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Development of Environmental Textbook-Based Ecopedagogy to Increase Environmental Awareness of PGMI Students

Dian Eka Aprilia Fitria Ningrum, [2]Imam Rofiki, [3]Muhammad Syahru Romadhon, [4]Lingga Saniman Derajat
[1,3,4]Universitas Islam Negeri Maulana Malik Ibrahim Malang, [2]Universitas Negeri Malang

**Corespondence:* ningrumdianeka@uin-malang.ac.id

Abstract

Environmental education and ecopedagogy are two things that are aligned to increase the environmental awareness of PGMI students. However, there is no main handbook in the Environmental Education course. Hence, this study aims to develop environmental textbooks based on eco pedagogy for PGMI students. This textbook is used in Environmental Education courses. Environmental Education aims to form a conscious and caring attitude towards the environment. So, this research is also to increase the environmental awareness of PGMI students. The research method used is Research and Development using the Dick and Carey Model with 9 stages. The developed book has gone through the validation and revision stages. The validation results of material experts are 92%, media experts are 89.3%, and learning practitioners are 93%. The validation results show a very valid category with a little revision following expert advice. In the trial 3 students for individual trials with 84% results and 9 students for small group trials with 86% results. Testing the effectiveness of textbooks on 33 students using the pretest-posttest showed an average pretest result of 76.16 and an average posttest of 85.33. The textbooks developed can be used in Environmental Education courses for PGMI undergraduate students.

Keywords: *Environment, Textbooks, Research and Development*

INTRODUCTION

Higher education is one part of the national education system that plays a role in improving the nation's human resources (Abulibdeh et al., 2024; Al Muqarshi, 2024; Chankseliani et al., 2021; Sebola, 2023). The level of education has a strategic role in improving the nation's competitiveness in the face of globalization through the development of science and technology (Menkumham, 2012b). The realization of the government's effort to face globalization in preparing qualified and certified nation's children is done through the formulation of *Kerangka Kualifikasi Nasional Indonesia* (KKNI). The government designed KKNI to equalize the competence of graduates through a framework of learning outcomes in order to provide recognition of work competencies in accordance with the structure of work in various sectors (Menkumham, 2012a).

The qualification level of KKNI consists of 9 levels, where undergraduate students are at level 6. The qualification for undergraduate students is to be able to utilize science and technology in their field of expertise and be able to adapt to situations encountered in problem solving (Menkumham, 2012a). Students are expected to actively develop their

potential along with the development and advancement of science and technology by studying the branch of science they are pursuing. One of the branches of science pursued by PGMI students is Natural Sciences (IPA). Science learning cannot be separated from nature or the environment.

A dynamic environment, always changing according to the activities of living things in it. The emergence of environmental problems has become a global issue. Environmental problems include air pollution, water pollution, waste accumulation, land pollution, chemical contamination, plastic waste accumulation, and others (Hasan et al., 2019; Heidbreder et al., 2019; Rachna & Sharma, 2022; Thompson & Darwish, 2019; Turner et al., 2020). Humans, as multidimensional beings, have a strong correlation with nature or the environment, so damage to nature can have a significant impact on human life. This has a direct impact on human obligations to maintain harmony, harmony, and balance with nature. Humans are part of the planet Earth (Dunkley, 2018). The Quran also emphasizes the importance of preserving the environment as written in QS. ar-Rum verse 41 as follows:

ظَهَرَ ٱلْفَسَادُ فِى ٱلْبَرِّ وَٱلْبَحْرِ بِمَا كَسَبَتْ أَيْدِى ٱلنَّاسِ لِيُذِيقَهُم بَعْضَ ٱلَّذِى عَمِلُوا۟ لَعَلَّهُمْ يَرْجِعُونَ

Meaning: There is corruption on land and in the sea because of the deeds of men, so that Allah may taste to them some of the consequences of their deeds, that they may return to the right path.

In essence, nature has been recognized as having value and worth, but in reality, nature is considered to be an object of life that humans can continue to use, resulting in damage through pollution, pollution, overuse and other bad things. This situation is evidence of the lack of ecological awareness in society. Based on this, environmental education is expected to be a solution to reflect this condition. Thus, environmental education can instill an attitude of ecological literacy (Berman, 2021; Curdt-Christiansen, 2021; Ha et al., 2023; Kahn, 2010; Nuangchalerm et al., 2023).

