

# Reflections on the Success Biology Entrepreneurship: A Case Study of Developing Student Entrepreneurial Self-Efficacy

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**Abstract** Biology Entrepreneurship Education has become a mandatory course that imparts a distinct characteristic to its graduates. There is an expectation that students will possess an entrepreneurial spirit and immediately establish businesses upon graduation. However, entrepreneurship education often leaves a gap between expectations and real-world outcomes. This research aims to elucidate reflections on the success of education on Entrepreneurial Self-Efficacy. We conducted a case study involving students who have completed the biology entrepreneurship course. Twenty students were selected based on specific criteria for in-depth interviews. The findings indicate that all students reported an enhancement in Entrepreneurial Self-Efficacy, including proficiency in business searching, business planning, business marshalling, and implementation. Additionally, it was observed that a substantial number of college graduates do not pursue entrepreneurship after graduation. Field findings reveal that graduates from entrepreneurial backgrounds are more likely to continue entrepreneurial ventures after graduation. Further research can be conducted to evaluate entrepreneurship education programs focusing on specific post-graduation achievements and the factors influencing graduates in pursuing entrepreneurial endeavours.

## 1 Introduction

Biological entrepreneurship refers to developing and applying biotechnological, life science, and biomedical science innovations in business [1]. This includes founding companies, developing biology-based products, and understanding the business aspects of the biotechnology and biological sciences industries [2]. As technology advances and discoveries in the field of biology advance, entrepreneurship in the field of biology becomes increasingly essential in connecting science with markets and societal needs.

In recent decades, there has been a surge in entrepreneurship education in the higher education sector, particularly in biology education and research on entrepreneurial learning and teaching [3]. Accumulating evidence suggests that entrepreneurship education, on average, has a positive impact on the development of entrepreneurial skills and entrepreneurial outcomes [4]. Although this evidence is reassuring to entrepreneurship educators, research is still needed to decipher what pedagogical approaches best support entrepreneurship education.

Research on how entrepreneurs learn from experience shows that reflection is important in entrepreneurial learning [5]. Reflection involves questioning assumptions, reappraising experiences, and considering alternative ways of acting, understanding, and thinking [6]–[9]. Based on studies of how entrepreneurship education works and literature on pedagogy, recent research suggests that reflection is an important, or even essential, aspect of entrepreneurial learning among students [1], [8], [10]–[13].

Although a growing number of studies investigate the impact of entrepreneurship education, particularly in biology [3], [4], [14]. Very few focus on the reflective aspect of learning based on entrepreneurial self-efficacy as a learning outcome. The reflection process helps entrepreneurial students learn throughout their education. [11]. However, although there are indications that reflection is important for entrepreneurial learning inside and outside the classroom, there is a need to conduct more quantitative research on the relationship between reflection and entrepreneurial learning in university settings [6], [9], [11], [15]. The problem arises because the literature on the role of reflection in education and training is fragmented across fields and is based primarily on theoretical reasoning rather than empirical testing [6].

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This research investigates the reflections on students' success in business after taking biology entrepreneurship courses. More specifically, this success is measured from entrepreneurial self-efficacy with aspects of business searching, business planning, business marshalling, and business execution. Thus, this research is intended to explain self-reflection in entrepreneurship education in increasing entrepreneurial self-efficacy.

## 2 Method

This research was conducted using qualitative methods using a case study. This research was conducted on biology students at the State Islamic University of Maulana Malik Ibrahim Malang in 2023. Case studies are an appropriate method for understanding the extent of the results of entrepreneurship learning among biology students on entrepreneurial self-efficacy. Several categories of case studies include exploratory, descriptive, explanatory, interpretive, and evaluative, with a research process that pays attention to the researcher's carefulness and focus. Exploratory case study methodology is used to obtain reflections on the results of learning carried out in the classroom.

