Efforts to Recycle the Tofu Waste Through Learning Project Based Entrepreneurship

Sa'diatul Fuadiyah^{1*} Ristiono Ristiono¹ Astuti Muh Amin² Romi Adiansyah³

Adi Maladona⁴ Dina Rahmawati²

¹ Biology Department, Faculty of Mathematics and Sciences, Universitas Negeri Padang, Indonesia

² Biology Education Department, Faculty of Teacher Training and Education, IAIN Ternate, Indonesia

³ STKIP Muhammadiyah Bone, Indonesia

⁴ Universitas Galuh, Ciamis, Indonesia

*Corresponding author. sadiyah@fmipa.unp.ac.id

ABSTRACT

Our research to apply learning project based entrepreneurship to high school students. The research method is *weak experiment*. The sample used in this study were 1 class taken using *cluster random sampling*. The instrument used in this study was the assessment of student performance. The results of the analysis show that the project learning based entrepreneurship can recycle tofu waste into a new product and students are able to carry out entrepreneurial activities. In addition, students' creativity in finding tofu waste processing is good enough by making products that are aesthetically and economically valuable.

Keywords: Learning Project based Entrepreneurship, tofu waste, assessment.

1. INTRODUCTION

Environmental pollution is one of the biggest problems faced by Indonesia along with the development of Science and Technology (Science and Technology) and the increase in human activities related to natural resources, without being matched by environmental stewardship that causes a decrease in quantity and the quality of existing natural resources[1]. The problem of environmental pollution affects the life of all organisms today and in the future because it can disturb the ecological balance[2]. There are around 84,000 tofu craftsmen (small or large scale) in Indonesia. The tofu craftsman consumes about 2.56 million tons of soybeans per year[3]. This if calculated simply produces concentrated waste of 14.6 million liters, if calculated overall there would be a rough figure of around 20 million liters per year[4].

The concentration of the hydrogen tofu waste ion industry tends to be acidic and this condition has exceeded established quality standards. However, industrial waste water knows its quality depends on the process used. If the process is not done properly, then the content of organic matter in the waste water will be high, and this is dangerous. Thus, if the tofu waste is not treated properly, the bad effects will accumulate[5]. Environmental-based education has an important role in preventing and overcoming the environmental pollution that has been described previously.

Education needed to overcome the environmental pollution referred to above, needs to facilitate the development of abilities demanded in the 21st century such as critical thinking, communication, collaboration,

creativity and other abilities[6]. One of the learning that suits these needs is a project-based learning model or called the project learning. Some research states that the implementation of project learning is proven to be able to increase the creativity of students in Indonesia[7].

Therefore, to optimize the benefits of long-term learning project, learning that is implemented needs to be based on entrepreneurship. The subject of biology in line with this is the concept of environmental pollution, which is recycling waste into something of economic value. It is hoped that through entrepreneurship-based learning, students will be able to creatively recycle waste as a proactive action on environmental pollution. That is, entrepreneurship has a positive correlation with creativity[8]. Creativity is one of the important factors needed in entrepreneurship[9]. By applying entrepreneurial-based learning, students are required to continue to think creatively and students will be honed and formed over time. In addition, it also said that *creative individuals are more likely to engage in entrepreneurial behavior*[10].

With entrepreneurship-based learning, it is expected to be able to equip students with life skills so that students are able to compete in the 21st century education and the era of the industrial revolution 4.0 and become equipped to maintain life because not all students are able to get a higher education either in the background by incapability in terms of academically and economically. So learning biology not only equips students with biological concepts but also life skills that come from learning biology, for example recycling organic waste.