Environmental education aims to build a human population in the world who are aware of and care about the total environment (whole) and all problems related to it, and people who have the knowledge, skills, attitudes and behaviors, motivation, and commitment to work together, both individually and collectively, to be able to solve various current environmental problems, and prevent new problems from arising. Environmental education is aligned with ecopedagogy. Ecopedagogy is a critical approach to learning that connects the environment and social issues. Two things that need to be considered in ecopedagogy are 1) studying environmental issues and solutions from various perspectives and 2) focusing on indigenous local knowledge and values (Misiaszek, 2020).

Environmental education and ecopedagogy are two things that are aligned to increase the environmental awareness of PGMI students. There have also been many studies on ecopedagogy, including research on the development of ecopedagogy-based American history literature (Nasution et al., 2021); and research on the factors that influence students' ecological awareness (Hendrawan et al., 2020).

The ecopedagogy approach to learning can be supported by the existence of textbooks. There have been many studies on the development of textbooks for students, including research on the development of remedial teaching textbooks for undergraduate Physical Education students (Mustafa & Winarno, 2020); research on the development of textbooks to improve students' concept understanding (Hakim, 2020). Textbook

development is needed to enrich, increase, or deepen students' knowledge (Departemen Pendidikan Nasional, 2008). However, research on the development of textbooks based on the ecopedagogy approach is very rare. Therefore, this research focuses on filling existing research gaps with the aim of developing coursebooks in ecopedagogy-based Environmental Education courses. Based on the results of preliminary studies on PGMI students, especially in Environmental Education courses, there is no main handbook. This research contributes to developing ecopedagogy-based environmental textbooks for PGMI students and analyzing the increase in environmental awareness of PGMI students after using the developed book.

METHODS

This research method is a development research method, with the Dick & Carey development model (Dick et al., 2009) consisting of ten stages. The selection of this development model is based on: (1) there is a strict alignment between learning outcomes, learner characteristics, learning activities, and assessment, (2) there is a relationship between each component, especially the relationship between learning strategies and desired learning outcomes, and (3) the use of empirical data and a repeatable process so that if there are deficiencies in the development product, they can be immediately corrected (Dick et al., 2009).

In this study, it is limited to stage 9 because at stage 9 the developed product has gone through the evaluation and revision stage related to the effectiveness of the product. Briefly, the Dick & Carey development model can be seen in Figure 1.

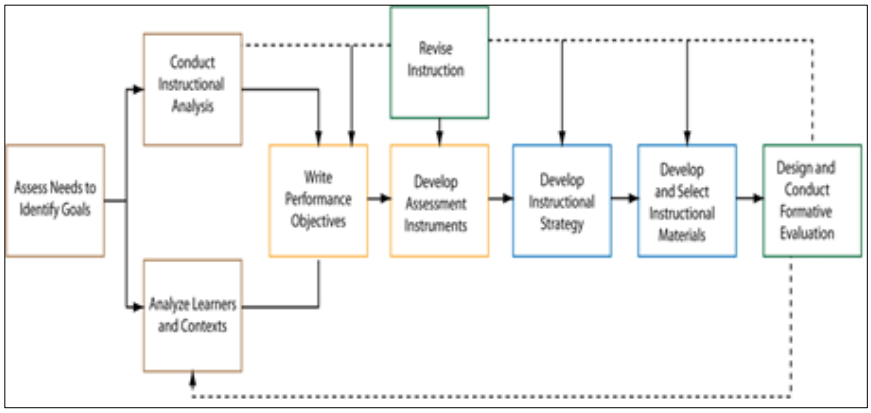

Figure 1. Dick and Carey Model

Dick & Carey's (2009) research and development procedure is as follows.

1. Identify Instructional Goal
   In this first stage, the learning outcomes that must be met by students are identified by analyzing the *Rencana Perkuliahan Semester* (RPS).
2. Conduct Instructional Analysis
   In this second stage, an analysis is carried out regarding the skills, knowledge, and attitudes needed by students to achieve the learning outcomes that have been formulated.
3. Analyze Learners and Contexts
   In this third stage, the initial knowledge and character of students were analyzed through learning observations and interviews.

4. Write Performance Objectives
   In this fourth stage, the learning objectives are written. Learning objectives determine the abilities that students must have after participating in the learning process by using the developed textbooks.
5. Develop Assessment Instruments
   In this fifth stage, an assessment instrument is developed to measure students' ability to achieve the learning objectives that have been previously compiled.
6. Develop Instructional Strategy
   In this sixth stage, the strategy to achieve learning objectives is determined based on the information collected from the previous five stages. The strategy is to develop textbooks.
7. Develop and Select Instructional Materials
   In this seventh stage, the development of textbook content is carried out. The textbook to be developed contains conceptual and applicative material
8. Design and Conduct Formative Evaluation of Instruction
   In this eighth stage, an evaluation of the developed textbook is carried out. There are two types of formative evaluation, namely evaluation by expert groups (validators) and student groups.
9. Revise Instruction
   This stage is a process for revising the developed coursebook. This stage is carried out by analyzing the results of the formative evaluation carried out in the previous stage so as to produce a valid textbook that can be used without revision.

