

# Manifestation A Meaningful and Sustainable Value of Research Skills: Study of Biodiversity Learning

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## ABSTRACT

Research skills are skills of conducting scientific research to seek scientific truth by applying the scientific method based on proven scientific reasons. Generally, lecturers at various universities have equipped their students with research skills with meaningful and sustainable values in studying biodiversity. However, information about manifestations had carried out by lecturers regarding this matter was still limited. This study aims to describe the manifestation of the value of meaningful and sustainable research skills in biodiversity learning. This study used a qualitative approach with a narrative research design, the type of data is questionnaire data. The research had conducted from March to June 2021. The sampling was purposive sampling qualitative snowball sampling with the respondent criteria being lecturers who gave lectures on biodiversity studies in their majors (n=82). The process of analysis and interpretation of qualitative data collection had done by coding the data. It had done to mark the respondents' open answers regarding the application of the value of meaningful and sustainable research skills based on the criteria made by researchers based on the value of citizen science activities. The conclusion of this study shows that lecturers have realized the value of meaningful and sustainable research skills in the study of biodiversity learning. This realization is expected to develop in various activities that are more varied, meaningful, and sustainable.

**Keywords:** *Meaningful and sustainable value, Biodiversity learning, Research skills.*

## 1. INTRODUCTION

The Sustainable Development Goals (SDGs) with 17 goals and 169 targets contain significant issues include studies on education and biodiversity. These various goals and targets constitute a global action plan to end poverty, reduce inequality and universally protect the environment with the main principle of leaving no one behind [1]. One of the designs to realize the fourth SDGs goal is the implementation of Education for Sustainable Development (ESD), it is a program that encourages people to constructively and creatively face global challenges and create a resilient and sustainable society. The implementation of this educational activity contains key issues of sustainable development in teaching and learning activities, for example, climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption [2].

The Indonesia Biodiversity Strategy and Action Plan (IBSAP) 2003 - 2020 evaluates and reviews the existing deficiencies in the field related to Indonesia's biodiversity issues. The result recommended several solutions are carried out, including strengthening important issues/values about the meaning of biodiversity into the education curriculum at

various levels; supporting various activities that increase understanding of the importance of conserving community-based biodiversity; increasing research activities which include: identification, inventory, mapping, and publication of potential biodiversity values [3]. In line with IBSAP, the Indonesian Biology Consortium (Konsorsium Biologi Indonesia/KOBI) and the Indonesian Biology Education Consortium (Konsorsium Pendidikan Biologi Indonesia/KPBI) are active in developing biology teaching and education at the university level in mastering knowledge (including equipping research skills) about biodiversity and utilizing to optimally and sustainably for the welfare of humanity [4, 5].

Research skills are skills of conducting scientific research to seek scientific truth by applying the scientific method based on proven scientific reasons. Students with these skills are expected to create good intellectual and practical links between learning and researching [6]. The research activity that is developing in today's global society that can be integrated into lectures is citizen science activity. This activity involves the general public in carrying out community-based scientific research and global investigations [7]. Citizen science has the potential as a

follow-up in providing research skills so that the activities carried out become more meaningful [8].

These explanations showed that it is important for lecturers at various universities to equip their students with research skills with meaningful and sustainable values in studying biodiversity. However, information about the manifestations by lecturers regarding this matter is still limited. This study aims to describe the manifestation of the value of meaningful and sustainable research skills in learning with biodiversity subject matter.

## 2. METHODS

### 2.1. Participants of the Study

The population used in this study were respondents from 38 universities in Indonesia. Sampling had carried out by purposive sampling with the criteria of lecturers giving lectures on biodiversity studies in their majors involving biology study programs/biology education study programs/science study programs/science education study programs. This study obtained 82 appropriate respondents.

### 2.2. Course Design and Treatments

This study used a qualitative approach with a narrative research design. It described the respondent's information and opinions of the respondent's views on the topic under study had obtained. The type of data collected was data from a questionnaire from open questions [9]. This study described the manifestation of a meaningful and sustainable value of research skills in the study of biodiversity learning. This research had conducted from March to June 2021.

