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Development of an Electronic Supplementary Book on Water Pollution

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Abstract
Water pollution is a scientific study of environmental chemistry on the sources, impacts and fate of chemicals in the aquatic environment, as well as the effects of human activities on them. As a student, you are required to have broad insight and knowledge, especially in dealing with environmental problems in society, by creating a caring character of the environment and finding solutions as an effort to overcome these problems. The purpose of this study is to produce educational materials in the form of additional e-books about water pollution, raising real problems that exist in the surrounding community. In addition, feasibility test and student responses were also measured against the Electronic Supplement on Water Pollution Equipment. The method employed in this study is R&D with the ADDIE model. Research data were collected through speaker and student interviews, due diligence questionnaires and student response questionnaires. The results of the feasibility test conducted by the expert validator on the Electronic Supplementary Book on Water Pollution Material show that the feasibility test for material, language and graphics is 1.00 with a very high validity category. The results of student responses to the Electronic Supplement Book on Water Pollution Material in the limited trial produced a percentage of 86% in the very good category and field trials produced a percentage of 93%.

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INTRODUCTION

Environmental problems are one of the main topics that require serious attention related to environmental care attitudes for the sustainability of environmental preservation. Along with the development of the current era, nature has undergone many changes. These natural changes ultimately affect the occurrence of environmental problems. The events that occur are environmental problems as part of a natural process, which is a natural problem. This natural process that occurs does not cause significant consequences for the environmental order itself. However, environmental problems cannot be said to be problems that naturally occur, if there are significant causal factors for events that occur in the environment as a result of human activity itself (Nina, 2015). One of them is the human lifestyle, which is in line with the increasing number of population growth, making various human activities as an effort to meet the needs of life, often ignoring environmental sustainability, which tends to only consider aspects of economic benefits in various fields (Sitorus et al., 2022). The development of cultural aspects as well as the development of the era in human life, is able to change the character and perspective of humans as the main factor that is more precisely related to environmental problems. The occurrence of environmental imbalances that cause environmental damage and pollution is a result of environmental problems.

Based on the Government Regulation of the Republic of Indonesia Number 22 of 2021 concerning the Implementation of Environmental Protection and Management, it is explained that environmental management and protection are systematic and integrated efforts made to preserve environmental functions and prevent environmental pollution and damage. Humans and the environment, in which there is a reciprocal relationship. Humans affect their environment and vice versa, humans are influenced by their environment. The environment is not only a resource that must be exploited but also a place to live that requires harmony between humans and the environment (Sastrawijaya, 2009).

Pollution is a condition that causes changes due to human activities by entering substances into an environment in concentrations such that the environment does not function as before and has an impact on health, welfare and biosafety (Erwin, 2008). Changes caused by environmental damage in the form of direct or indirect changes such as to the physical, chemical and/or biological characteristics of the environment so that they exceed the standard criteria for environmental damage. The environmental capacity of water reflects the transformation, migration and accumulation of pollutants in water and reflects the maximum limit of pollutants that a body of water can hold under certain environmental target value limits. It is also the basis for formulating quality standards for pollutant disposal and environmental standards (Li et al., 2022). One form of pollution caused by humans is through the activities of the textile industry. Contaminated environment due to waste disposal is a serious threat to health and the wider environment. It was not only direct contamination that resulted in the death of this lifeline, but also the combined effects of urbanization and industrialization (Faroque & South, 2021).

Textile industry activities are found in various regions of Indonesia, one of which is in the area of West Kalimantan, Sambas Regency, Sumber Harapan Village, the people of Kampung Seberang, namely in the form of a woven fabric industry. Based on the information from the local community, the village was nicknamed the weaving tourism village. This is because, weaving craftsmen are the average profession of the village community which has been carried out for generations. Of course, this community activity is very good to continue to be preserved in order to introduce the uniqueness, culture, traditions of an area (Damayanti et al., 2013). However, through interviews conducted by researchers with one of the woven craftsmen, generally in the process of making woven woven fabrics, they still use synthetic dyes, this is in line with research conducted by (Muflihati et al., 2019).

The use of synthetic dyes is based on the relatively cheap price, long lasting, easy to obtain, and easy to use compared to natural dyes. However, there are negative impacts resulting from the use of these synthetic dyes, in the form of waste produced that is still colored and difficult to degrade (Sari & Damayanti, 2020). Based on preliminary studies conducted by researchers, it was found that the waste from the process of making woven cloth did not go through processing beforehand, but was directly disposed of into the surrounding environment, namely the ditches and sometimes the Sambas River. Disposal of dye waste and the washing process of tie threads requires quite a lot of water, so that the colors produced are good and do not fade. The ditch which is the place where dye waste is disposed of is very close to where the weavers live, as well as the Sambas River which is used for people's daily activities, such as washing, bathing, and so on. This shows the lack of public concern for the surrounding environment, which if it continues to be carried out will have a negative impact on various aspects of life.

The act of polluting the environment is tantamount to killing the environment itself so that countermeasures are needed to prevent damage to the surrounding natural environment and to develop efforts to repair the natural damage that has already occurred. Related to the lack of environmental care character possessed by the community, it takes an inculcation of an

environmental caring character. Individuals with character are needed in facing the 21st century (Zulfa & Haryanto, 2021). Environmental education plays a role in socializing and teaching responsible behavior towards the surrounding environment starting at an early age (Schelly et al., 2012). Education and understanding provided regarding the importance of caring for the environment will create awareness and shape environmental care behavior and need to be based on correct knowledge of science (Safrina Junita, 2018). In addition, education also plays a role in producing a generation that has a skilled attitude in solving problems in everyday life, especially in phenomena that occur and involve the environment (Fauziah et al., 2016). Insight and knowledge also play an important role in efforts to scientifically explain and find solutions to overcome environmental problems in society, especially among students.

Based on the results of interviews conducted by researchers with one lecturer in Environmental Chemistry FKIP UNTAN, it was found that the teaching materials used did not connect learning with the existing environment and tended to be more general in nature, and the teaching materials used were limited to data related to pollution which are not specific to the identification of sources, effects, or ways to overcome them. In addition, the researcher also conducted indirect interviews with three Chemistry students at FKIP UNTAN who had taken the course, so that information was obtained that the use of teaching materials had an effect on students' interest in learning, namely the teaching materials used were in the form of Power Point which tended to be limited and contains only important points as a result, does not summarize all the material as a whole and has never used teaching materials based on real problems. This results in a lack of student interest in exploring the material which is the basic cause of the lack of knowledge possessed (Kanapathy et al., 2022).

Based on these conditions, it can be concluded that there is a need for additional teaching materials that support student needs, especially in environmental chemistry courses on water pollution material. The process of learning activities can not be separated from the means and learning tools called teaching materials. Basically, in the learning process in higher education lectures, students are required to have independent efforts. The lecture process like this is what distinguishes student and student learning patterns, where the lecturer is only a mediator and facilitator (Hartono & Noto, 2017). Students as intellectuals must have a good reading culture so that knowledge can easily be mastered. Therefore, students need more information in order to awaken their potential. According to Akbar (2017) the development of information technology requires student awareness of the importance of literacy. The facts that happened in Indonesia based on the latest January 2020 data, UNESCO stated that Indonesia ranks second from the bottom in terms of world literacy, this means that people's interest in reading is very low. According to UNESCO data, the reading interest of the Indonesian people is only 0.001%. As stated in the semester learning plan, there are expected final outcomes in learning, one of which students can explain the types, influences, sources, and solutions in dealing with water pollution based on existing problems. The selection of teaching materials influences literacy skills by relating them to everyday life making concepts easier to understand (Raharjo et al., 2017). So we need a solution that can be used to achieve this.

