

ETHNOSCIENCE APPROACH: DEVELOPMENT OF ETHNOBOTANY TEXTBOOK IN IMPROVING CREATIVE THINKING SKILL

ELFRIDA ¹, NURSAMSU ², MARJANAH ³, RAJA NOVI ARISKA ^{4*} and
SALWA REZEQI ⁵

^{1,2,3,4}Universitas Samudra, Jalan Prof. Syarif Thayeb, Meurandeh, Langsa Lama, Langsa City, Aceh, Indonesia.

⁵Universitas Negeri Medan, Indonesia.

Email: ¹elfrida@unsam.ac.id, ²samsu_bio@unsam.ac.id, ³marjanah@unsam.ac.id,

⁴rajanovia@unsam.ac.id (*Corresponding Author), ⁵salwarez@unimed.ac.id

ORCID ID: ²0000-0002-9395-0798, ⁴0000-0003-1330-2991, ⁵0009-0004-8212-2497

Abstract

Textbook is one of the main resource learning materials. The design and adaptation of textbooks used as learning resources must take into account the demands of the students. Students have difficulties in understanding the material as a result of the subpar textbook compilation, particularly in the area of science and biology. Ethnoscience is a form of integrating subject matter with local culture in the surrounding environment; stimulate the meaningful learning for the students. Recently, the ethnoscience become the prevalent and common idea integrated in science curriculum. The aim of the research was to determine the feasibility and effectiveness of the Ethnoscience Approach with the Development of Ethnobotany Teaching Materials in Improving Creative Thinking Skill. This developed textbook had an average value of 92.60% for feasibility test by the material experts, which was deemed to be very valid, while the viability of textbook products to media experts had an average value of 90.37% were categorized as very valid. It is concluded that textbooks suitable for student teaching material. Additionally, the practicality test is rated as extremely good for usage as a lecture material (90.90%). Moreover, the creative thinking skills of the students is classified as good.

Keywords: Ethnoscience Approach, Textbook, Ethnobotany, Creative Thinking Skills

INTRODUCTION

Elements of social life are inseparable from the norms and rules that bind relations between communities and shape culture. The culture that is ingrained in a community is not only based on social, religious, or familial information, but also includes unintentionally incorporated and applied scientific principles. Ethnoscience is the knowledge of a society that shows how they understand the environment that underlies their behavior (Yuliana, 2017). Science is not just a body of information or a finished good, but also includes the process of discovery or how to find out about nature (Iskandar *et al.*, 2019) and as well as a mindset (Siregar *et al.*, 2020). In reality, the rapid development of science and technology creates contradictions in society regarding cultural values and science itself. Many of the community's cultural values are considered old-fashioned and irrelevant to be applied in modern world. In contrast, ethnoscience is the study of communal knowledge and is a cultural heritage that needs to be researched and protected.

Ethnobotany is a form of realization of community knowledge in using and utilizing plants to support basic and secondary needs. It is considered a cultural value since knowledge about a

plant's advantages and uses is typically gleaned from ancestors' firsthand experience and passed down within a community group. The ethnobotanical importance of using plants as building blocks for homes, raw materials for food, clothing, and traditional medicines is still strong today. However, it is uncommon for studies on ethnobotany and its connection to ethnosience to be included in teaching materials, particularly textbooks (Ahmad & Eka, 2022).

Teaching materials are one of the main learning resources and guide learning activities. To ensure that students have the best possible understanding of the content they are studying, teaching materials should be created and adapted to the needs of the students as well as the relevant curriculum. This is consistent with Nasution's (2017) assertion that instructional materials should be created based on the requirements of teachers and students and should be used appropriately to enhance learning. According to Magdalena et al. (2020), instructional materials are deemed to be of good quality if they are pertinent, timely, and able to attract attention. Ethnosience as an activity can be integrated in the form of developing learning tools to increase scientific literacy (Stanley *et al.*, 2001). Additionally, integrating ethnosience into instructional materials has numerous good effects, including improving students' positive reactions to ethnosience-based learning and increasing students' critical thinking, interest, and learning outcomes (Ahmad & Eka, 2022). An ethnosience approach to science learning can be carried out by integrating learning materials with contextual and local wisdom values (Puspasari et al, 2020). Research that integrates ethnosience into educational practice shows a positive effect on improving students' skills. Ethnosience-integrated science learning can also improve scientific literacy and scientific character of students (Atmojo, 2012). Ethnosience integrated learning enables students to apply learning in everyday life and learning becomes more meaningful so that learning outcomes increase (Mihardi, 2013).