In the research, 20 students in semester seven were used as research respondents. These students were given biology entrepreneurship lessons for 12 meetings. The specific criteria in the inclusion process are students who have taken biology entrepreneurship courses. Data collection for this research was carried out by answering research questions through semi-structured interviews. Twenty respondents were actively involved in the research process. The data collected is in the form of personal identity and reflective responses on aspects of business searching, business planning, business marshalling, and business execution. In this research, several lecture assignments were also collected from respondents.

Interview data and lecture assignment data were analyzed descriptively. Apart from that, two questions only require a "yes or no" answer to each aspect, which is analyzed quantitatively descriptively. Questions include: "Do you think the learning provided can help guide you in designing a business?" Do you think you have adequate skills in designing a business?".

## 3 Result and Discussion

These results detail four aspects: business searching, business planning, business marshaling, and business execution. These four aspects are the main themes forming our field findings. Specifically, Figure 1 below is the central theme of this research.

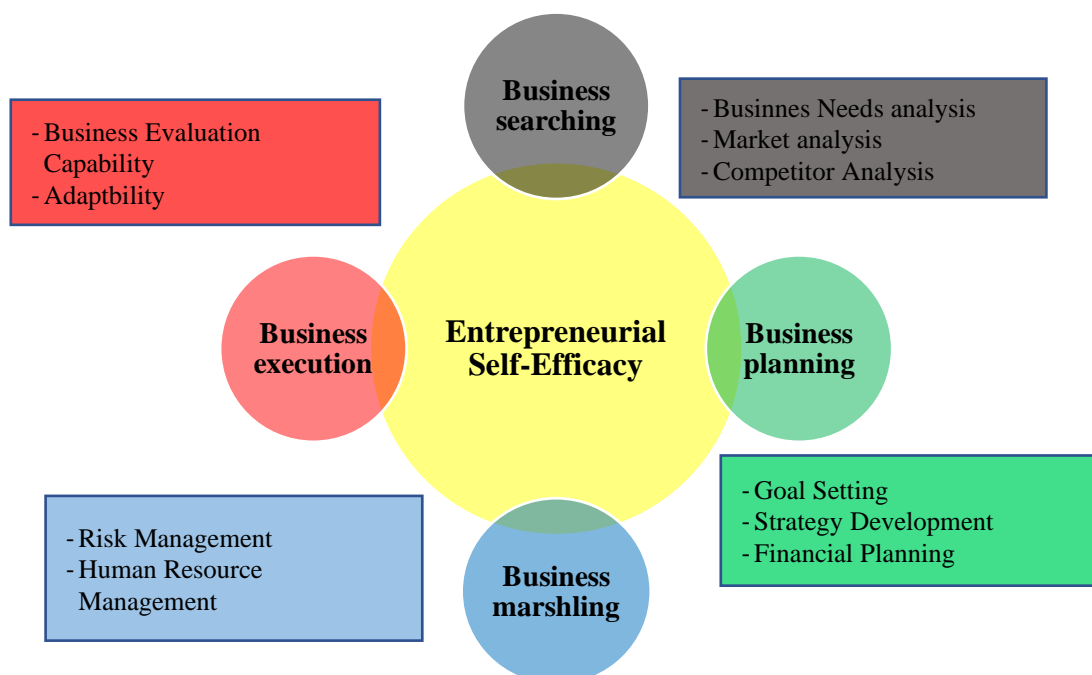


Fig. 1 Component of Entrepreneurial Self-Efficacy

### 3.1 Business Searching

Business searching refers to the process of searching for and identifying business opportunities. In this context, there are three leading indicators: business/service needs analysis, market analysis, and analysis of opportunities and competitors. Within this aspect, we pose questions such as, 'How do you understand and search for business opportunities?' and 'What steps have you taken to gather information about business searching?' We meticulously recorded all interview results during this session. Students were asked to share their experiences while participating in biology entrepreneurship courses. In response to the question “*Do you comprehend how to find a business from this lecture*”, it was observed that 95%, or 19 students, answered yes, while 5%, or one student, answered no. Figure 2 below illustrates the results of student responses regarding business searching.