Additional teaching materials in the form of electronic supplements are a solution that can be given to students. Electronic supplement is an additional book that aims to enrich and improve mastery of science and technology and skills (Suherli, 2008). Regulation of the Minister of National Education of the Republic of Indonesia Number 11 of 2005 article 1 explains that textbooks are included in textbooks which can be divided into several types, namely basic textbooks, complementary textbooks, reading books and source books. The material obtained at tertiary institutions is not limited to the main books. Therefore, complementary books in the form of supplementary books (enrichment books) which contain

material by linking concrete problems related to water pollution are needed to support the learning process. This electronic supplement is compiled by raising real problems regarding water pollution that occurs directly in Sambas Regency so that it brings students closer to their environment by connecting related material that is adjusted to the final results to be achieved. Students who are demanded need to have broad insight and knowledge, especially in dealing with problems in society, so they can obtain information to create a caring character for the environment and find solutions related to these problems that can be applied in social life. There needs to be a strategy to increase the emergence of critical thinking skills, creative thinking and science process skills (Khery et al., 2015).

In the midst of the rapid development of technology, especially in the world of education today, the use of technology is seen as very supportive in efforts to improve the quality of learning (Budiman, 2017). The use of information technology is designed in such a way as to make the implementation of learning effective and can achieve learning objectives (Azizah et al., 2017). In addition, students are closer to technology so that the use of electronic teaching materials is efficient in supporting learning which makes it easier for students to access it accompanied by applicable examples so that it is easy to understand. This electronic supplement will later be developed using the Flip PDF Professional application with a more attractive display design.

METHOD

The research conducted is a type of development research (R&D). The development model applied is the ADDIE model, consisting of five stages, namely analyze, design, development, implementation, and evaluation (Branch, 2009). In this study, the implementation stage was not carried out due to limited time and costs, so this research only focused on the level of feasibility and student response. In this research learning teaching materials were developed in the form of Electronic Supplement Books on Pollution Materials for students.

The Electronic Supplement Book on Water Pollution is a product developed by researchers. The product then passed the due diligence stage by six expert lecturers including two content aspect experts, two language aspect experts, and two graphic aspect experts. The technique used in data collection was in the form of direct communication techniques through interviews while the indirect communication techniques used instruments in the form of due diligence questionnaires and student response questionnaires. The due diligence sheet used is based on the **Badan Standar Pendidikan Nasional** (BSNP). The feasibility test in this study used a Likert scale with four rating scales, namely a score of 4 (very feasible), a score of 3 (decent), a score of 2 (less feasible), and a score of 1 (very inappropriate). Result data were analyzed qualitatively and quantitatively. Analysis of feasibility results data and feasibility calculations refers to Gregory (2015) in Table 1 and is analyzed using equation (1).

Tabel 1. Matriks Gregory

		Appraiser 1	
		Less relevant (score 1-2)	**Very relevant (score 3-4)**
Appraiser 2	**Less relevant (score 1-2)**	(A)	(B)
	Very relevant (score 3-4)	(C)	(D)

(Source: Gregory, 2015)

$$\text{Content validity} = \left(\frac{\text{D}}{A + B + C + D}\right) \quad (1)$$

There are:
A : The two raters disagreed
B : Rater 1 agrees, rater 2 disagrees
C : Assessor 1 disagrees, assessor 2 agrees
D : Both raters agreed

Determination of eligibility criteria for electronic supplement books on water pollution material according to the validator can be seen in Table 2.

Table 2. Criteria for The Eligibility of Electronic Supplementary Books Based On The Results of The Gregory Matrix Tabulation

No.	Koefisien	Validitas
1.	0,8 – 1,00	Sangat tinggi
2.	0,6 – 0,79	Tinggi
3.	0,4 – 0,59	Sedang
4.	0,2 – 0,39	Rendah
5.	0 – 0,19	Sangat rendah

(Source: Agung, 2014)

After the feasibility test by experts and revisions are carried out, the next stage is the student response test. The samples used were 5th and 7th semester students of Chemistry Education FKIP UNTAN who had taken environmental courses. The sampling technique used was a random sampling technique. Student response questionnaires in this study used a Likert scale with four rating scales, namely a score of 4 (strongly agree), a score of 3 (agree), a score of 2 (disagree), and a score of 1 (strongly disagree) for each positive and negative statement. The response test was carried out twice, namely a limited scale trial with 14 student respondents and an extended scale trial with 30 student respondents. Student response criteria for each statement can be seen in table 3.

Table 3. Student Response Criteria for Each Statement

Category	Positive Statement	Negative Statement
SS	4	1
S	3	2
TS	2	3
STS	1	4

(Source: Riduwan, 2016)

Data analysis of student response test results refers to Riduwan (2016) by calculating the total score for each statement and the percentage of total responses using equations (2) and (3).

$$\mathrm{P} = \left(\frac{\sum X}{\sum Xi}\right) \times 100 \qquad (2)$$

There are:
P : Percentage of score acquisition
$\sum X$: The total score obtained for each statement
$\sum Xi$: Maximum total score

$$P_{total} = \left(\frac{\sum P}{n}\right) \qquad (3)$$

While:
P : Percentage of total responses
$\sum X$: Total percentage of score acquisition
$\sum Xi$: Number of statements

The interpretation of determining the response criteria for each statement refer to table 4.

Table 4. Criteria for Student Responses to Electronic Supplement Books on Water Pollution Material

Criteria	Interpretation
Very Less Good	0% - 20%
Not good	21% - 40%
Pretty good	41% - 60%
Good	61% - 80%
Very good	81% - 100%

(Source: Riduwan, 2016)

RESULTS AND DISCUSSION

The results of this study are described based on the stages of the ADDIE model developed by Branch (2009) and only go through 3 stages including Analyze, Design and Development.

Analyze

The analysis stage is carried out with the aim of identifying the possibility of a gap between expectations and the facts that occur in the field (Branch, 2009). In the analysis stage, several procedures are carried out so that the final result is a summary of the analysis. Work gap validation is the initial stage of analysis by conducting interviews with lecturers in environmental chemistry courses, weaving craftsmen, and administering questionnaires to students so that facts that occur in the field are obtained. Based on the results of interviews with the lecturer, it was found that the teaching materials used did not connect learning with the existing environment so that they were limited to data and were not specific to identifying sources, effects, or ways to deal with pollution. In addition, the results of indirect communication to students obtained that the teaching materials used did not summarize all the material and had never used problem-based teaching materials so that it affected students' interest and interest in learning. As for the results of an interview with one of the woven craftsmen, namely that in the process of making woven fabrics they still use synthetic dyes and there is no processing of color waste before it is disposed of which has an impact on the surrounding environment. So that these problems become the main topics that researchers raise and relate to learning materials, especially water pollution material.

The next stage is making performance goals by analyzing learning outcomes so as to produce goals in the form of students being able to analyze the occurrence of water pollution and explain the impact it causes and the hazardous materials it contains based on the problems that occur in society. Then, the process of identifying student characters and the resources needed is carried out by analyzing the teaching materials used previously as the main information in learning. In addition, it is followed by determining how to convey information based on the analysis that has been carried out in the form of developing supplemental teaching materials on water pollution material that are designed using an application and delivered electronically using the professional flip pdf application. Making a plan regarding the product to be developed is carried out by designing project management in the form of a storyboard regarding the concept of Electronic Supplements as a teaching material that will be developed by determining writing, material, appearance, learning strategies, approaches, learning methods and learning resources.

Design

The design phase is carried out to verify the desired performance with the appropriate test method (Branch, 2009). The initial stage of the design process is to carry out the preparation

of tasks and materials that will be included in teaching materials that are adjusted to the expected final results and indicators contained in water pollution material. The next stage is carried out by making performance goals aimed at students to be able to achieve learning goals through the teaching materials provided. After that, it is followed by carrying out a testing strategy in the form of selecting an approach that is appropriate to the teaching material, namely the electronic supplement book that will be developed. The testing strategy used requires students to construct their own concepts obtained through problems encountered in society in the form of electronic book packaging. By preparing assignments and materials that included in teaching materials and adjusted to the expected final results.