At the time of validation 3 experts, namely material experts, media experts, and learning practitioners. At the time the product practicality test involved 3 students for individual trials and 9 students for small group trials. At the time the product effectiveness test involved 33 PGMI students.

Data collection techniques used observation, interviews, expert validation, questionnaires, and tests. Observation and interview techniques were used to obtain needs analysis data. The expert validation technique was used to assess the validity of the product. The questionnaire technique was used to obtain student responses about the practicality of the product. The test technique is used to obtain the value of environmental awareness of PGMI students through pretest and posttest.

The type of data is quantitative data obtained from the validation sheet in the form of scores, qualitative data obtained from the responses of expert validators and students, and quantitative data on the results of measuring environmental awareness in the form of student test scores.

The data analysis technique is a descriptive statistical analysis technique used to process data obtained from questionnaires and presented in percentage form. The formula is as follows.

$$P = \frac{x}{xi}$$

Description:
P = Percentage of validity
x = the total score of the answers per item
xi = total maximum score per item

The results of the analysis were then summarized based on the validity criteria adapted from (Akbar, 2016), as presented in Table 1.

Table 1. Criteria for the Validity of Research Data Results

Criteria of validity (%)	Level of validity
100	Very valid, could used without revision
85.01 - 99.99	Very valid, could used however need revised small
70.01 - 85.00	Enough valid, could used however need revised small
50.01 - 70.00	Not enough valid, suggested no used because need revision big
01.00 – 50.00	Not valid, no can used

RESULTS AND DISCUSSION

The result of this development is an ecopedagogy-based environmental textbook product used for PGMI students. This textbook is specifically used in the Environmental Education course attended by 5th semester students at PGMI UIN Maulana Malik Ibrahim Malang.

A. Results of The Textbook Development Process

This section will describe the results of research that refers to the Dick and Carey (Dick et al., 2009) development model with nine stages, namely (1) identify instructional goals, (2) conduct instructional analysis, (3) analyze learners and contexts, (4) write performance objectives, (5) develop assessment instruments, (6) develop instructional strategies, (7) develop and select instructional materials, (8) design and conduct formative evaluation of instruction, and (9) revise instruction. The results of the process of developing ecopedagogy-based environmental textbooks for PGMI students according to the stages in the Dick and Carey development model (Dick et al., 2009) are described as follows.

1. Identify Instructional Goal

   In this first stage, the results of identifying learning outcomes are based on the Semester Lecture Plan (SSP) of the Environmental Education course. The results of the identification of learning outcomes for Environmental Education courses are as follows.

   a. Students are able to explain the basic concepts of environmental education
   b. Students are able to apply environmental education
   c. Students are able to analyze various natural resources
   d. Students are able to analyze environmental problems
   e. Students are able to apply environmental ethics

2. Conduct Instructional Analysis

   In this second stage, an analysis was carried out regarding the skills, knowledge and attitudes that must be mastered by students to achieve the learning outcomes that have been formulated. The results of the details of the skills, knowledge and attitudes required are presented in Table 2.

Table 2. Student Skills, Knowledge, and Attitudes

Aspect	Description
S 05	Value diversity culture, views, religion, and beliefs, as well opinion or findings someone else 's original;
S 06	Work same and have sensitivity social as well as concern to society and environment.
KU 01	able to apply thinking logical, critical, systematic, and innovative in context development or implementation knowledge and technology that pays attention to and applies score appropriate humanities _ with field expertise;
KU 02	Able to show performance independent, quality, and measurable.
KK 01	Skilled in arrange document curriculum and plans implementation learning at the MI / SD level with apply principles learning with corner view pedagogy, andragogy, and
KK 06	heutagogy Skilled in develop professionalism and science based integrative Islam and science at the MI / SD level sustainable through development self.
P 05	able to understand Theory eye science _ subjects taught at the MI /SD level are
P 11	appropriate applicable curriculum; _ Able to integrate Science and Islam in MI / SD learning.