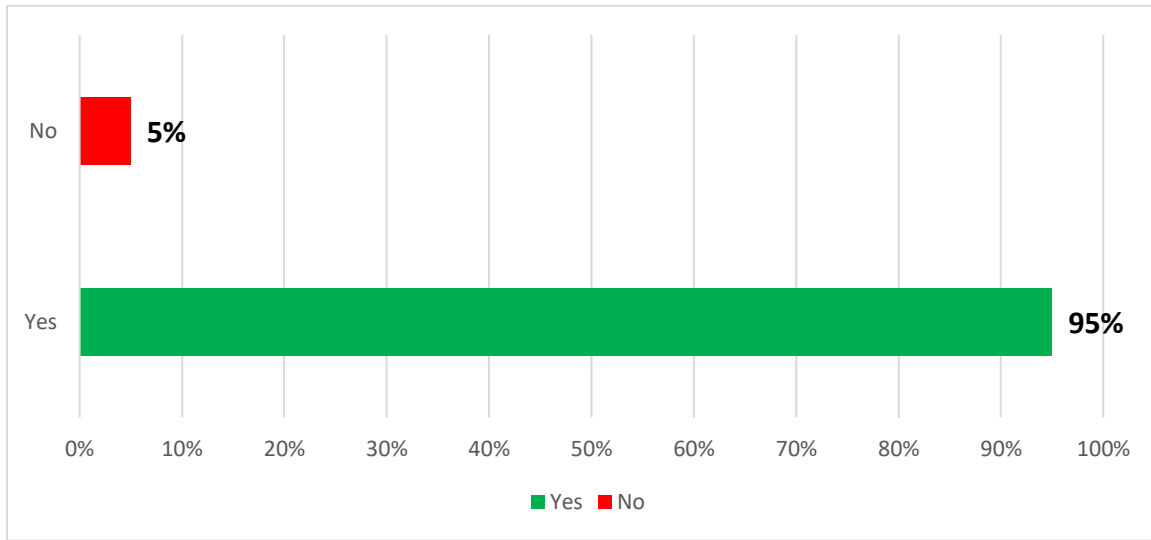


Fig. 2 Students' Responses After Receiving Business Searching Material

Based on the interview results, each student possesses good knowledge and skills. Four respondents stated, 'I have conducted initial observations to gain early business development experience. These observations include the process of market surveys, industry trends, competitor analysis, and the identification of current unmet market needs.' However, one student expressed, 'I still find it challenging to analyze business opportunities because currently, all business areas are already pursued by others, making it difficult to come up with something new.' Thus, students have provided responses indicating that they have gained experience in learning biology entrepreneurship and have had practical opportunities directly in the field through market observations.

### 3.2 Business Planning

Business planning involves strategic planning that includes setting business goals, developing business strategies, financial planning, and human resource planning. In this aspect, several questions arise, such as "*How do students understand setting business goals to be developed? What kind of strategy is formulated to develop the business? What is the financial and human resource planning in the business being built?*" Interview results revealed that some respondents expressed, "*I am trying to develop a business from the family business that has been running. I am attempting to modify the product with the business goal of producing new and varied products*".

Many respondents responded positively regarding business planning, even though everyone has the potential and capabilities to plan their developed businesses. One respondent answered, "*I am developing a business with the aim of creating job opportunities for myself and others*". In addition, from several answers, their business goals include increasing personal income by developing various types of businesses such as culinary, organic vegetable business, green fertilizer, plastic-free soap, and natural aroma therapy.