The instruments used were feasibility assessment sheet and student response sheet which aimed to assess electronic supplement books. Before being used as an assessment sheet, the two instruments were first validated by 2 experts. The feasibility assessment sheet contains various aspects, namely aspects of content (material and presentation), language, and graphics with 2 expert lecturers as validators in each aspect. The student response assessment sheet is in the form of a questionnaire which will be tested on students. The trial was conducted on chemistry education students who had taken environmental chemistry courses. The tryout was carried out 2 times, namely a limited scale trial involving 14 students from class 2019 and an extended scale trial involving 30 students from class 2020.

Development

At this stage product development is carried out by realizing the designs that have been designed in the previous stage. The selection of supporting media starts from determining the size and type of letters to choosing the appropriate color for the book. The font used is Times New Roman with size 14 for the title and 12 for the content, while the paper size used is A4 (210 x 297 mm). Broadly speaking, the electronic supplementary book consists of a cover, author's identity, preface, table of contents, learning outcomes, introduction, illustrations in the form of pictures of community activities related to the process of making woven ikat cloth from the beginning of stringing the threads to processing the waste produced, the use of substances color, the impact of the use of dyes, ways of coping, conclusions, practice questions, glossary, index, list of references, and author profiles. The hardware and software needed in this design stage include smartphones, laptops, Flip PDF Professional, Google Drive, Microsoft Word 2016, and the website https://www.drv.tw/.

Making a guide for educators is also carried out at this stage which aims to make it easier for educators to use electronic supplement books. After that, a formative revision was carried out as a form of evaluation of the teaching materials which consisted of validation, revision and trial steps. The instruments used were in the form of a feasibility assessment sheet and a student response sheet which aimed to assess electronic supplement books. Before being used as an assessment sheet, the two instruments were first validated by 2 experts. The feasibility assessment sheet contains various aspects, namely aspects of content (material and presentation), language, and graphics with 2 expert lecturers as validators in each aspect. The student response assessment sheet is in the form of a questionnaire which will be tested on students. The trial was conducted on chemistry education students who had taken environmental chemistry courses. The tryout was carried out 2 times, namely a limited scale trial totaling 14 students from class 2019 and an extended scale trial totaling 30 students from class 2020. This stage produces teaching materials in the form of electronic supplement books on water pollution material which are then validated by experts. The assessment indicators for various aspects of content (material and presentation), language, and graphics can be seen in table 5.

Table 5. Indicators for Evaluating Aspects of Content, Language, and Graphics

Eligibility Aspect	Assessment Indicator
Content	Appropriateness of material with achievements, accuracy of material, up-to-date material, encouraging curiosity, presentation techniques, and presentation support
Language	Straightforward, communicative, dialogic and interactive, as well as compliance with language rules
Graphics	Suitability of the size of the supplement book with ISO standards, the cover design of the electronic supplement book, and the design of the contents of the electronic supplement book

The content aspect of validation consists of material and presentation. The feasibility of the contents was validated by two experts who mastered the subject of water pollution.

Material Aspect

The content aspect feasibility sheet instrument can be seen in table 6.

Table 6. Assessment Indicator for Material Aspect

Assessment Indicator	Rating Items
Appropriateness of material with achievements	1. The material presented includes material contained in the learning outcomes, namely explaining the types, effects, and sources of water pollution
	2. The material presented reflects the description that supports learning outcomes
	3. The material presented starts from the introduction of concepts, definitions, procedures, output displays, examples, cases, exercises, to interactions between concepts according to the level of education in Higher Education and in accordance with learning outcomes
Material Accuracy	4. The concepts and definitions presented do not give rise to many interpretations and are in accordance with the concepts and definitions that apply to water pollution
	5. Facts and data are presented realistically and efficiently to increase student understanding
	6. Examples and cases presented are in accordance with reality and efficiency to increase student understanding
	7. The pictures, diagrams, and illustrations presented are in accordance with reality and are efficient to increase student understanding
	8. Technical terms are in accordance with the prevailing prevalence in water pollution materials
Material Update	9. Preference will be given to pictures, diagrams and illustrations found in everyday life, but also equipped with explanations
	10. The examples and cases presented are in accordance with the situations and conditions that occur in everyday life
Encourage Curiosity	11. The descriptions, exercises or case examples presented encourage students to do it further and foster creativity
	12. The descriptions, exercises or case examples presented encourage students to find out more about the material

Presentation Aspects

Content aspect of feasibility sheet that developed was describe on table 7.

Table 7. Content Aspects Feasibility Sheet

Assessment Indicator	Rating Items
Serving Technique	1. The presentation of concepts is presented in a coherent manner starting from the easy to the difficult, from the concrete to the abstract and from the simple to the complex, from the known to the unknown. The material in the previous section can help understand the material in the next section.
Presentation Support	2. The questions given can train the ability to understand and apply concepts related to the material in learning activities 3. Contains information about the role of the module in the learning process. 4. The glossary contains important terms in the text with an explanation of the meaning of these terms, and is written alphabetically. 5. The list of books used as reference material in writing the module begins with the author's name (arranged alphabetically), year of publication, title of book/magazine/paper/article, place and name of publisher, name and location of internet site and site access date (if using a reference that has a website)

The results of the feasibility assessment based on the content aspect assessment items in table 7 are interpreted in the form of Figure 1.

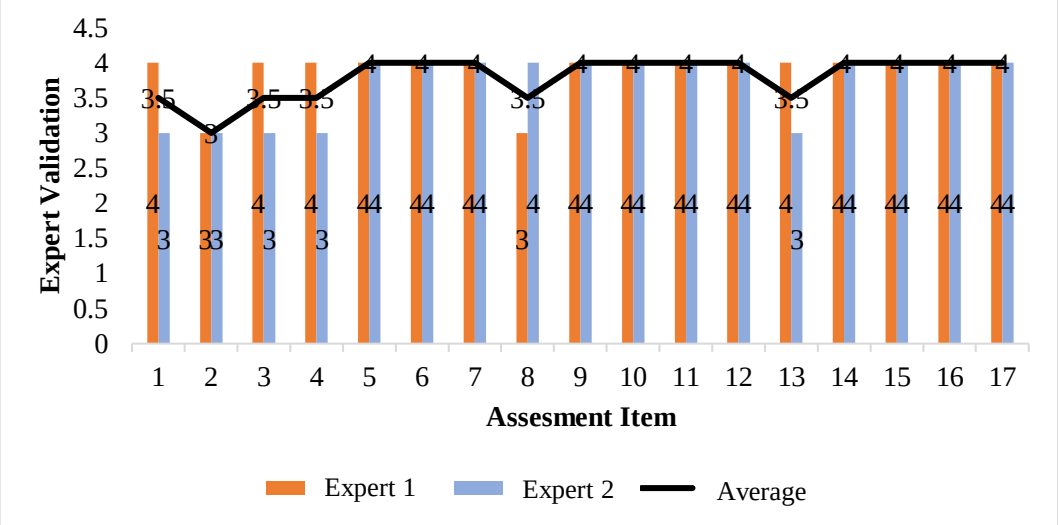


Figure 1. The Results of The Feasibility Assessment of The Content Aspect by The Validator

The results of the feasibility assessment can be seen in Figure 1. In the material aspect with the indicators for assessing the suitability of the material for learning outcomes in item numbers 1-3, the average values are 3.5, 3, and 3.5 for each assessment item. These results were obtained based on the value given by assessor 1, namely 4, 3, and 4, while assessor 2 gave a value of 3 for each item in this aspect. For indicators for assessing the accuracy of material with item numbers 4-8, an average value of 3.5, 4, 4, 4, and 3.5 is obtained for each assessment item. This result was obtained based on the value given by assessor 1, namely 4 except for item number 8 while assessor 2 gave a value of 4 except for item number 4. For indicators of assessment of material sophistication with item numbers 9 and 10, an average value of 4 was obtained. These results were obtained based on the value given by the two assessors, namely 4 in each item. Assessment indicators to encourage curiosity with item numbers 11 and 12 obtained an average value of 4. These results are based on the assessors of the two validators who give each item a value of 4.