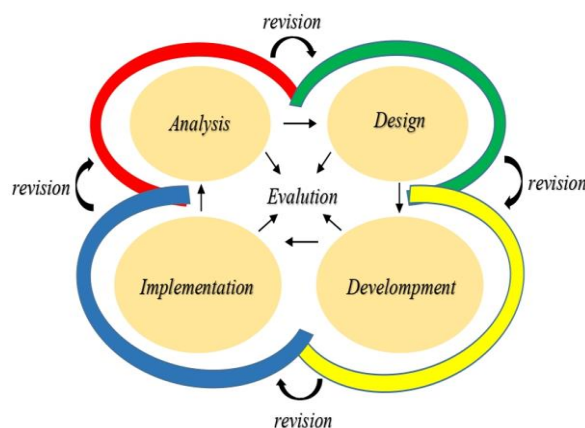
Mahendrani & Sudarmin, (2015) developed a photographic ethnosience booklet on an ecosystem theme that contained local wisdom values by incorporating environmental elements into learning and illustrated through photographs to improve student learning outcomes. The implementation of learning activities is adapted to the local situation and links ethnosience to relevant topics. In other words, the application of ethnosience-based science learning is only applied to certain materials that can be associated with elements of environmental wisdom.

Creative thinking skills are the ability to provide solutions and solve problems so as to create something new. These creative thinking skills are also expressed as skills that aim to be able to solve a problem from various points of view (Fitriyah *et al.*, 2021). Students who possess creative thinking abilities can use their imagination to come up with original theories, hypotheses, or experiments. According to Kurnia et al. (2002), the ability to think creatively is often about how pupils may approach challenges from various points of view. Creative thinking skills are skills that can be trained by giving individuals the opportunity to think and express the ideas that arise within themselves according to their interests and needs (Kartina *et al.*, 2021). Creative thinking skills have a goal so that students can produce ideas or ideas that tend to be new or unique (Sari *et al.*, 2016). Creative thinking skills as a smooth form of a combination of logical thinking and divergent thinking based on intuition but still in awareness (Hasanuddin, 2017). Creative thinking skills need to be improved in students so that students

can answer the problems they face in their own lives (Hagi & Mawardi, 2021). The ability to think creatively is also needed in the mathematical process, especially in the process of formulating problems and solving them (Hamidy & Jailani, 2019). Students can be said to have good creative thinking skills if they fulfill the characteristics of the indicators of creative thinking skills (Ahmad *et al.*, 2022). There are 4 indicators of creative thinking, including fluency, flexible thinking, originality, and elaboration (Silalahi *et al.*, 2020). Creative thinking skills are a part of high-level thinking skills which aim to improve students' thinking skills at a higher level (Purba *et al.*, 2022). Divergent thinking encompasses both spreading and expanding thinking, which is the ability to generate numerous thoughts from a single topic or idea (Noperman, 2022). It is vital to develop the brain in a different way because not everyone is born with the ability to think creatively (Abubakar *et al.*, 2021). Thus, teaching materials in the form of ethnobotany textbooks related to ethnosience can improve the ability to think creatively, which is a reflection of fluency, flexibility, and originality in thinking, as well as the ability to elaborate (develop, enrich, detail) an idea. This definition places more emphasis on aspects of the change process (innovation and variation) (Sternberg, 2008). Creative abilities can also analyze their own ideas and evaluate the value or quality of their personal work, be able to translate theory and abstract things into practical ideas, so that individuals are able to persuade others to agree with their views (Nieveen *et al.*, 2006) The concept of teaching materials like this has not been optimally applied to learning activities by teachers and students, resulting in a lack of students' critical thinking skills and creative thinking regarding local culture related to ethnosience. This causes students to lack the knowledge to develop local culture based on the different therapeutic plants they can find at home. This research developed an ethnobotany textbook that will used as a textbook for lectures.

METHOD

This study used Research and Development/R&D method with ADDIE development model which consists of five stages; Analysis, Design, Development, Implementation, and Evaluation. Schematic of the research stages in Figure 1.