3. Analyze Learners and Contexts

   In this third stage, the initial knowledge and character of students were analyzed through learning observations using a learning observation sheet in the Environmental Education course for undergraduate PGMI students at UIN Maulana Malik Ibrahim Malang. The results of learning observations show that presentations made by students do not discuss topics in depth, learning resources for presentation materials are obtained from the internet, students do not use printed books or e-books.

4. Write Performance Objectives

   In this fourth stage, the learning objectives are written. Learning objectives determine the abilities that students must have after participating in the learning process by using the developed textbooks. The learning objectives are presented in Table 3.

Table 3. Environmental Education Learning Objectives

Sub Course Learning Outcome	Theory Learning
Student capable explain about draft base education environment life	Concepts of *Pendidikan Lingkungan Hidup* (PLH), includes: - Definition - Purpose, target, space scope - PLH basics - History of LH up exists day environment life - Constitution or regulation government about Environment Life
Student capable analyze the PLH learning model	Learning models that can applied to PLH, such as: - PBL - PjBL - Inquiry
Student capable analyze about ecology as base knowledge environment	Ecology as base knowledge environment, including: - Individual - Population - Community

Sub Course Learning Outcome	Theory Learning
	- Ecosystem - Interaction between component
Student capable explain about source power natural	People and resources nature, including: - Biological and non- biological; - Updated and not; - Air; - Water
Student capable analyze problem environment life	Problem Environment Life, includes: - Problem environment - Mount Eruption, Tsunami, Earthquake Earth, Fire Forest, Effect Home Glass - Effort to solve problem environment
Student capable analyze about settlement	Settlements: - Problem settlement - Settlement healthy - Criteria Home Healthy - Disease vector control
Student capable analyze response to environment life surrounding	Response to Environment Living in Indonesia, including: - Pressure Public to LH pollutant and destroyer - Institutional about LH - Award in the field of LH
Student capable explain Analysis About Impact Environment (AMDAL)	Analysis About Impact Environment (AMDAL), including: - Type studies - Weaknesses of EIA in Indonesia
Student capable analyze about health environment	Environmental Health, including: - Provision of clean water - Processing and Distribution Food - Management the place general - Control vector disease - Management waste and garbage
Student capable apply ethics environment	Environmental ethics, including: - Definition - Theory ethics environment - Principles ethics environment - Types ethics environment - Ethical basis embodies awareness society and behavior man to environment - Application ethics environment life

5. Develop Assessment Instruments

   In this fifth stage, an assessment instrument is developed to measure students' ability to achieve the learning objectives that have been previously compiled. The assessment instrument used is a test. The test questions refer to 2 main considerations in ecopedagogy, namely 1) studying environmental issues and solutions from various perspectives and 2) focusing on indigenous local knowledge and values (Misiaszek, 2020).

6. Develop Instructional Strategy

   In this sixth stage, the strategy used to achieve learning objectives is determined based on the information collected from the previous five stages of the Dick & Carey development model (Dick et al., 2009). So, the textbook for the Environmental Education course based on ecopedagogy was developed. The textbook in question is

a book that can enrich students' knowledge related to the environment. The ecopedagogy approach was chosen because it is in line with the goal of Environmental Education, which is to foster a sense of care and love for the environment.

The textbook developed is titled "Environmental Education-for PGMI Students". This textbook was developed with the following specifications.

a. The textbook is printed with A4 80 gsm paper size.
b. The font type used is Times New Rowman, size 12, and 1.5 spaces.
c. Images are presented in color, some of which come from various sources, both books and scientific articles and some come from the author's research documents.
d. The material contained in this textbook is a study of the environment, environmental problems, and environmental ethics.
e. The textbook consists of a cover, cover page, preface, table of contents, learning outcomes, how to use the book, contents, and bibliography.

The initial part of the coursebook is the cover of the book (Figure 2). The cover of the book is dominated by green color which is consistent with the content of the book. On the front cover is written the title of the book, the author's name, and accompanied by a photo of the environment which is the author's personal document. On the back cover there is a personal photo of the author accompanied by a brief description of the contents of the book.

Figure 2. Front and Back Cover of the Book

The second part of the coursebook is the preface which contains gratitude for the completion of the developed coursebook, a brief description of the contents of the coursebook, and thanks to those who contributed to the development of the coursebook. The third part of the coursebook is the table of contents which contains the parts of the coursebook and the pages. The fourth section of the coursebook is learning outcomes (Figure 3) which contains a description of the competencies that must be achieved by students in Biotechnology courses. The fifth section of the coursebook is instructions for using the book which contains a brief explanation of the features presented in the

coursebook. The sixth section of the coursebook is a description of the material which is divided into several chapters. The last part of the coursebook is a bibliography which contains a collection of sources used in writing coursebooks.