The data collection procedure used purpose sampling was carried out in the qualitative snowball sampling. The instrument was a questionnaire distributed via WhatsApp in Google form format. The questionnaire contained questions about whether they have equipped research skills in biodiversity study by applying a framework Research Skill Development (RSD) which facets consist of 1) Embark & Clarify 2) Find & Generate, 3) Evaluate & Reflect, 4) Organize & Manage, 5) Analyze & Synthesise, 6) Communicate & Apply [10]. There were also open questions about the manifestation of a meaningful and sustainable value of research skills in the study of biodiversity learning. It was related to the implementation in general and in citizen science activities by lecturers.

### 2.3. Data Analysis

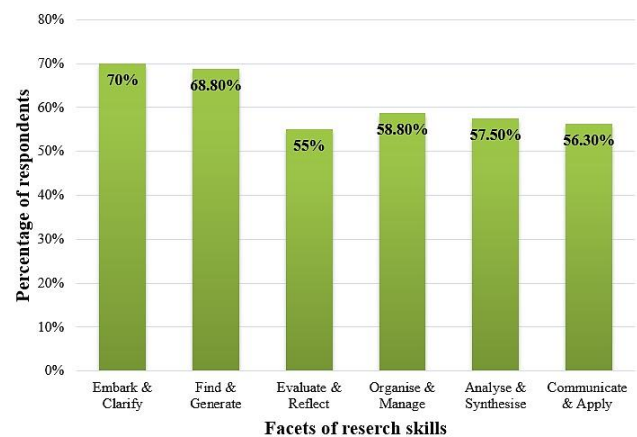
The process of analysis and interpretation of qualitative data collection had done by coding the data. This had done to mark the respondent's open answer regarding the application of the value of meaningful and sustainable research skills based on the criteria made by the researcher with the values contained in citizen science. Significant value criteria include: developing the research conducted; cooperating with other parties; researching results into useful information; research providing solutions to solve problems; there is further research. While the criteria for sustainable value are students continuing the research that had done for the thesis topic; writing research results in the form of research articles published in scientific seminars or published in scientific journals; participate in the Student Creativity Program. The

researcher's interpretation of the findings had done by expressing the researcher's personal views, making comparisons between the findings and the literature, mentioning limitations, and suggesting future research.

## 3. RESULTS AND DISCUSSION

The research skills Developments (RSD) framework is the archetype for the Models of Engaged Learning and Teaching (MELT), as research on the RSD guided the broad parameters for engaged learning and teaching [11]. The facets of research are as follows: 1) Embark & Clarify: Respond to or initiate research and clarify or determine what knowledge is required, heeding Ethical, Cultural, Social, and Team (ECST) considerations; 2) Find & Generate: Find and generate needed information/data using appropriate methodology; 3) Evaluate & Reflect: Determine and critique the degree of credibility of selected sources, information and data generated. Metacognitively reflect on processes used; 4) Organize & Manage: Organize information and data to reveal patterns and themes and manage teams and research processes; 5) Analyze & Synthesise: Analyze information/data critically and synthesize new knowledge to produce coherent individual/team understandings; 6) Communicate & Apply: Discuss, listen, write, present and perform the processes, understanding, and applications of the research, and respond to feedback, accounting for ethical, cultural, social and team (ECST) issues [10].

The results showed that 97.6% of respondents stated that they had equipped research skills for their students. Figure 1. showed the details of the result. It can be seen in Figure 1. that more than half of the respondents have implemented the Facets of an RSD framework. The most used facets were Embark & Clarify (70%), and the other hand the least used were Evaluate & Reflect (55%). The results of the study can be explained that Embark and Clarify was an activity that is mostly carried out by respondents because it is an early stage in conducting research skills. While the Evaluate & Reflect activities were the fewest activities carried out by respondents, it was possible that the Evaluate & Reflect activities had not used to being carried out by them.



