

Development of Bio-Entrepreneurship Book: Review of Its Practicality and Effectiveness in Biological Entrepreneurship Learning

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Abstract: One of the graduate profiles of the Biology Education Study Program, as a form of preparation for the demands of the 21st century, is entrepreneurs in the field of biology. To achieve this goal, it is necessary to instill an entrepreneurial spirit in higher education biology learning, in this case in biology entrepreneurship courses. The biology entrepreneurship course itself is a new course in the Biology Education Study Program, so it still requires relevant teaching materials. The limitation of teaching materials that integrate biological concepts with entrepreneurial values is the reason for the development of the Bio-Entrepreneurship Book based on local potential. The purpose of this study is to describe the practicality and effectiveness of the developed Bio-Entrepreneurship Book in biology entrepreneurship learning. This study uses Educational Design Research (EDR) with the Plomp model. The practicality and effectiveness data were tested through Tessmer evaluation, namely at the one-to-one evaluation and field test stages, with data collection techniques using questionnaires and pre-tests and post-tests. The results of the study indicate that the developed Bio-Entrepreneurship Book is practical based on student responses and effective in supporting biological entrepreneurship learning based on learning outcomes and student motivation responses. Thus, the Bio-Entrepreneurship Book is suitable for use as an alternative teaching material that can foster students' entrepreneurial spirit.

Keywords: Bio-Entrepreneurship Book, biological entrepreneurship, effectiveness, practicality.

Introduction

One of the requirements for 21st-century college graduates is the ability to survive and thrive in the face of changing times. Colleges are required to produce graduates who are able to seize various opportunities in global competition. Entrepreneurship has become a trending topic in certain fields of study in education (Blankesteyn et al. 2021). Biology, as a field of study, has great potential for the development of entrepreneurship. Therefore, one of the graduate profiles of the biology education study program at UIN Antasari Banjarmasin is to become a biologist entrepreneur. A special course offered to support the achievement of this profile is biological entrepreneurship.

Entrepreneurship studies in higher education have the potential to help students develop their entrepreneurial spirit (Atmojo et al. 2022). Biology learning can be linked to the real world to create innovation and carry out entrepreneurial activities so that students can upgrade their skills in facing the challenges of the times (Wardani et al. 2025). Entrepreneurship in biology education is a great opportunity in the era of the creative economy. Biology students are not only required to understand theoretical concepts, but also to be able to apply biological knowledge to produce products of economic value. However, in practice, biology entrepreneurship learning is often still theoretical and has not been linked to local potential. Students find it difficult to come up with business ideas that are relevant to the field of biology and the

surrounding environment. The lack of books on entrepreneurship related to specific fields of application is cited as a major challenge affecting the role of lecturers as course facilitators (Fulgence 2015). Moreover, the biology entrepreneurship course is relatively new to students, so teaching materials, media, or other learning aids are needed to support the achievement of the course objectives. This condition shows the need for innovative, contextual, and applicable learning materials.

Previous studies have shown that the development of teaching materials related to biological entrepreneurship has been proven to increase students' interest in entrepreneurship by providing real examples of commercial products based on biological innovations (Hayati & Fitriyah 2021). Innovation for entrepreneurship that prioritizes local biological resources and strengthens entrepreneurial character can be trained through the use of teaching materials that integrate biological concepts into entrepreneurship (Hakim et al. 2023). In addition, teaching materials that link biological concepts to entrepreneurship will further strengthen the application of knowledge in the real-life context of students.

Previous studies have shown that the development of teaching materials related to biological entrepreneurship has been proven to increase students' interest in entrepreneurship by providing real examples of commercial products based on biological innovations (Hayati & Fitriyah 2021). Although the development of entrepreneurship-based teaching materials in the field of science has been widely carried out, most of them still focus on the development of e-modules or other digital media. Most of the teaching materials developed are not yet comprehensive and contextual for biology students (Retnowati et al. 2021; Yulianti et al. 2022). Entrepreneurial innovation that prioritizes local biological resources and strengthens entrepreneurial character can be trained through the use of teaching materials that integrate biological concepts into entrepreneurship (Hakim et al. 2023). In addition, teaching materials that connect biological concepts with entrepreneurship

will further strengthen the application of knowledge in the context of students' real lives.