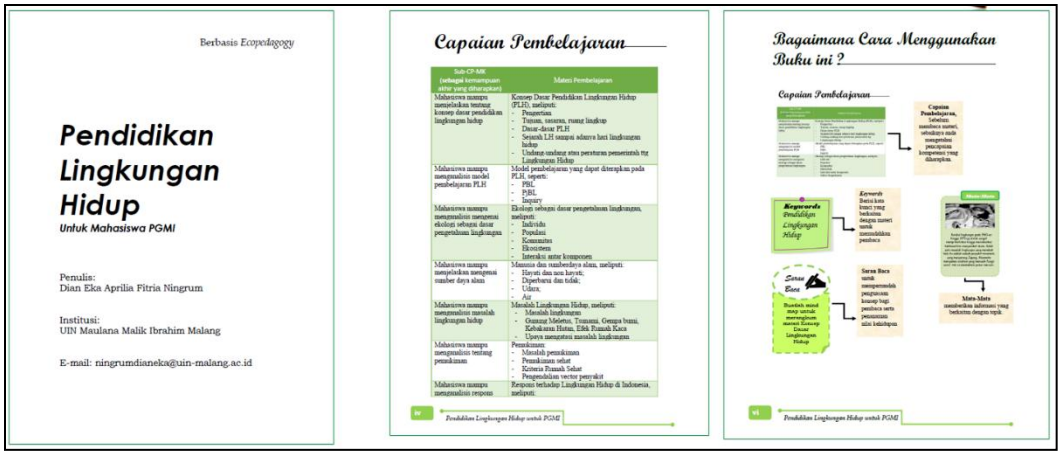

Figure 3. Complementary Contents of the Book

7. Develop and Select Instructional Materials

In this seventh stage, the content of the textbook was developed (Figure 4). The developed textbook contains conceptual and empirical material. Conceptual explanations are summarized from various sources in the form of books and research articles, while empirical explanations are based on data related to the environment. The material studied is the environment.

Figure 4. Some Parts of the Textbook Content

8. Design and Conduct Formative Evaluation of Instruction

In this eighth stage, an evaluation of the developed textbook is carried out. There are two types of formative evaluation, namely evaluation by expert groups and student groups. The expert group consists of material experts, media experts, and learning practitioners. Validation by material experts is a lecturer at PGSD FIP UNESA. This expert is a graduate of elementary school teacher education and has done a lot of research on the development of learning resources and media. Material validation

aims to determine the validity of the material described in the textbook. Validation by media experts is a lecturer in science education FKIP UNEJ. This expert is a biology education graduate and has done a lot of research on the development of teaching materials. Media validation aims to determine the feasibility of the appearance and presentation of coursebooks. Validation by learning practitioners is a lecturer in PGMI FAI UNISMA. This expert is a teacher and head of the Madrasah Ibtidaiyah teacher education study program and does a lot of research on learning. Validation by learning practitioners aims to determine the efficiency of using coursebooks in learning. Evaluation by students as audiences who use coursebooks aims to determine the effectiveness and practicality of using coursebooks. Quantitative data on the results of validation and evaluation by students are as follows.

a. Expert Validation Result Data

1) Material Expert

Assessment by material experts is divided into three components, namely material/substance feasibility, language feasibility, and presentation feasibility. Data on the results of validation by material experts can be seen in Table 4.

Table 4. Data on Material Expert Validation Results

No	Component	Sub Components	Total Score	Max Score	Criteria validity (%)
A	Material / Substance	The material contains element truth from facet knowledge, data, and facts	4	20	90
		The material encourages / move thoughts and feelings reader target for accept idea new or deepen return material.	3		
		The material is actual, appropriate with development of science and technology in the field	3		
		Theory characteristic contextual corresponding with characteristics field knowledge	4		
		Theory could expand insight and skills 21st century	4		
B	Language	Accuracy appropriate choice of words (diction). with reader goals, concepts, and sense values	4	12	91.7
		Writing corresponding with Guidelines General Indonesian Spelling (PUEBI) and Indonesian Standard Grammar	3		
		language used communicative and effective	4		
C	Presentation	Presentation text and/ or picture systematic, coherent, as well coherent as one unity channel think	3	16	93.75
		Presentation text and/ or picture corresponding with ability read and rate development age reader target	4		
		Presentation picture relevant and supportive clarity Theory	4		
		Presentation interesting and creative so that evoke interest read and feel know	4		

No	Component	Sub Components	Total Score	Max Score	Criteria validity (%)
		Total	**44**	**48**	**92**

Based on the validity criteria adapted from Akbar (2016), the results of validation by material experts of 92% indicate that the textbook developed is very valid. Hence, it can be used after being revised based on suggestions from material experts.