Thus, students understand the goals of business development. Regarding strategy and financial planning, some students have a good understanding of concepts and strategies, as evidenced by their answers, indicating that they have designed product development strategies and planned the financial needs of their businesses. One respondent stated, "*From my understanding of financial planning concepts, I try to calculate the financial needs of the business to be developed, so I*

obtained information about the need for Rp.4,000,000 as initial capital for the business, and the products will be sold at a price of Rp.13,000 per item".

Students' understanding of Business Planning is generally reflected in goal setting at 100%, strategy development at 95%, financial planning at 90%, and natural resource planning at 95%. This result is presented in Figure 2 below.

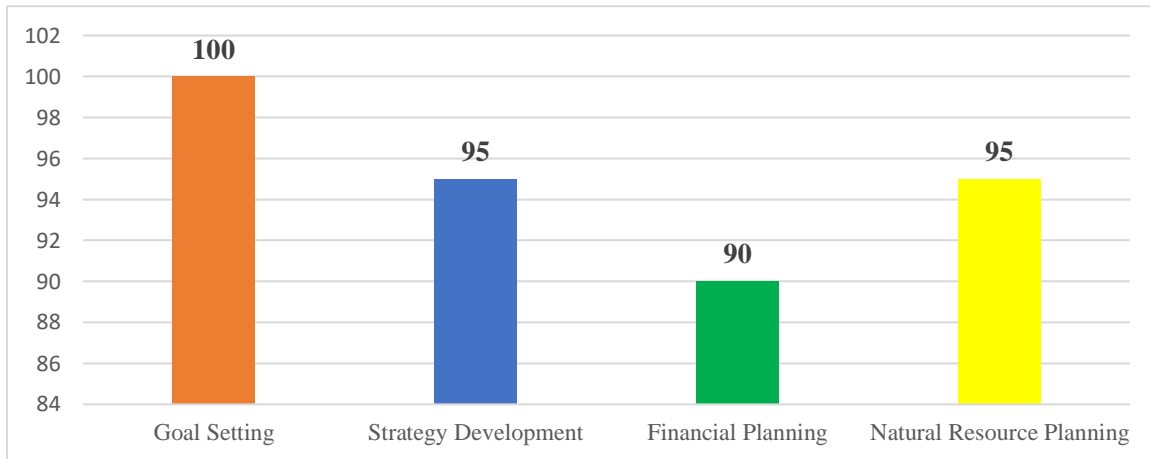


Fig. 3 Students' Responses to Business Planning Skills

### 3.3 Business Marshling

Based on the interview results of respondents about risk management, it is known that they have designed ways to identify risks, assess existing threats, and plan how to handle them. One respondent stated, "I understand what needs to be prepared in facing business risks, both in identifying those arising from business activities or factors from the business environment". Another respondent explained, "I am still learning to understand every existing risk and trying to plan how to overcome them." From the interview results, the researcher can conclude that all students can understand risk management.

Moving on to the next indicator, Human Resource Management, we found that students have organized their functions and tasks well in business development. This entrepreneurship education allows students to develop businesses in groups, allowing them to allocate roles and tasks within the businesses they are developing. Respondents explained, "The beginning of this business journey, we will focus together as a group of friends to make funding more efficient and effective" In addition, respondents have divided tasks and roles for each group member, such as "We have divided tasks and roles like production division, marketing division, searching and development division, packaging design division, and financial division". One respondent added, "Each division has tasks and roles that must be carried out for the business to run maximally". These interview results indicate that each respondent understands how to allocate roles and tasks for each human resource.

### 3.4 Business Execution

Business execution is measured by business evaluation capability and adaptability to the market environment. All students who attended the lectures were successful in developing businesses. One student said, "We are developing a food business". This business has received positive responses from customers, where our market is students around campus". Many students explained how they tried to promote the products they developed and some challenges they had to overcome when starting in the business environment.