**Figure 1.** The equipped research skill

The results of field research were conducted by testing the integration of the RSD framework into Biology courses at the University of Indonesia and testing how the framework helps

academics and freelance staff develop students' critical thinking. The results indicated two benefits: self-perception of critical thinking and student laboratory reports were suitable for the RSD framework [12]. Based on the positive results of the research, it is possible that in the future, lecturers can further improve their efforts to equip research skills by conducting all facet research by the RSD framework.

Regarding the implementation of citizen science, 46.3% of respondents stated that they knew about citizen science activities and 37.8% of respondents said that they integrated citizen science to provide students with research skills. Based on the respondents' open answers about the implementation of citizen science, the researchers tried to find various criteria for a meaningful value in the activities carried out. Some of the activities carried out by the respondents are shown in Table 1. The results obtained in Table 1. described that the lecturers had manifested a meaningful value in providing research skills in teaching biodiversity material. The value obtained by developing research, collaborating, and providing useful information has emerged, while the value of providing solutions and sustainability is still not very visible. It is necessary to conduct more in-depth interviews to obtain information about the implementation of the value of providing solutions and sustainability of the activities carried out.

Several examples of activities obtained in this study indicated that these activities had led to citizen science activities. The field of education has challenges in providing meaningful education for its students. Citizen science can be used in student project activities to participate and exploit citizen science in the academic sector [13]. An example of the activities of participants involved in citizen science in other countries was involved in a galaxy observation project called Green Peas. After carrying out the observation process according to the research procedures, it showed that the scientific research activities can be carried out become more meaningful. [14]. The results of research based on case studies from the Oak Bodyguard Citizen Science Project

**Table 1.** The meaningful value in activities

No	Activities performed	Meaningful value criteria in research activities				
		Develop research conducted	Cooperated with other	Research results become useful information	Research provided solutions to solve problems	There was a follow-up research
1	Writing scientific papers.	√	√	√	-	√
2	Using Citizen Science online and identifying plants with PI@ntNet.	√	√	√	-	-
3	Students make in-depth presentations and consultations with stakeholders involved in research.	√	√	-	-	√
4	Collecting public opinion through the distribution of questionnaires.	√	√	√	-	-
5	Students take data about the benefits of garden plants for the residents of Banjar Angga Sari in Bukit Jimbaran, Badung, Bali.	√	√	√	-	-
6	Students document the diversity of species in the surrounding environment and make a short report containing photos of plants and their characteristics.	√	√	√	-	√
7	Organoleptic tests using probands involve the community as users of research results.	√	√	√	-	-
8	Conducting FGDs involving the community related to biodiversity research.	√	√	√	-	-
9	Researching lake management involving the community in monitoring activities.	√	√	√	-	-
10	Students conduct surveys or interviews with local communities during field practice and Community Service Program.	√	√	√	-	√
11	Involving the community in data collection for independent ethnobiology/ethnoscience in research projects	√	√	√	-	-
12	Students are conducting practical work directly with farmers and involving in community service programs to increase their provision for implementing problem-solving-based programs.	√	√	-	√	-

show that students can support ecological research activities [15]. Students should construct the concepts they have to learn based on experience and the meaning of facts or learning experiences. They should too interpret some of the information obtained as secondary data. They could gain mastery of concepts in a correct and meaningful way to equip them to learn others concepts that are relevant to more advanced [16].

Based on the analysis of the criteria for meaningful learning from the activities obtained in this study, it had explained that of the five criteria made, all of the existing activities almost met the three existing criteria while the two criteria were still not well informed. It shows that meaningful learning is carried out. For the next steps, the quality of citizen science activities by containing meaningful values needs to be improved so the five criteria can be implemented in lecture activities. Meaningful learning involves education actors in the learning process to connect new information/subject material with existing knowledge/concepts in their previous cognitive structure. Every student who acquires new information in the learning process will add, modify, update, revise, and change their previous understanding and prior knowledge. It has more value and becomes more meaningful [17].