2) Media Expert

Assessment by media experts is divided into two components, namely graphic feasibility and presentation feasibility. Data on the results of validation by media experts can be seen in Table 5.

Table 5. Media Expert Validation Result Data

No	Component	Sub Components	Total Score	Max Score	Criteria of validity (%)
A	Book Cover Design	Typography (use of fonts)	4	16	93.75
		element on the cover	3		
		Same cover design with design content	4		
		Cover Anatomy	4		
B	Content / page design book	Typography (use of fonts)	3	24	87.5
		Image form photo or illustration used _	3		
		Quality picture	4		
		Free text from a single row	4		
		Inclusion title runner (running title)	3		
		Use color on the part content book	4		
C	Physical Book	Size book	4	16	87.5
		Quality results print	3		
		Election paper	4		
		Binding book strong and tidy	3		
		Amount	**50**	**56**	**89.3**

Based on the validity criteria adapted from Akbar (2016), the results of validation by media experts of 89.3% indicate that the textbook developed is very valid. Thus, it can be used after being revised based on suggestions from media experts.

3) Learning Practitioner

Assessment by learning practitioners is divided into three components, namely clarity of coursebooks, influence on students, and feasibility. Data on the results of validation by learning practitioners can be seen in Table 6.

Table 6. Data from the Learning Practitioner Validation Results

No	Component	Total Score	Max Score	Criteria validity (%)
1	Textbook clarity	43	44	98
2	Influence on learners	17	20	85
3	Possibility (*feasibility*)	18	20	90

No	Component	Total Score	Max Score	Criteria validity (%)
	Amount	**78**	**84**	**93**

Based on the validity criteria adapted from (Akbar, 2016) that the results of validation by learning practitioners of 93% indicate that the textbooks developed are very valid, so they can be used but after being revised based on suggestions from learning practitioners.

b. Student Practicality Test Data

The test on students was carried out in two stages, namely individual test and small group test. The student test consists of three components, namely clarity of coursebooks, influence on students, and feasibility. Data from individual student tests can be seen in Table 7, while data from small group tests can be seen in Table 8.

Table 7. Individual Trial Result Data

No	Component	Total Score	Max Score	Criteria validity (%)
1	Textbook clarity	110	132	83
2	Influence on learners	50	60	83
3	Possibility (*feasibility*)	51	60	85
	Amount	**211**	**252**	**84**

Based on the validity criteria adapted from Akbar (2016) the results of the individual trial of 84% show that the textbook developed is quite valid, so it can be used but after minor revisions based on suggestions from students.

Table 8. Data from Small Group Trial Results

No	Component	Total Score	Max Score	Criteria validity (%)
1	Textbook clarity	344	396	87
2	Influence on learners	156	180	87
3	Possibility (*feasibility*)	154	180	85.5
	Amount	**654**	**756**	**86**

Based on the validity criteria adapted from Akbar (2016) the results of the small group trial of 86% show that the textbook developed is very valid, so it can be used but after being revised based on suggestions from students.

9. Revise Instruction

Textbook revisions refer to qualitative data in the form of suggestions that have been given by material validators, media, and learning practitioners, as well as suggestions from individual tests and small group tests on students. The results of the textbook revision are described as follows.

a. Expert Validation

1) Material Expert

Qualitative data in the form of suggestions from material experts is one of the basic considerations in revising coursebooks. Some of the things revised in the coursebook are presented in Table 9.

Table 9. Textbook Revisions Based on Material Expert Suggestions

No	Suggestion	Revision
1	Writing a table of contents must be in accordance with applicable standards	Fixed table of contents display
2	There are several terms that are wrong	Replaced the wrong term

2) Media Expert

Qualitative data in the form of suggestions from media experts is one of the basic considerations in revising coursebooks. Some of the things revised in the coursebook are presented in Table 10.

Table 10. Textbook Revisions Based on Media Expert Suggestions

No	Suggestion	Revision
1	On the front cover there is no identity of the study program	Adding the study program identity to the front cover
2	Improve table of contents display	Fixed table of contents display
3	The image title should not be spaced too far from the image	Removes the space between the image and the image title.
4	The use of foreign terms must be in italics, if they are already in the form of loanwords, there is no need	Replace the wrong text
5	Some tables do not have table titles	Write down the table title

3) Learning Practitioner

Qualitative data in the form of suggestions from learning practitioners is one of the basic considerations in revising coursebooks. Some of the things revised in the coursebook are presented in Table 11.

