Widayati et al 2010 Guideline Research-based Learning University of Gajah Mada Retrieve on Aug 31st 2017 from <http://ppp.ugm.ac.id/p3/wp-content/uploads/pupbringgris.pdf>
- [5]. Poonpan Suchada & Siriphan S 2001 Indicators of Research-Based Learning Instructional Process: A Case Study of Best Practice in a Primary School. Faculty of Education. Chulalongkorn University Phaya Thai Bangkok Thailand Retrieve on Sept 1st 2017 from <https://www.aare.edu.au/data/publications/2005/poo05581.pdf>
- [6]. Griffith Institute for Higher Education 2008 Research-based Learning: Strategies for Successfully Linking Teaching and Research University of Griffith Retrieve on Sept 1st 2017 from https://www.griffith.edu.au/learning-futures/pdf/gihe_tipsheet_web_rbl.pdf