Gambar 1: Development Stage of ADDIE Model

The subjects of this research were 20 students of the biology education study program who took the ethnobotany course. The research instruments consisted of questionnaires, observation sheets, interviews and documentation. While the product assessment was carried out by validating a questionnaire from material experts, media experts, linguists, a practicality test questionnaire for educators and a student response questionnaire. Scoring data uses a Likert scale. The validation value of ethnobotany textbooks is measured using the formula:

$$\text{Percentage \%} = \frac{\text{Total Score of Validation Results}}{\text{Max Score}} \times 100\%$$

The percentage results obtained from the validation analysis of ethnobotany textbooks are categorized into the following assessment criteria:

Table 1: Interpretation of Textbook Feasibility Assessment Scores

No.	Percentage	Interpretation
1.	81% - 100%	Excellent
2.	61% - 80%	Favorable
3.	41% - 60%	Decent
4.	≤ 40%	Bad

Analysis of effectiveness was analyzed using the Normalized gain test (N-gain score). The N-Gain Score division category to determine student learning activeness, can be seen in the following table:

Table 2: N-Gain Score Category

Category	Note
$g > 0,7$	High
$0,3 < g \leq 0,7$	Medium
$g \leq 0,3$	Low

An interpretation of the N-Gain Score effectiveness category to see learning outcomes seen from the following table:

Table 3: Effectivity of N-Gain Score Category

Percentage (%)	Interpretation
< 40	Ineffective
40-55	Less effective
56-75	Fairly effective
> 76	Effective

RESULT AND DISCUSSION

Analyze Stage

This stage includes the stages of needs analysis, material analysis, performance, and student characteristics. The purpose of this phase is to serve as a guideline and consideration in the

preparation of textbooks regarding appropriate materials taught with an ethnosience approach in ethnobotany courses based on student needs.

Design Stage

This stage consists of compiling a textbook framework with a format according to standards, tools and applications used to design, and designing assessment instruments. The purpose of this stage is to design an initial product based on predetermined specifications of teaching materials. The textbook specifications include: (1) textbooks are associated with an ethnosience approach in ethnobotany courses; (2) The ethnosience approach is used as a learning that relates to culture or habits in the environment around students; (3) textbooks use language that is easy to understand and understand; (4) Loading pictures appropriate to the content of ethnosience and ethnobotany courses; (5) Displaying pictures of ethnobotanical plants that draw clear colours and attract students' attention (6) There are six sections of the textbook with discussions that are interrelated to one another. (7) The size of textbooks according to the format developed is paper with a minimum size (width x height) of 15.5 cm x 23 cm, page margins: top 2 cm, bottom 2 cm, left 2 cm, right 2 cm, font using Times. New Roman with size 12, Spacing 1.5, Minimum book thickness 60 pages (outside page i, bibliography, attachments, Glossary, and Index).

Development Stage

Pada tahap ini produk buku ajar etnobotani yang dikembangkan selanjutnya dilakukan penilaian ahli (validasi). Validator yang dipilih berjumlah 6 orang yang terdiri dari 2 orang ahli materi, 2 orang ahli media dan 2 orang ahli bahasa. Tujuan dari tahap ini adalah diperoleh masukan dan penilaian terhadap buku ajar etnobotani yang dikembangkan untuk kemudian dilakukan perbaikan sesuai saran.

1. Feasibility Validation of Ethnobotany Textbook

The results of the data processing were obtained in research activities regarding the Ethnosience Approach: Development of Ethnobotany Textbook which consisted of several aspects of the research results, namely the Validation of Ethnosience-based teaching materials carried out by 3 validators, including 2 Biology Education lecturers. The components included in the validation aspect are the validity of the material expert and the validity of the media expert. The recapitulation of the results of the textbook validation stage is presented in Table 4.

Table 4: Content Validation

No	Rated Aspect	Average%	Category
A	Content Feasibility		
1	Conformity of material with Course Learning Outcome	100	Very Valid
2	Conformity of material with indicator	90.0	Very Valid
3	Conformity of material with learning objective	90.0	Very Valid
4	Conformity of material with concept or theory in biology field	80.0	Valid
Average Score of Content Feasibility		90.00	Very Valid
No	Rated Aspect	Average%	Category