Table 11. Textbook Revisions Based on Learning Practitioner Suggestions

No	Suggestion	Revision
1	Some pages use bullets	Replace with numbering
2	Writing on instructions use book unclear	Replace text on instruction use black book
3	Pay attention to the table font size	Change the table font size to 10

b. Student Practicality Test Data

1) Individual Test

Qualitative data in the form of suggestions from students in the individual test with a total of 3 students who have not taken environmental education is one of the basic considerations in revising coursebooks. The suggestion obtained from the results of the individual test is that the size of the book is too large. The author did not change the size of the book based on the consideration that the pictures in it were clearly visible.

2) Small Group Test

Qualitative data in the form of suggestions from students in small group tests with a total of 9 students who have taken environmental education is one of the basic considerations in revising coursebooks. Some of the things revised in the coursebook are presented in Table 12.

Table 12. Textbook Revision Based on Student Suggestions in Small Group

No	Suggestion	Revision
1	There are some posts that lack contrast with the *background*	Change the text color to black
2	The image on the cover isn't that big	The author does not change the image on the cover because the image is considered to represent the contents of the book. The author highlights the title of the book.
3	There are some pictures that are not clear	The image display is clearer

B. Textbook Effectiveness Test Results

Field trial data were collected using initial and final tests in order to determine the learning outcomes of the target test group, namely PGMI students in semester V who were taking environmental education courses. The results of the development of ecopedagogy-based environmental textbooks to increase environmental awareness of PGMI students are presented in the average results of Pretest and Posttest in Table 13.

Table 13. Pretest Posttest Results

Identity Class	Pretest Average	Posttest average
PGMI Semester V Class A with total 33 students	76.16	85.33

The developed textbook products were validated by material experts, media, and learning practitioners and tested individually and in small groups on undergraduate students of the Biology Education study program who acted as users. The validation test was carried out by involving experts, users, and audience (Akbar, 2016). An expert is someone competent in their field, in this study expert validation by material and media experts. Users are educators who will later use this textbook in learning practices, in this study the users are PGMI lecturers. Audience is students who learn with textbooks, in this study the audience is PGMI students. Validation is carried out to assess the feasibility of coursebooks before use. Textbook validation is an effort to produce books with high validity through validation tests (Akbar, 2016). The validation results follow the validity criteria adapted from (Akbar, 2016).

The results of material expert validation, especially the truth of the material must reach 100%. This is so that there are no concept errors to students as users. Textbook authors need to pay attention to the correctness, currency, and accuracy of the information conveyed based on the discipline concerned (Sitepu, 2015). This research-based textbook has reached 100% for the sub-component of material accuracy (Table 4), by revising according to suggestions from material experts.

The overall result of the material expert validation of the developed coursebook is 92% with a very valid category but there needs to be some revisions. Revisions were made by suggestions from material experts. In the material/substance component,

material experts have provided several suggestions for improvement such as correcting wrong concepts, writing wrong terms, and the order of chapters in the coursebook. This intends that students are coherent in learning according to the RPS developed by the study program. This will be in line with the learning objectives that have been formulated in accordance with KKNI. Every writer will be faced with three basic questions when writing, namely: what to write, who reads it, and how to write it (Trimmer, 2004). The three initial questions can be answered by the curriculum (Sitepu, 2015). Thus, the curriculum is the main reference in writing textbooks. In the language component, suggestions from material experts are that there are some incorrect uses of terms in describing the content of the material and there are some words that are not standardized.

The results of media expert validation of the developed coursebook are 89.3% with a very valid category but there needs to be some revisions. Revisions were made by suggestions from media experts. In the design component of the book cover and book content, media experts have provided several suggestions for improvement such as writing the identity of the study program on the cover, the use of ornamental letters should be avoided, the appearance of the table of contents, the clarity of images, the identity of images and tables.

Improvements to the font used are in the writing of the preface and table of contents, while improvements to the font size used are in the writing of tables. The developed textbook has used a standard font size of 12pt for text and 10pt for tables and images with Times New Roman font style. Improvements in image illustrations are made by replacing images that are less clear and unattractive because they are black and white. The role of picture illustrations in textbooks is to generate interest and motivation, attract and direct attention, help learners understand concepts that are difficult to explain in words, help learners who are slow to read and help them remember longer (Sitepu, 2015). Improvements to the table of contents section are by changing the layout of the table of contents to make it more informative. The table of contents in the textbook serves to make it easier for educators to show students which parts are being studied.