Point number 13 on the presentation aspect with the presentation technique assessment indicator obtained an average value of 4. This result was obtained because both raters gave a

value of 4. Meanwhile, on the presentation supporting assessment indicator with item numbers 14-17 the average value obtained was 4, based on the value given by the two assessors, namely 4 on all items. So that the results of the feasibility assessment for the content aspect which includes material and presentation by 2 experts show a very high coefficient of k = 1.00. In this aspect, the two assessors gave a score range of 3-4. Although different, this value range is still in the strong relevance category according to Gregory (Retnawati, 2016). However, the validator continues to provide various suggestions and input, namely in the form of improving the coherence of material translation. The second validation carried out is the language feasibility assessment. Language feasibility was validated by 2 experts.

Language Aspect

The language aspect of feasibility sheet instrument was described in table 8.

Table 8. Language Eligibility Sheet

Achievement Indicator	Statement Points
Easy	1. The sentences used represent the contents of the message or information to be conveyed while still following the Indonesian grammar
	2. The sentences used are simple and to the point
Communicative	3. The terms used are in accordance with the Big Indonesian Dictionary and/or standard technical terms used in water pollution materials
	4. Messages or information are conveyed in an interesting and common language in Indonesian written communication
Dialogic and Interactive	5. The language used arouses curiosity when students read it and encourages them to study the book thoroughly
Conformity with the rules of language	6. The language used is in accordance with the level of emotional maturity of students
	7. The sentence structure used to convey the message refers to good and correct Indonesian grammar rules
	8. The spelling used refers to the Enhanced Spelling guidelines

The results of the feasibility assessment based on the assessment items on the language aspect in table 8 are interpreted in the form of figure 2.

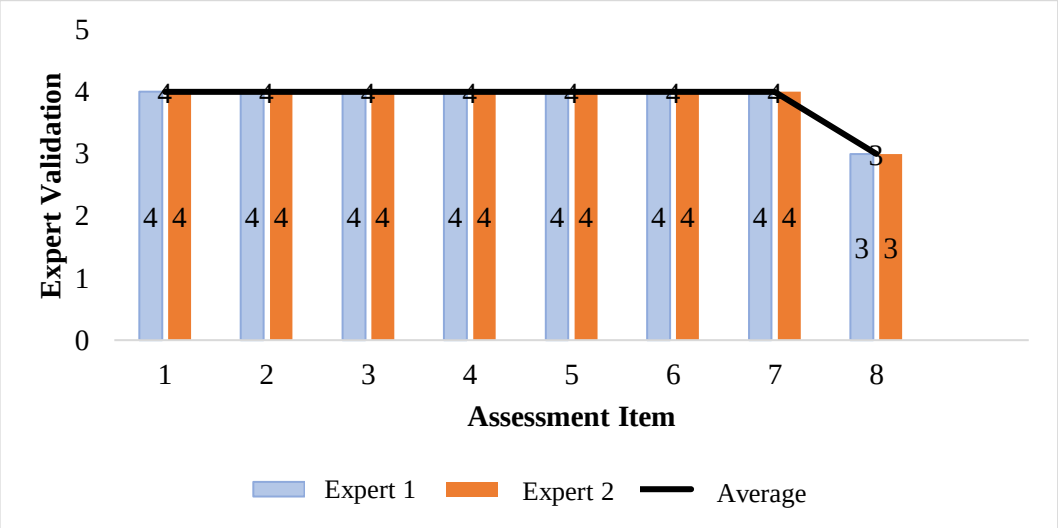


Figure 2. The Results of The Feasibility Assessment of The Language Aspect by The Validator

The results of the feasibility assessment on the language aspect can be seen in Figure 2. On the assessment indicators for straightforward, communicative, dialogic and interactive as well as conformity with language rules in point numbers 1-5, an average score of 4 is obtained. The score obtained is because the two assessors gave a value of 4 For the assessment indicators for conformity with language rules in point numbers 6-8, the average values are 4, 4, and 3.5. This result was obtained based on the value given by raters 1 and 2, namely 4 in item numbers 6 and 7, while item number 8 was given a value of 3.

The results of the feasibility assessment for the language aspect by 2 experts showed a very high efficiency, namely k = 1.00. In this aspect, the two assessors gave a score range of 3-4. The rating range is still in the category of strong relevance. As for the suggestions and input given by the validator in the form of improving the use of punctuation and spelling which refers to the Enhanced Spelling guidelines. The last validation carried out was on the graphic aspect which was assessed by 2 expert assessors.

Graphic Aspects

The graphical aspect feasibility sheet instrument can be seen in table 9.

Table 9. Graphic Feasibility Sheet

Assessment Indicator	Rating Items
Suitability of the size of the supplement book with ISO standards	1. Supplement size A4 (210 x 297 mm), A5 (148 x 210 mm), B5 (176 x 250 mm)
Supplemental Electronic Book Cover Design (Cover)	1. The design of the front cover, back and back is a unified whole. Color elements, illustrations and typography are displayed harmoniously and are interrelated with one another. 2. Pay attention to the overall color appearance which can give a certain nuance and can clarify the material/content of the module. 3. The letters used are attractive and easy to read: a. The module title must be able to quickly provide information about the contents of the module. b. The module title is displayed more prominently than its background color. 4. Using two types of letters to make it more communicative in conveying the information conveyed. To distinguish and get a combination of letter appearance, you can use letter variations and series.
Design of Supplementary Electronic Book Contents	1. Illustration of supplement book cover a. Can quickly provide an overview of certain teaching materials and can visually reveal the type of illustration displayed based on the teaching material. b. Displayed in accordance with the shape, color and size of the object so as not to cause misinterpretation or understanding of students, the colors used are appropriate so as not to cause misunderstanding and interpretation. 2. Layout consistency a. Placement of layout elements (title, subtitle, preface, table of contents, illustrations etc.) at the beginning of each activity consistently b. The arrangement of the text at the end of the paragraph is clearly separated, which can be in the form of spacing (in the left-right/block alignment of text) or with indents (in the arrangement of text with paragraphs). 3. Harmonious layout elements a. Placement of layout elements (titles, subtitles, text, illustrations,

Assessment Indicator	Rating Items
	captions, page numbers) on a proportional print area b. It is a display unit between text and illustrations on one page. 4. Layout speeds up the page a. Placing decorations/illustrations on the page as a background should not interfere with clarity, convey information in the text, so that it can hinder student understanding. b. Placing titles, sub-headings, illustrations and image captions should not interfere with clarity, the delivery of information in the text, so that it can hinder student understanding. 5. Typography of the contents of a simple supplementary book a. Maximum use of two types of letters so as not to interfere with students absorbing the information conveyed. b. Used to distinguish levels/hierarchies of titles and subtitles and to emphasize the arrangement of text that is considered important in bold and italic form c. It greatly affects the level of legibility of the arrangement of the text. Approximate number for textbooks between 45 – 75 characters (approximately 5-11 words) including punctuation, spaces between words and numbers. The module itself is not too bound by the width of the text arrangement. d. The spacing is not too wide or too narrow, making it easier to read. e. Affects the level of readability of the arrangement of the text (not too tight or too loose) 6. Ease of use a. The process of installing chemical supplement electronic books can easily be done on the devices used in the learning process b. In the process of operating supplementary electronic books, it can run smoothly without any interruptions c. In the process of using it both in moving pages, playing videos, etc. it can be operated easily 7. Quality of illustrations (images, videos, animations) both in terms of position, size, color, clarity, and smoothness of the illustration when executed

The results of the feasibility assessment based on the assessment items on the graphical aspects in table 9 are interpreted in the form of figure 3.