Continuous activities are part of meaningful learning. This study tried to describe the research activity that usually is carried out by lectures on campus. Figure 2. showed the results of this study. It had known that the follow-up that mostly was done by lecturers was asked students to continue their research for the thesis (76.80%). While the follow-up by participating in the national of the Student Creativity Program had only done by 46.30% of respondents. The results of this study indicated that the lecturers had carried out several activities which were a manifestation of the value of sustainability from the provision of research skills carried out.

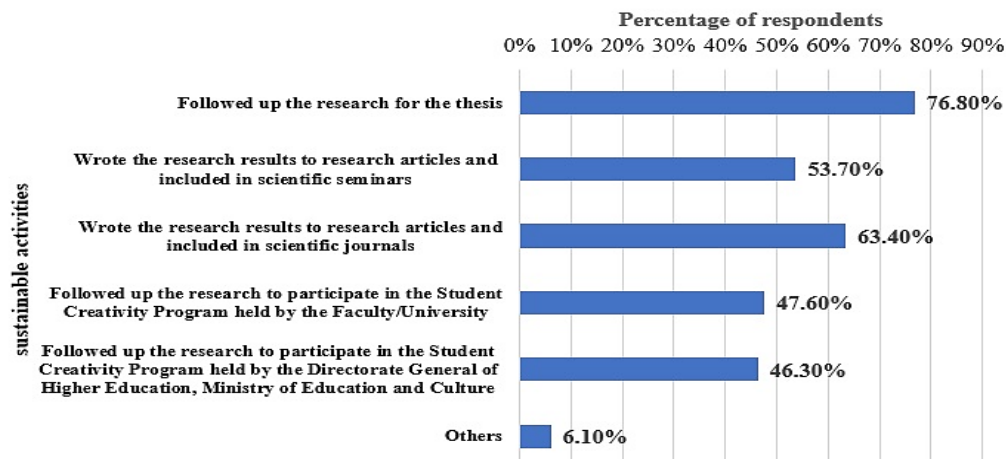


Figure 2. The sustainable value in activities

The study results indicated that follow-up activities by making scientific writings included in seminars or published in journals had adequate responses. Nearly more than 50% of respondents have done these activities. Examples of the results of previous research were the integration of scientific article writing activities in animal systematics lectures to train scientific literacy for students. From lecture activities, it followed up by writing scientific papers. In this study, the data had based on the results of students' research who did field practicum in the Mangrove Education Park Area, Labuhan Madura. Students succeeded in producing 11 reports of field practicum activities as scientific articles [8].

The results of follow-up research for participation in The Student Creativity Program were still less than 50% of respondents. This activity has good opportunity to be followed up because The program aims to grow, accommodate, and realize students' creative and innovative ideas. It had an impact on increasing student achievement, and higher education achievements in the ranking carried out by the Ministry of Education and Culture. In addition, the Student Creativity Program output produced can obtain a patent or Intellectual Property Rights/HAKI [18].

Research skills with meaningful and sustainable values are expected to be a provision for students. It can be continuously utilized and updated, both in academic activities at school/campus and off-campus. It can be participating in social organizations or social activities that require research skills in carrying out their activities such as citizen science activities. In addition, the provision of research skills can be used when continuing in higher education (S2/master or S3/doctor) or used in the world of work. Biodiversity material possible to be explored as research that can provide solutions in preserving local and global biodiversity.

#### 4. CONCLUSION

The conclusion of this research, the lecturers have realized the value of meaningful and sustainable research skills in the study of biodiversity learning. It is hoped that this manifestation can be developed into other forms of activities that are more varied, meaningful, and sustainable.

#### AUTHORS CONTRIBUTION

All authors conceived and designed this study. All authors contributed to the process of revising the manuscript, and at the end all authors have approved the final version of this manuscript.

#### ACKNOWLEDGMENT

Acknowledgment is given to Lembaga Pengelola Dana Pendidikan (LPDP)/Indonesia Endowment Fund for Education, Ministry of Finance of The Republic of Indonesia for the scholarship, research and publication costs.

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