In the presentation feasibility component, the author has used various sources of information such as printed books, e-books, internet media, and research articles. The material or content of the book will be very good if it uses up-to-date references that have relevance from various sources such as books, the internet, magazines, and research journals (Departemen Pendidikan Nasional, 2008). Another improvement is in the instructions for using teaching materials, some parts do not contain instructions for students, so the author makes improvements according to the suggestions of media experts.

The results of the learning practitioner validation of the developed coursebook are 93% with a very valid category but there needs to be some revisions. Revisions were made by suggestions from learning practitioners. The improvements suggested by learning practitioners are that there is still the use of bullets in the book, which should use numbering.

The next discussion is the trials conducted on students including individual tests with 3 students who have not taken environmental education courses and small group tests with 9 students who have taken environmental education courses. The selection of the number of test subjects and groups of students (who have not taken and have taken environmental education courses) is based on the instructions in the Dick and Carey

development model (Dick et al., 2009). The individual trial aims to eliminate obvious errors, including writing errors, image presentation, and clarity of features in the book; therefore, a group of students who have never taken environmental education courses are used as users who learn new knowledge and new skills. The small group trial aims to determine the effectiveness of changes made after the individual trial and whether students can use the book without interacting with the author; therefore, a group of students who have taken environmental education courses are used as users who already have prior knowledge about environmental education.

The results of the individual trial of the developed coursebook are 84% with a valid category so there needs to be some revisions. Revisions were made by considering suggestions from individual trials. The suggestion obtained from the individual test results is that the size of the book is too large. The author did not change the size of the book based on the consideration that the pictures in it were clearly visible. Students did not write other corrections in the suggestion column on the trial sheet. Students wrote that the book developed was good and increased student knowledge.

The results of the small group trial of the textbook developed were 86% with a very valid category but there needed to be some revisions. Revisions were made by considering suggestions from small group trials. In the clarity component of coursebooks, suggestions from students are to improve writing that lacks contrast with the background and improve images that are less clear. In the aspect of influence on students, students stated that the information presented was good, there were applicable activities, and the layout was appropriate. In the aspect of feasibility, students argue that the developed book has motivated students to find out more.

Overall, the results of the validation and trial of this environmental education textbook are very valid and can be used in the learning process after going through revisions according to the qualitative data obtained. This shows that this textbook is in accordance with KKNI so that it can support students in achieving learning outcomes, especially in environmental education courses.

The advantages of this environmental education coursebook are that the material presented in each chapter contains additional new information related to the material, this coursebook invites students to get involved in using the book presented in Chapter 2 in the form of LKPD in accordance with environmental problems, coursebooks are presented with color image illustrations as a result of literature review and the author's personal documents, so that they can help students visualize the material described in the coursebook, and coursebooks integrate with Islam. The disadvantage of this environmental education coursebook is that it has not been fully implemented in direct learning, only a few parts, so its effectiveness needs to be studied further. Textbooks can be used as a supplement to teaching materials for undergraduate students in subjects relevant to the content of textbooks (Jakupčević & Ćavar Portolan, 2024; Weng et al., 2020), especially environmental education courses, and textbooks can be used as a reference in studying the environment (Brownlee et al., 2020).

The use of environmental education coursebooks on a wider scale needs to pay attention to several things, namely that environmental education coursebooks are developed for undergraduate students of the PGMI Study Program at Maulana Malik Ibrahim State Islamic University Malang. The use of textbooks on a wider scale needs to review the suitability of the contents of the book with the target users. The development of this environmental textbook only reached the 9th stage of the 10 stages of the Dick and

Carey development model (Dick et al., 2009). Therefore, it is necessary to do the 10th stage, namely design and conduct summative evaluation, so that it can be utilized on a wider scale.

CONCLUSION

To sum up, the developed textbook can be used as teaching material in the Environmental Education course for undergraduate students of the PGMI Study Program at UIN Maulana Malik Ibrahim Malang. Environmental textbook based Ecopedagogy is declared valid, practical, and effective. The textbook is declared valid based on the results of validation by experts, practical based on the results of questionnaires by students, and effective based on the results of trials during classroom learning. The implication of this research is that students can increase environmental awareness after using the textbooks. The textbook can be used as a supplement to teaching materials for undergraduate students in subjects that are relevant to the contents of the coursebook. The limitation of this research is that the use of textbook on a wider scale needs to review the suitability of the contents of the book with the target users.

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