Referring to existing problems and opportunities in the field, this study developed the Bio-Entrepreneurship Book as a solution, which is a book on entrepreneurship in the field of biology based on sustainable biological resources. The Bio-Entrepreneurship Book contains guidelines and examples of processing regional food products based on local potential. Buku yang dikembangkan tidak hanya memenuhi aspek teoritis namun juga teruji empiris di lapangan. This book is expected to be easy to use and able to improve the learning outcomes and entrepreneurial interest of biology students.

Methods

Research design

This study uses Educational Design Research (EDR) which aims to produce a product in the form of a bio-entrepreneurship book, as well as to assess its practicality and effectiveness in biological entrepreneurship learning. The practicality and effectiveness data were tested through Tessmer evaluation, namely at the one-to-one evaluation and field test stages, with data collection techniques using questionnaires and pre-tests and post-tests. Student motivation during the application of biological entrepreneurship after learning using the Bio-Entrepreneurship Book was taken from a questionnaire responding to the use of the Bio-Entrepreneurship Book in learning. This research was conducted in the Biology Education Department at the Faculty of Tarbiyah and Teacher Training, UIN Antasari Banjarmasin. The research subjects were students of the Biology Education Department who took the Biology Entrepreneurship course. The research section on the implementation of the learning process was conducted at least 3 times.

Data collection and analysis techniques

Data analysis of the research results will be conducted with reference to the data generated and related references. The following are details of the

data, data sources, instruments, and data analysis techniques that will be used in this study.

Table 1 Data, Data Sources, Data Collection Instruments, and Data Analysis Techniques

Data	Data Sources	Data Collection Instruments	Analysis Techniques
The Practicality of Bio-Entrepreneurship Book	Student responses to the Bio-Entrepreneurship Book practicality questionnaire	Bio-Entrepreneurship Book Practicality Questionnaire	Quantitative and Qualitative
Effectiveness of learning using the Bio-Entrepreneurship Book	Student Pre-Test and Post-Test Results	Test Questions	Quantitative and Qualitative

Practicality data was extracted from students' responses to the Bio-Entrepreneurship Book practicality questionnaire and then categorized based on Table 2 below.

Table 2 Practicality Category Bio-Entrepreneurship Book

Scor	Category
81% – 100%	Very practical
61% - 80%	Practical
41% - 60%	Quite practical
21% - 40%	Not very practical
0% – 20%	Not very practical

Source: Akbar 2022

The effectiveness of learning will be obtained from the results of the pre- and post-tests. Next, the data will be analyzed using N-gain calculations based on the following formula Hake (1998):

$$\langle g \rangle \equiv \frac{\% \langle G \rangle}{\% \langle G \rangle_{maks}} = \frac{\% \langle S_f \rangle - \% \langle S_i \rangle}{100 - \% \langle S_i \rangle}$$

where $\langle S_f \rangle$ is the final test average and $\langle S_i \rangle$ is the initial test average. N-gain scores after further calculations are categorized according to Table 3.

Table 3 N-Gain Category

Range	Category
$\langle g \rangle \geq 0,7$	Tinggi
$0,7 > \langle g \rangle \geq 0,3$	Sedang
$\langle g \rangle < 0,3$	Rendah

Source: Hake 1998

Effectiveness was also assessed based on motivation, which was measured through student

responses after using the Bio-Entrepreneurship Book and calculated using the Guttman scale score.

Table 4 Guttman scale

Answer	Scor
SS (Strongly agree)	1
TS (Disagree)	0

Calculation of data presentation obtained using the formula:

$$\text{Percentage } (\%) = \frac{\text{Total Score for each question}}{\text{Number of Respondents}} \times 100\%$$

The motivation categories in the calculation can be seen in the table below

Table 5 Motivation Category Scale

Percentage Score	Category
81 % - 100%	Very high
61% - 80%	High
41% - 60%	Moderate
21% - 40%	Low
0% - 20%	Very low

Source: Iskandar 2008

Results And Discussion

Research findings on Development of Bio-Entrepreneurship Book: review of its practicality and effectiveness in biological entrepreneurship learning presented as follows:

The Practicality of Bio-Entrepreneurship Book

The practicality of the Bio-Entrepreneurship Book teaching material was measured through student responses to its ease of use, attractiveness,

usefulness, and efficiency. Table 6 below shows the results of the practicality of the teaching material developed.