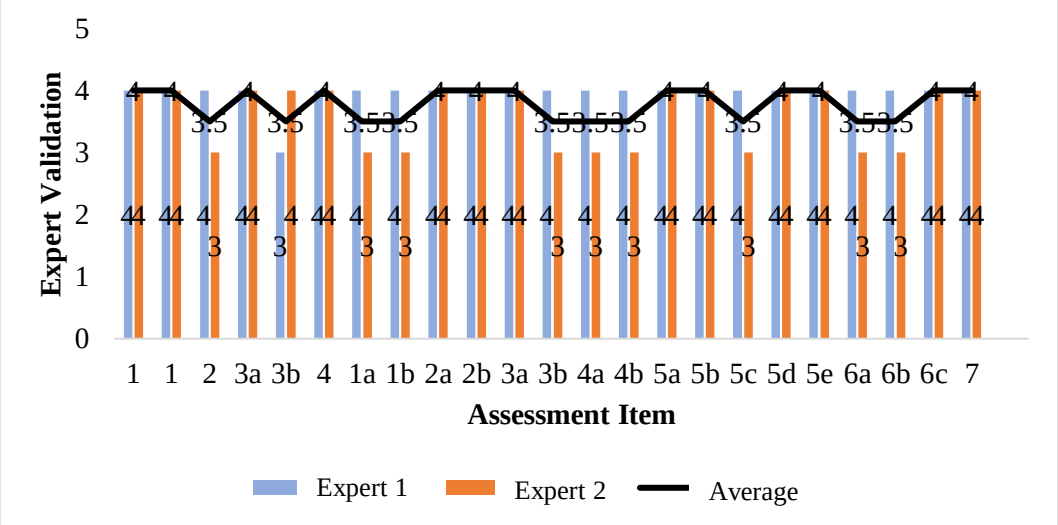


Figure 3. The Results of The Graphical Feasibility Assessment by The Validator

In Figure 3 it can be seen the results of the assessment of the graphical aspect. The results of the feasibility assessment with the assessment indicators related to the suitability of the supplement book size in accordance with the ISO standard in item 1 show an average value of 4, this is because the two assessors gave a value of 4 for that item. For the assessment indicators related to the electronic supplement book cover design with item numbers 1-4 both assessors give a value of 4 resulting in an average of 4 except for item number 2 assessor 2 gives a value of 3 and in item number 3.b assessor 1 gives a value of 3 so that the value the average obtained is 3.5.

On the assessment indicator for the design of the contents of the electronic supplement book with item numbers, 1-7 assessors 2 give a value of 3 on item numbers 1.a, 1.b, 3.b, 4.a, 4.b, 5.c, 6.a , and 6.b while assessor 1 gives a value of 4 so that the average value obtained is 3.5. For the remaining item numbers the average value obtained is 4, because both assessors give a value of 4 for each item.

The results of the feasibility assessment for the graphical aspect by 2 experts showed a very high efficiency, namely k = 1.00. In this aspect, the two assessors gave a score range of 3-4. The rating range is still in the category of strong relevance. The suggestions and input provided by the validator are in the form of improvements to the cover design, logo layout, and updating the type of writing used.

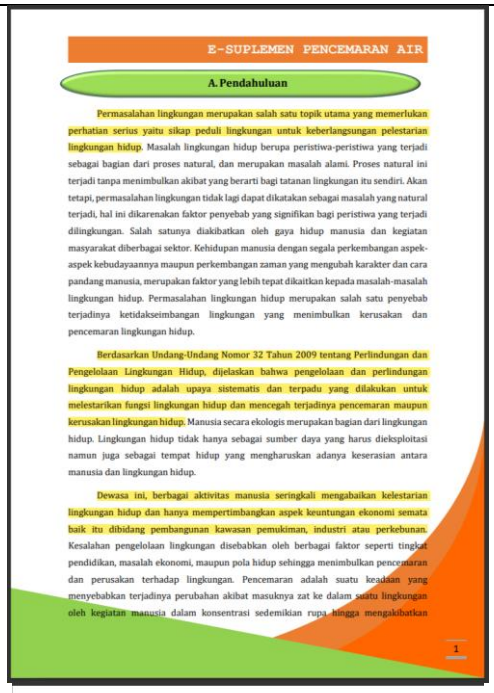
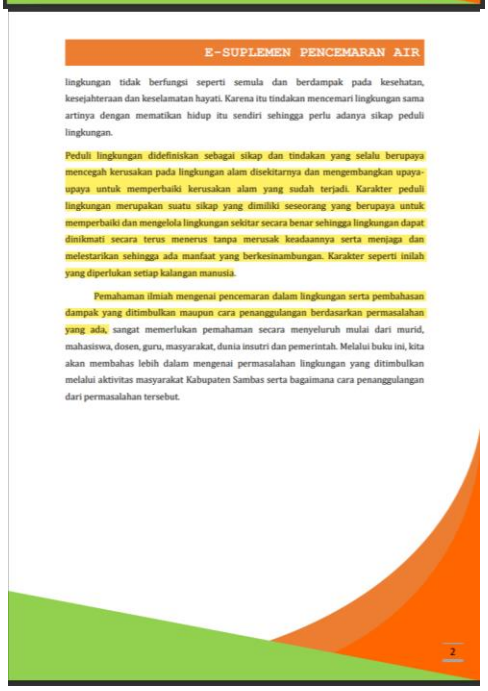
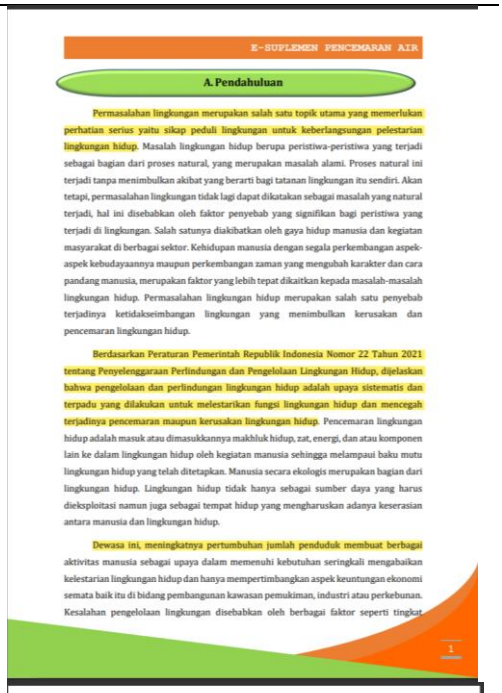
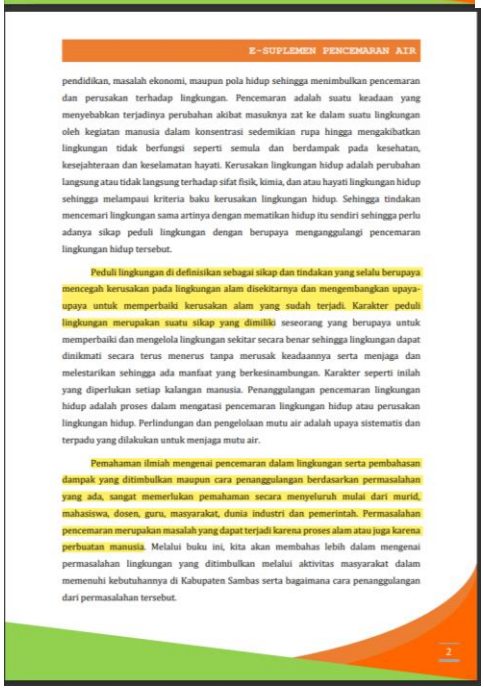
The results of input and suggestions from the aspects of content, language, and graphics by all validators are summarized and described in table 10.