B	Ethnoscience		
1	The accuracy of ethnoscience with ethnobotany courses	100	Very Valid
2	Completeness and accuracy of ethnoscience information	90.0	Very Valid
3	Assist students develop their own ideas	100	Very Valid
Average Score of Ethnoscience Feasibility		96.67	Very Valid
No	Rated Aspect	Average%	Category
C	Presentation Feasibility		
1	Font size and font format affect student readability.	90.0	Very Valid
2	Includes presentation attributes (owner identity, preface, table of contents, concept maps, and bibliography)	85.0	Very Valid
3	Learning activity is well organized	100	Very Valid
4	Citations include clear sources	95.0	Very Valid
Average score of Presentation Feasibility		92.50	Very Valid
No	Rated Aspect	Average%	Category
D	Language Feasibility		
1	The use of sentences in the textbook is in accordance with the rules of the Indonesian language.	100	Very Valid
2	The language used is straightforward, easy to read and understand for students	95.0	Very Valid
3	Proper sentence structure	90.0	Very Valid
4	Understanding of the material presented	80.0	Valid
Average Score of Language Feasibility		91,25	Very Valid
Total Average		92,60	Very Valid

Table 4 explains that in the development of ethnobotany textbook integrated with ethnoscience, the validation results from material experts covering aspects of content quality, ethnoscience, scientific literacy, quality of presentation and quality of language obtained an overall average of 92.60% categorized as very valid. It can be concluded that the textbook is worth to use in ethnobotany class.

Table 5: Validation of Media Expert

No	Rated Aspect	Average %	Category
A	Textbook Size		
1	Textbook size according to ISO standard	95.0	Very Valid
2	The size of the textbook is in accordance with the content material	90.0	Very Valid
Average Score of Textbook Size Feasibility		92,50	Very Valid
No	Rated Aspect	Average %	Category
B	Cover Design		
1	Appearance of layout elements (title, author, illustration, logo) is balanced with the layout of the content.	90.0	Very Valid
2	Color and elements define function	80,0	Valid
3	The letters used are attractive and easy to read	90.0	Very Valid
4	Less letter combinations	100	Very Valid
5	Cover illustrations can describe the contents/teaching materials	85.0	Very Valid
Average Score of Cover Design Feasibility		89,00	Very Valid
No	Rated Aspect	Average %	Category
C	Content Illustration		
1	The suitability of science concepts with the content of textbooks	95.0	Very Valid

2	Compatibility of aspects of scientific competence with questions in textbooks	85,0	Very Valid
Average Score of Content Illustration Feasibility		90,0	Very Valid
No	Rated Aspect	Average %	Category
D	Content Design		
1	Font size and font format selection affect student readability.	90.0	Very Valid
2	There are presentation attributes (owner identity, preface, table of contents, concept maps, and bibliography)	85,0	Very Valid
3	Learning activity is well organized	100	Very Valid
4	Citations include clear sources	85.0	Very Valid
Average Score of Content Design Feasibility		90.0	Very Valid
Total Score		90.37	Very Valid

Table 5 explains that in the development of scientific literacy-based ethnosience textbook products, the validation results obtained from media experts' assessment included aspects of the quality of size feasibility, cover design, content illustrations and content illustration designs obtained an overall average of 90.37% and categorized as very valid. It can be concluded that textbooks are appropriate to be used as learning media for students.

2. Practicality Test

The practicality test of ethnobotany textbooks with an ethnosience approach is carried out by implementing practical activities. Then, students filled out a questionnaire to give their opinion on the application of the ethnobotany textbook that had been developed. Based on the calculation of the percentage of student responses regarding the ethnobotany textbook, it can be obtained in Table 6.

Table 6: Practicality Test

No	Rated Aspect	Average %	Category
A	Content Feasibility		
1	Conformity of the material presented in the textbook with the Program Learning Outcome and Course Learning Outcome to be achieved	90.0	Very Valid
2	Conformity of material with Course Learning Outcome	90.0	Very Valid
3	Conformity of material with concept or theory in biology field	80.0	Valid
Average of Content Feasibility		86.7	Very Valid
No	Rated Aspect	Average %	Category
B	Ethnosience		
1	The accuracy of the ethnosience theme with sub-chapter material classification of living things	95.0	Very Valid
2	The completeness and accuracy of the information content of the ethnosience discourse text	90.0	Very Valid
3	Assist students develop their own ideas	90.0	Very Valid
4	Textbooks present discourses that are in accordance with ethnobotany lecture material	100	Very Valid
5	Textbooks present discourses that can make students hypothesize	85.0	Very Valid
Average Score of Ethnosience Feasibility		92.0	Very Valid
No	Rated Aspect	Average %	Category