Table 6 Results of the Practicality Assessment of the Developed Book

No.	Respon Siswa	Skor	Total Skor	Persentase
1.	SS	138	216	75%
2.	S	78		
3.	TS	0		
4.	STS	0		

Source: Data Processing Results

The Effectiveness of Bio-Entrepreneurship Book

The effectiveness of the Bio-Entrepreneurship Book as teaching material developed for the biological entrepreneurship course can be seen from the

learning outcomes and learning motivation of students. The following is a presentation of data on its effectiveness.

Table 7 Student Learning Outcomes After Using the Bio-Entrepreneurship Book

No.	Student's name	Scor		g	N-Gain
		Pre Test	Post Tes		
1.	HLP	70	90	0,67	Moderate
2.	RS	60	100	1,0	High
3.	NR	40	80	0,67	Moderate
4.	GMUA	40	90	0,83	High
5.	PN	50	80	0,6	Moderate
6.	NKA	60	90	0,75	High
7.	NK	50	100	1,0	High
8.	TM	40	90	0,83	High
9.	NH	30	80	0,71	High
10.	NM	50	90	0,8	High
11.	AN	30	100	1,0	High
12.	YN	40	90	0,83	High
13.	AN	50	100	1,0	High
14.	MIS	30	80	0,71	High
15.	NA	40	80	0,67	Moderate
16.	HL	40	80	0,67	Moderate
17.	EAS	50	100	1,0	High
18.	IWP	60	100	1,0	High
19.	AN	40	90	0,83	High
20.	WD	40	80	0,67	Moderate
21.	MH	50	100	1,0	High
22.	MF	60	90	0,75	High
23.	DNP	70	100	1,0	High
24.	NK	30	90	0,85	High
25.	DKP	40	80	0,67	Moderate
Average				0,79	High

Source: Data Processing Results

Table 8. Motivational response after using the Bio-Entrepreneurship Book

No	Questions	Answer		Category
		SS	TS	
1	I enjoy entrepreneurship.	100%	0%	Very Good
2	I know there is a specific field of entrepreneurship in biology.	100%	0%	Very Good
3	I am increasingly interested in culinary entrepreneurship in South Kalimantan.	100%	0%	Very Good
4	After reading this book, I realised that I still do not know much about how South Kalimantan's cuisine can be linked to biology.	100%	0%	Very Good
5	After reading this book, I have learned a lot about the culinary specialities of South Kalimantan	100%	0%	Very Good
6	After reading this book, I have become interested in exploring the biology of entrepreneurship	100%	0%	Very Good
7	I feel it would be a waste not to take advantage of opportunities in entrepreneurship	100%	0%	Very Good
8	I understand that there are risks in entrepreneurship	100%	0%	Very Good
9	I want to start a business with small capital and maximise profits	100%	0%	Very Good
10	I understand how to make culinary dishes through the image and video tutorials attached via barcode	100%	0%	Very Good
11	I feel challenged when I see my friends becoming entrepreneurs.	96%	4%	Very Good
12	I feel unsure about my ability to become an entrepreneur.	32%	78%	Very Poor
13	I think that learning about biological entrepreneurship is closely related to success in biological entrepreneurship.	100%	0%	Very Good
14	I think that the information about nutritional content in the book Biology Entrepreneurship is very helpful for readers to understand.	100%	0%	Very Good
15	This book has helped me understand the study of biological entrepreneurship.	100%	0%	Very Good
16	I have plans to start a business in the field of biology by developing the knowledge I have gained from this book.	100%	0%	Very Good
17	I am motivated to start a business after seeing the business opportunities in the field of biology presented in the Biology Entrepreneurship book.	100%	0%	Very Good
18	It turns out that I have just discovered that the nutritional content of every dish studied in the book has many benefits.	100%	0%	Very Good
19	I am motivated by the dishes presented in the Biology Entrepreneurship book	100%	0%	Very Good
20	I am interested in trying to make the dishes presented in the Biology Entrepreneurship book	100%	0%	Very Good
Average		96,4%	3,6%	Very Good