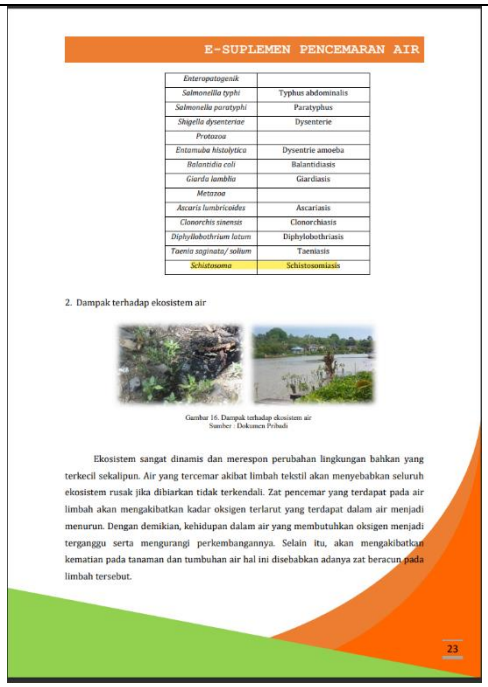
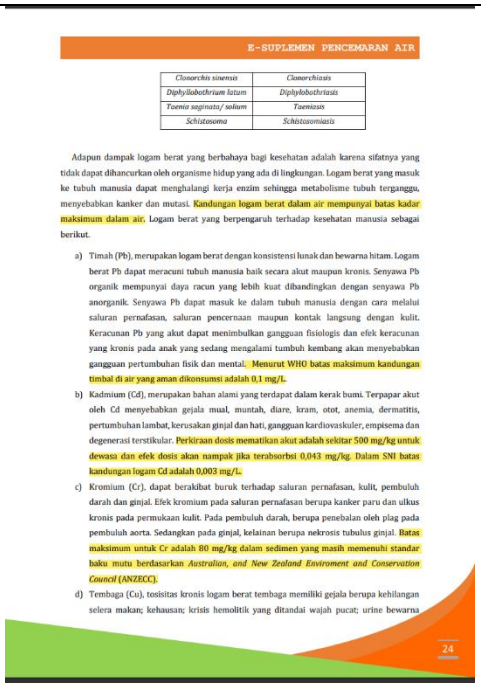
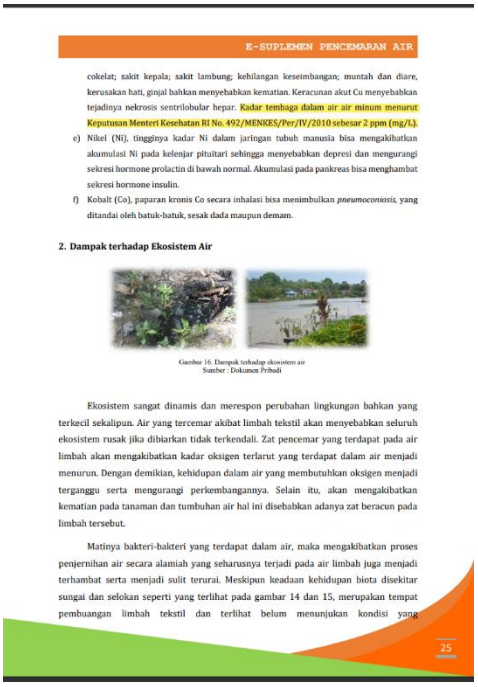
Table 10. Suggestions and Input from The Validator

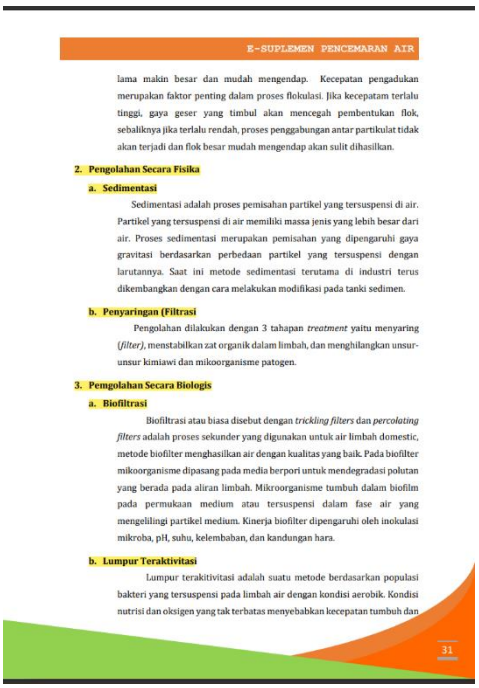
Validators	Suggestions and Feedback
Content	In the introductory section there are additional regulations for the UUD number 11, PP number 22 of 2022. Improved the sequence of discussions in the introduction. Include quality standards of water and waste. The discussion of impacts is translated into health, ecosystems and food chains. Waste treatment is translated into physical, biological and chemical waste treatment. Conclusion is changed to conclusion.
Language	Overall the language used is good, but there are improvements in spelling and number writing according to the level, such as after writing points using uppercase letters, the next part of the point is to use numbers then if there are still parts in these points you can use lowercase letters.
Graphics	On the cover, related courses are added, text color corrections are added, and the location of the logo and author's name is added. Change the page number color to white and bold. Then the writing on the contents is made so that it doesn't get hit by the footer. For the back cover filled with a description of the course.

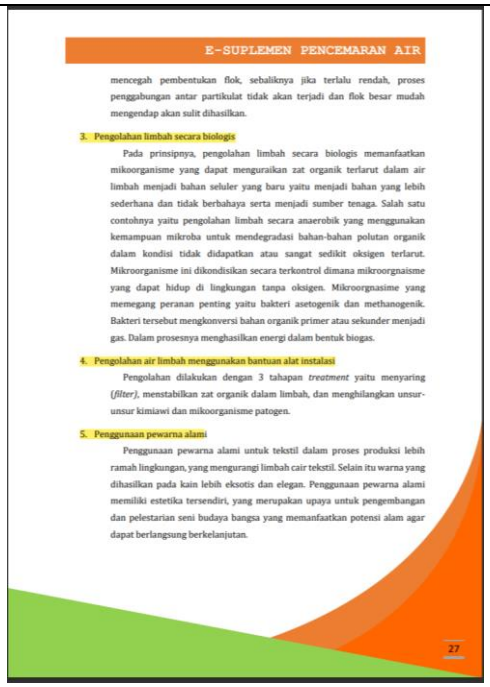
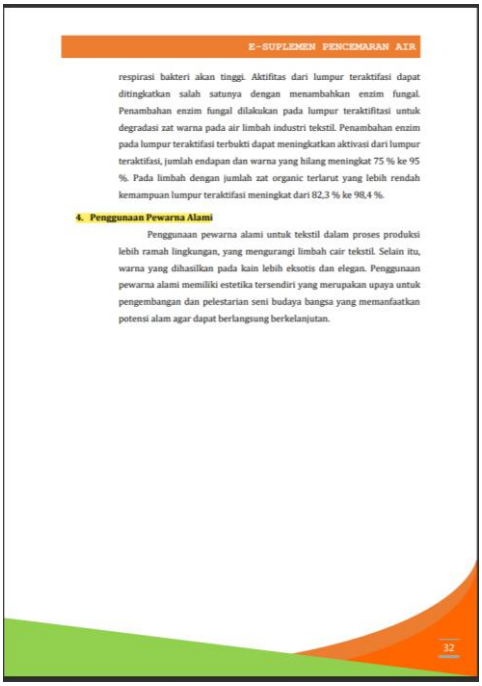
The inputs and suggestions given by all validators were then revised by the researchers in each aspect. So that the results before and after the revision can be seen in table 11.