Students collect customer responses to the products being developed through consumer response questionnaires. One of the students stated, "On average, our customers fill out the questionnaire with answers that they like our products. This response makes us happy and enthusiastic to continue developing this business". One student explained, "I improved the product that had been developed through the suggestions given, such as improving the shape of the packaging, adding a variety of flavors to the food and reconsidering the sales price which consumers still felt was high". Thus, students have evaluated their products and tried to consider improvements in maintaining the product's existence on the market.

### 3.5 Discussion

Reflection provides essential information in confirming the success of a complete learning achievement for students. This reflection is specific to a person's entrepreneurial self-efficacy after entrepreneurship education [14], [16]. Entrepreneurial self-efficacy (ESE) is described as the result of learning cognitive elements that can stimulate entrepreneurial readiness in the real world [14], [17], [18]. Besides, self-efficacy is the initial source of motivation in every action taken, especially in entrepreneurship education. This self-confidence refers to people's ability to organize and carry out actions to achieve predetermined goals [14], [18], [19].

Reflecting on learning outcomes in ESE is essential in utilising and applying entrepreneurial knowledge directly in the field [10], [11], [20]. We found that students have excellent entrepreneurial self-efficacy and have produced entrepreneurial products. These results refer to four aspects: business searching, business planning, business marshalling, and business execution. The business searching aspect, which starts with business introduction and identifying business opportunities, is the initial factor in starting a business [21]–[23]. The preliminary analysis results serve as a stepping for students to progress to the next stage [24]–[26].

The finding from reflection on business planning shows that students stated that they could not only plan a business [23]. This reflection is based on Goal Setting, Strategy Development, and Financial Planning. In the results of this interview, we observed that students were generally able to meet all the indicators. However, financial management still needs to be improved for students because they need more experience and capital.

Business planning requires good analytical skills [27]. The planning phase describes ideas designed into a business plan [14]. Planning is integrated to do business [28]. Several studies reveal that planning directly influences a person's business intentions [14], [28], [29]. Thus, success in planning provides good results for the subsequent business development process.

Apart from that, business marshalling impacts students' business skills. This stage provides the ability and skills to face business risks and human resource management [13] [10]. Human resource management is a strategic step in continuing business development. Adeniyi et al. (2022) found that the challenge of resource-gathering skills continues to raise global concerns among the younger generation. Then, human resource management skills help overcome problems and face business changes [30].

The success of the educational process can be seen from the achievement of learning objectives. So, the last element observed is how students can execute a business. This adaptability is rooted in the ability to survive in the existing environment, especially in the business being developed [16], [31]. The skills obtained in this business are survival by carrying out goals, business management, risks and human resources, and market competition [27]. Most student respondents have demonstrated the ability to handle business execution aspects.

### 4 Conclusion

This research has shown the results of in-depth reflection on 20 students who took biology entrepreneurship courses at universities. This research aims to comprehensively explore the success of entrepreneurship education for students based on a reflection of students' experiences participating in biology entrepreneurship lectures. The data shows that students have attended courses well and completed assignments according to the lecturer's instructions. Students also develop business ideas gradually, from initial design to product evaluation.

This reflection emphasizes students' acquisition of knowledge, skills and experience during the learning process and practice in the field. The focus is business searching, planning, marshalling, and execution. From the research findings, we found that students already understand conceptually about entrepreneurship and carry out product development and business practices by selling the developed products.

In this research, we acknowledge that there needs to be more access to business development experiences because students carry out business development in groups. So that experience in practice is carried out and obtained together. It must be accepted that this is due to time constraints in the lecture process. However, through intensive interviews, we can overcome these shortcomings.

As a suggestion for further research on this topic, we suggest that other researchers conduct it in a broader sample. Additionally, using college programs to infuse business skills will help reveal deeper data. Moreover, some lecturers have recently tried integrating business skills as a final product. This process provides an opportunity to review further the entrepreneurial experiences students gain. Further research can also be conducted to evaluate entrepreneurship education programs focusing on specific post-graduation achievements and factors influencing graduates in pursuing entrepreneurial ventures.

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