Source: Data Processing Results

Discussion

The Practicality of Bio-Entrepreneurship Book

Practicality is a follow-up test after the validation stage that is tested on students as users. This practicality test was conducted on 8 students from the class of 2021. The purpose of the practicality test is to describe the ease of use of the South Kalimantan Local Potential-Based Bio-Entrepreneurship Book in lecture activities. In line with this objective, Zahra et al. (2020) conducted a

practicality test after the validation stage to assess the practicality of the teaching materials for users.

Agustyaningrum (2017) stated that the practicality of teaching materials used by students is assessed from various aspects, namely ease of use and presentation. In line with this, Nasution (2024) categorized the practicality instrument into four aspects, namely ease, interest, usefulness, and efficiency, so that this practicality questionnaire instrument assessed these four indicators, namely

the aspects of ease, interest, usefulness, and efficiency. After conducting a practicality test, the results showed that the South Kalimantan Local Potential-based Bio-Entrepreneurship Book scored 75% in the practical category. According to Suniasih (2019) and Fajriyah et al. (2024), teaching materials can be considered practical if they facilitate users in their application in learning.

The research findings show that the Bio-Entrepreneurship Book is practical, in line with Ita's findings (2024), which state that the developed teaching materials are practical based on user assessments. The level of practicality of the Bio-Entrepreneurship Book is in line with Refnywidialistuti's statement (2021) that the developed teaching materials are practical based on aspects of ease of use, learning time efficiency, benefits, and attractiveness. This finding is also relevant to the findings of Alwi et al. (2020) and Jufri et al. (2024), whose teaching materials are also categorized as practical. Thus, the Bio-Entrepreneurship Book can be one of the references in biological entrepreneurship learning at the university level.

The Effectiveness of Bio-Entrepreneurship Book

The assessment of teaching material effectiveness is a summative assessment conducted in development research. This effectiveness measurement assesses student learning outcomes and motivation after using the product. This measurement was conducted on 25 Biology Education students. The Bio-Entrepreneurship Book based on local potential was developed in accordance with the needs of the course, which had been analyzed based on a needs survey that revealed the absence of teaching materials developed based on the local potential specific to South Kalimantan. The research showed that the learning outcomes obtained from the post-test and pre-test scores using the Bio-Entrepreneurship Book based on local potential were in the high category (Aminah & Ulfa 2024). This is in line with the research conducted by Destiara (2020), which found that research on the development of teaching materials based on local potential can improve the effectiveness of learning outcomes. The findings of this study are also in line with the

results presented by Rukmana et al. 2024, which stated that the effectiveness of teaching materials was classified as high with an N-Gain of 0.71.

Furthermore, based on the results of the motivation response questionnaire, it appears that 96.4% of students responded positively to the book that was developed. Students felt motivated to become entrepreneurs after learning to use the Bio-Entrepreneurship Book. Students were motivated to learn based on the response questionnaire provided (Nuryasana & Noviana 2020). The use of the Bio-Entrepreneurship Book increased student learning motivation (Harahap & Abidin 2021). Overall, based on student learning outcomes and motivation, the developed book is effective in supporting learning outcomes in the biology entrepreneurship course.

Conclusions

The Bio-Entrepreneurship Book has been successfully developed, as evidenced by the results of the assessment of the practical book category. The Bio-Entrepreneurship Book is also effective for use as teaching material in biological entrepreneurship learning, based on the high learning outcomes with an average of 0.79 and the high level of student motivation with an average rating of 96.4% (very good).

Acknowledgements: The researchers would like to express their gratitude to LP2M UIN Antasari Banjarmasin for providing support in the form of research grants so that this research could be completed successfully.

Conflict of Interest: The authors declare that there are no conflicts of interest concerning the publication of this article.

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