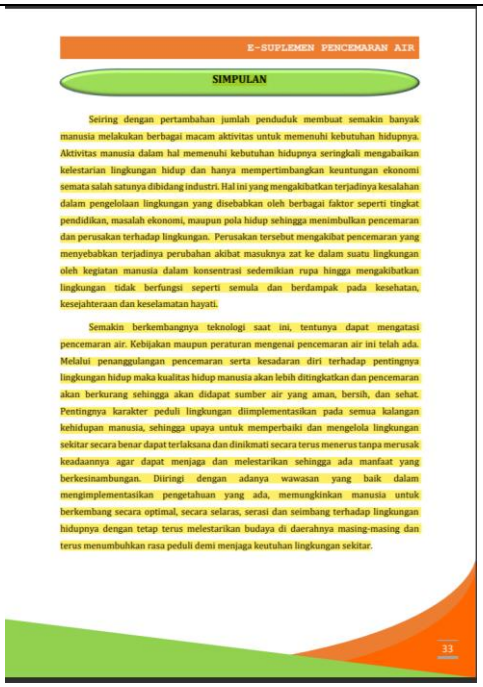
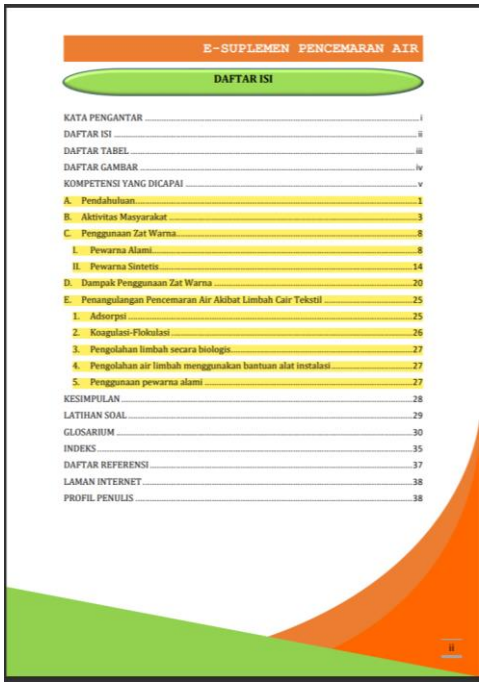
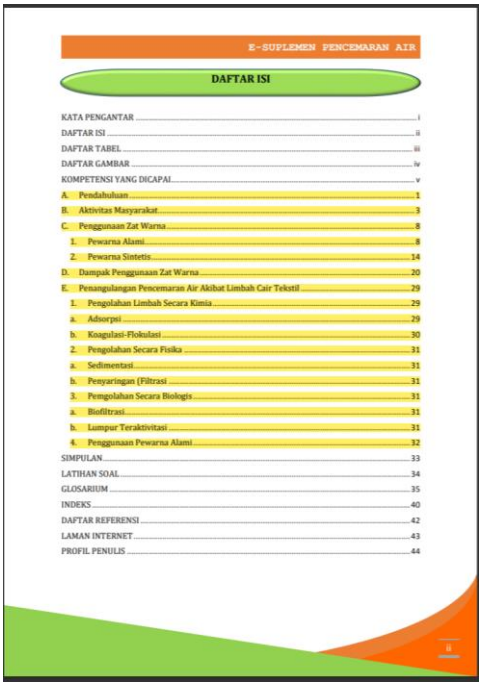
Table 11. Revision Results from The Validator

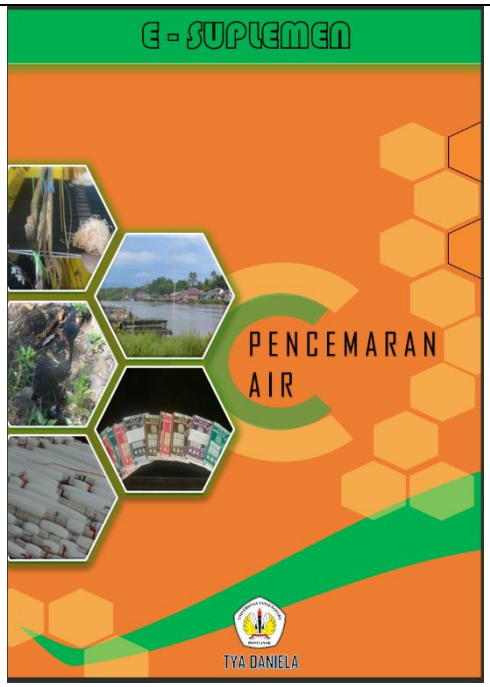
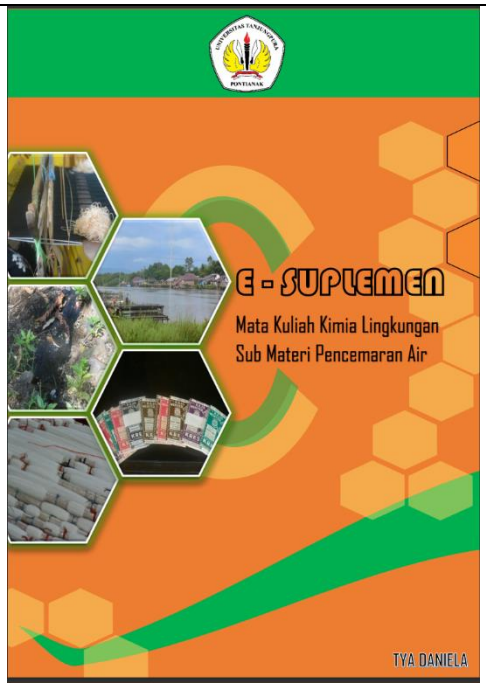
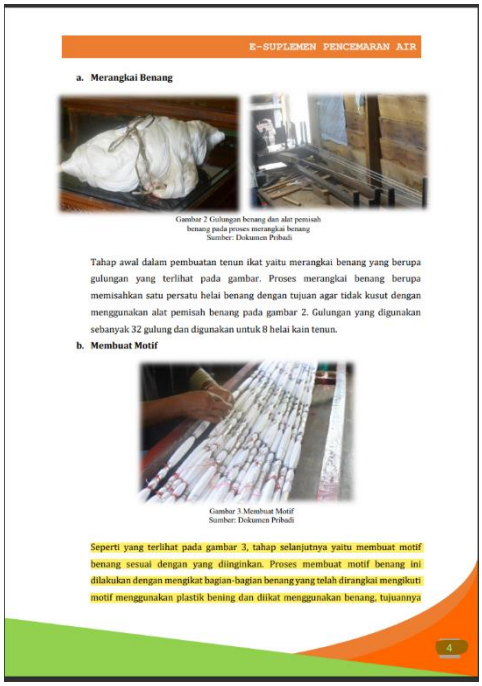
Suggestions and Feedback	Before Revision	After Revision
Adding PP UU number 22 of 2022 and improving the sequence of discussions in the introduction section.	 	 