C			
Presentation Feasibility			
No	Rated Aspect	Average %	Category
1	Font size and font format affect student readability.	90.0	Very Valid
2	Includes presentation attributes (owner identity, preface, table of contents, concept maps, and bibliography)	80.0	Valid
3	Learning activity is well organized	100	Very Valid
4	Citations include clear sources	90.0	Very Valid
Average Score of Presentation Feasibility		90.0	Very Valid
D			
Language Feasibility			
No	Rated Aspect	Average %	Category
1	The use of sentences in the textbook is in accordance with the rules of the Indonesian language.	90.0	Very Valid
2	The language used is straightforward, easy to read and understand for students	100	Very Valid
3	Proper sentence structure	85.0	Very Valid
4	Understanding of the material presented	85.0	Very Valid
Average Score of Language Feasibility		90.0	Very Valid
E			
Appearance Feasibility			
No	Rated Aspect	Average %	Category
1	The textbook has an attractive cover design	100	Very Valid
2	The appearance of the layout elements (title, author, illustration, logo, etc.) is balanced with the layout of the content.	95.0	Very Valid
3	The letters used are attractive and easy to read	90.0	Very Valid
4	The placement of layout elements (titles, subtitles, illustrations) in each chapter is consistent	100	Very Valid
5	The images presented are clear, attractive and the colors support the clarity of the material	90.0	Very Valid
6	The use of variations of letters (bold, italic, all capital, small capital) is not excessive	100	Very Valid
Average Score of Appearance Feasibility		95.83	Very Valid
Total Average		90.90	Very Valid

3. The Effectiveness of Ethnobotany Textbook to Students' Creative Thinking Skills

The effectiveness of the developed ethnobotany textbook can be seen through the average N-gain score. The N-gain score is a score taken from a comparison between pretest scores and post-test scores based on the stages of students' creative thinking tests. The results of the achievement of students' creative thinking before and after can be seen in the following figure.

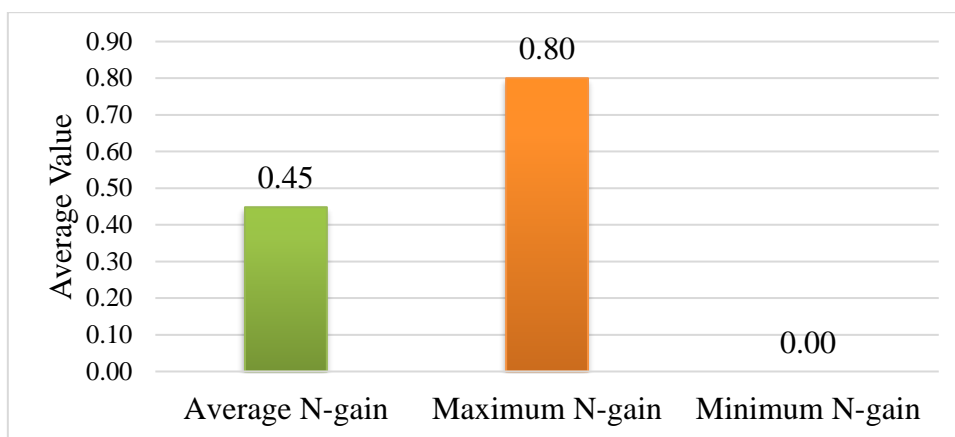


Figure 2: The Effectiveness of Students' Creative Thinking Skill

The diagram (fig.2) shows the result of the N-gain value of students' creative thinking skills with a value before 0.45% and after 0.80%. It shows that the textbooks developed have succeeded in increasing students' creative thinking skills in studying ethnobotanical plants. So it can be concluded that textbooks are categorized as worth to use in ethnobotany class.

DISCUSSION

Research conducted by Liyan states that modules can be used as teaching materials or effective learning media for students (Rizqi, Parmin, & Nurhayati, 2013). The Ministry of National Education also states that science process skills can be used as a guideline in developing several student skills, namely in the form of physical, intellectual and social skills (Arsih, 2016). This is in line with research (Nurhairunnisah & Sujarwo, 2018) which states that an increase in the average posttest score indicates that in general interactive teaching materials are effective in increasing understanding of mathematical concepts after students use the product in learning.

CONCLUSION

The implementation of ethnobotany textbook product development with an ethnosience-based approach was carried out to find out the feasibility test of ethnobotany textbooks consisting of material experts, media experts and due diligence was validation by material experts obtained an overall average of 92.60% categorized as very valid, validation by material experts obtained the overall average of 90.37% is categorized as very valid and validation by practicing experts obtains an overall average of 90.90% which is categorized as very good. While the results of measuring the effectiveness of students' creative thinking abilities increased before with values before 0.45% and after 0.80%, it can be concluded that creative thinking skills experienced a good increase.

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