2. MATERIAL AND METHODS

The research method used is *weak experiment* or *pre-experimental design*, where the *PPA* entrepreneurship-based is applied to an experimental text^[11]. The application of entrepreneurial PPA requires a lot of time and energy, so researchers want to focus direct and detailed observations on its application in one class. Measuring the success of making tofu waste recycling into an entrepreneurial product, namely by using product valuation. The project-based learning in this study is learning to conduct an investigation of the problem of handling waste and then make the project to recycle the solid waste of tofu into pudding and brownies that are suitable for eating. The stages of project based entrepreneurship learning undertaken include starting with the essential question, designing a plan for the project, creating a schedule, monitoring the students and the progress of the project, assessing the outcome, and evaluating the experience. The learning process starts from determining the basic questions about handling organic waste problems, designing organic waste recycling project planning, arranging project implementation schedules, monitoring students and the progress of their projects, testing the results, evaluating experience of project activities and results that have been carried out. The learning stages are carried out during the four learning

meetings. Each meeting takes 3x45 minutes. The stages of the meeting are:

- First meeting, students and teachers visit the waste collection place. Students make observations and see problems that occur in the environment.
- The second meeting, students present the results of observations at the first meeting and design the manufacture of waste treatment products.
- The third meeting, students carry out waste recycling practicum.
- The fourth meeting, students present the results of waste treatment at the third meeting and the teacher provides reinforcement of concepts, facts, and material procedures. Then students carry out activities
- Entrepreneurial by selling pudding and brownies from tofu waste recycling to teachers and friends at school.

3. RESULT AND DISCUSSION

3.1. Result

Table 1. Student group product assessment statistics

Group	<i>Fluency</i>	<i>Flexibility</i>	<i>Elaboration</i>	Originality	Average
Kelompok II	100	89	89	89	92
Kelompok III	100	100	89	78	92
Kelompok IV	89	100	89	89	92
Kelompok V	89	100	89	78	92
Kelompok VI	100	100	89	78	92
Average	86	98	89	84	92

Table 2. Statistical data for individual student product assessment

Student	Value	Student	Value
SP 1	94	SL 20	92
SP 2	94	SL 21	92
SP 3	94	SP 22	92
SL 4	92	SL 23	89
SP 5	92	SP 24	89
SP 6	92	SP 25	94
SP 7	92	SP 26	94
SP 8	92	SL 27	92
SP 9	92	SL 28	92
SL 10	92	SP 29	94
SL 11	92	SP 30	89
SL 12	92	SP 31	89
SP 13	92	SP 32	90
SP 14	92	SP 33	91
SL 15	92	SP 34	92
SL 16	92	SP 35	93
SP 17	92	SP 36	94
SP 18	92	Average	92
SL 19	92		

For clearer statistics on product valuation statistics can be seen in the Diagram follow in

Figure 1. Product Assessment Diagram

Based on the results of the product assessment, groups and individual students are quite capable of making alternative products of tofu recycling, but most groups make products that are less in accordance with the project design solution. That is because students make products that are exactly the same as those made before, and there are some products that are less tasty, the texture is still soft, but overall students have been able to make tofu waste processing products into edible food. Product assessment can also be seen from the results of sales or entrepreneurial results made by students, what is the amount of profits generated

by students from the results of entrepreneurship in waste tofu recycling products. It can be seen that students can do entrepreneurial activities, but there are still groups of students who do not benefit from selling products, this is because not all products are sold at one time. The following is shown a picture of tofu waste recycling products and students' entrepreneurial activities.

Figure 2. Student Products

Figure 3. Students Selling Products to Teachers

4. CONCLUSION

In general, the stages of teacher implementation and student activities in each learning meeting learning project based on entrepreneurship on the concept of waste recycling can be implemented well. The results of students' creativity after participating in the learning project -based entrepreneurship from the aspect of making products as a way to process tofu waste quite well by producing products that have economic value and high taste as a form of problem solving and environmental awareness. Students and teachers give positive responses to learning project based entrepreneurship. Students state that learning can increase creativity, motivate learning, foster awareness, awareness and responsibility for preserving the environment. The teacher realizes the importance of teaching science not just understanding concepts, but how teachers can produce graduate students who will later be ready to face problems in real life by using the science they already have.

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