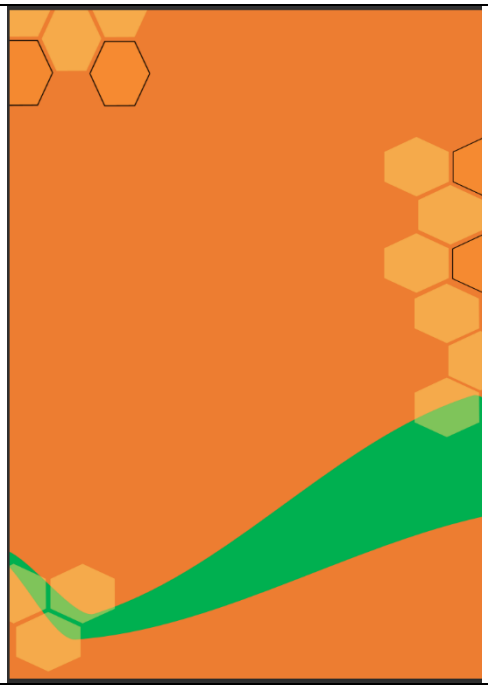
Suggestions and Feedback	Before Revision	After Revision
Addition of quality standards		
		

Suggestions and Feedback	Before Revision	After Revision
The elaboration of waste processing into physical, chemical and biological treatment		
		

Suggestions and Feedback	Before Revision	After Revision
		
		

Suggestions and Feedback	Before Revision	After Revision
Conclusion is changed to conclusion		
Changes in the writing of numbers according to the level		

Suggestions and Feedback	Before Revision	After Revision
Changes to the cover, starting from changes in the location of the logo, the author, and the addition of environmental sub-chemical material		
Changed the color of the page numbers and fixed the text so it doesn't hit the footer		

Suggestions and Feedback	Before Revision	After Revision
Added course descriptions to the back cover		

Based on the feasibility assessment of various aspects that have been carried out by the validator, the results obtained can be seen in Figure 4.

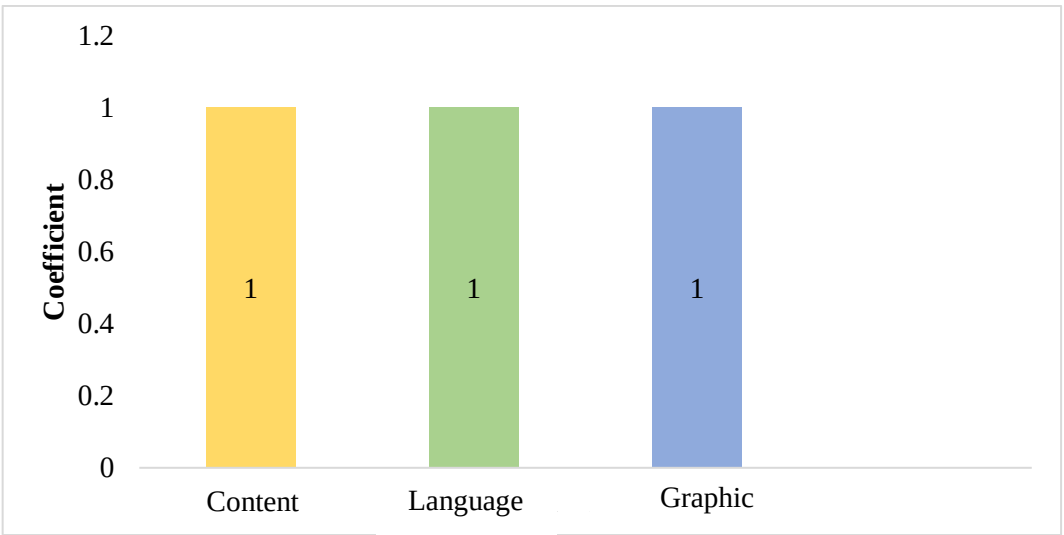


Figure 4. Content, Language and Graphic Feasibility Coefficient Scores

The overall results of the experts on various aspects show a very high coefficient, namely k = 1.00. However, there are several notes as suggestions and input that have been previously described for revision so that they can be continued at a later stage. These results show that the feasibility assessment of electronic supplement books on water pollution material has a very high coefficient in all three aspects so that it is suitable for use in trials (Mirnawati, Sulfasyah, 2022)

After going through the product revision stage, a response test was carried out by distributing questionnaires to students. The distribution of questionnaires was carried out online through the Zoom meeting application and WhatsApp. In the process, the researcher provided guidance on using an electronic supplementary book which was then followed by filling out a

response questionnaire. The response test was carried out by students who had taken environmental chemistry courses and was carried out 2 times. The results of the response test can be seen in Figure 5.

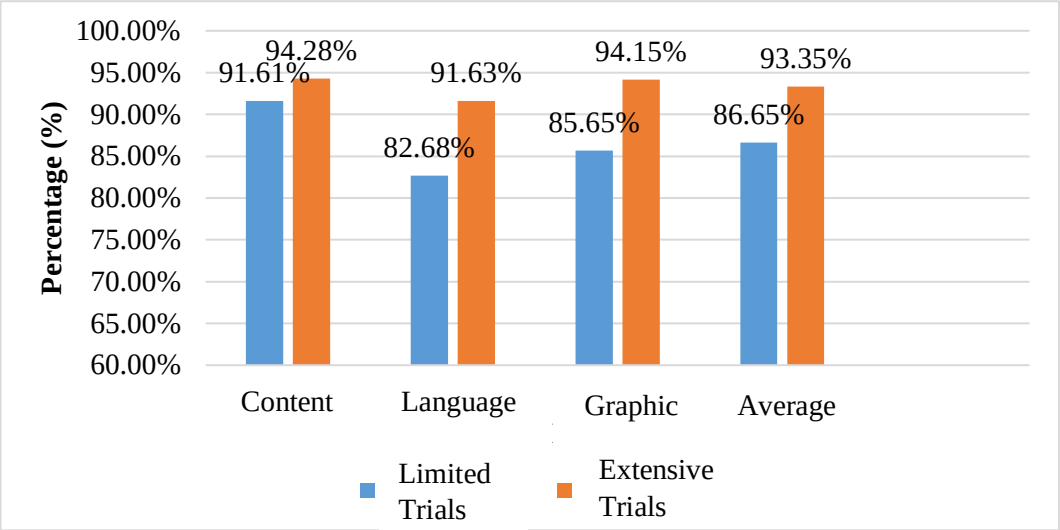


Figure 5. Test Results of Student Responses to Electronic Supplement Books on Water Pollution Material.

Based on Figure 5, it can be seen that the results of the limited response test conducted on 14 students are included in the very good interpretation criteria (Riduwan, 2016). The percentage of eligibility for each aspect is 92% for the content aspect, 83% for the language aspect, and 86% for the graphic aspect. For the results of the broad response test conducted on 30 students, the interpretation criteria were very good. The percentage of eligibility for each aspect is 94% for the content aspect, 92% for the language aspect, and 94% for the graphic aspect. The results of the overall response of both limited and expanded student trials of electronic supplement books are interesting to use. Based on these results, it can be seen that there was an increase in the percentage of extended response tests with an average percentage ratio of 87% for limited trials and 93% for widespread trials. However, the two results still show very good interpretation criteria, so electronic supplement books can be implemented in practice in learning (Ferdianto & Setiyani, 2018).

CONCLUSION

Based on the results of the research that has been done, it can be concluded that the Electronic Supplementary Book on Water Pollution Material has a very high coefficient (k=1) so it is categorized as very feasible. The results of the limited trial obtained a feasibility percentage of 86% with a very good interpretation category and in the expanded trial the feasibility percentage was 93% with a very good interpretation category so that it can become teaching materials that can add insight and knowledge to students and can implement this knowledge in the community environment affected by pollution, especially water pollution as well as being teaching materials for educational units at various levels in the context of increasing environmental awareness in various circles.

RECOMMENDATION

The use of these teaching materials is not limited to students, but can be wider such as the community, students and teachers who live around the area.

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