



Research Article



## Inovasi E-Book Berbasis Blended Learning Menggunakan Aplikasi Sigil pada Mata Kuliah Biokimia

(*E-Book Innovation Based on Blended Learning Using Sigil Application in Biochemistry Courses*)

Miftahussa'adiah<sup>1\*</sup>, Stevia Ladisa<sup>2</sup>, Muhammad Fauzi Romadhan<sup>3</sup>

<sup>1,3</sup> Pendidikan Biologi, Universitas Islam Negeri Raden Fatah Palembang, Sumatera Selatan, Indonesia

<sup>2</sup> Pendidikan Biologi, STKIP Alhussunnah Bukittinggi, Sumatera Indonesia, Indonesia

\*Corresponding Author: [miftahussaadiah\\_uin@radenfatah.ac.id](mailto:miftahussaadiah_uin@radenfatah.ac.id)

Article Information	ABSTRACT
Submitted: 28 – 04 – 2025 Accepted: 18 – 05 – 2025 Published: 25 – 06 – 2025	<p>This research to produce a valid and practical e-book teaching content product. The method used in this study is Research and Development (RnD) with the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). The data in this study were obtained through expert validation questionnaires (content experts, media experts, and language experts) and student response questionnaires on blended learning-based biochemistry e-book products using the developed sigil application. Data analysis techniques were carried out by referring to the standard criteria for validity and practicality of e-books. The results of the study were obtained based on the results of the media expert validity questionnaire (98%), content experts (98%), language experts (91%) with a very valid category, and field practitioners consisting of questionnaires filled out by lecturers who teach biochemistry courses (91.66%) and students as a form of readability from e-book users (97.86%). Therefore, it can be concluded that blended learning-based e-books using the sigil application in biochemistry courses are valid and practical for use in learning activities.</p> <p><b>Key words:</b> <i>e-book, Biochemistry, Blended Learning, Sigil application</i></p>
Publisher	ABSTRAK
Program Studi Pendidikan Biologi FKIP Universitas Jambi, Jambi- Indonesia	<p>Penelitian ini bertujuan untuk menghasilkan e-book yang valid dan praktis. Metode yang digunakan dalam penelitian ini adalah Research and Development (RnD) dengan model pengembangan ADDIE (Analysis, Design, Development, Implementation, and Evaluation). Data dalam penelitian ini diperoleh melalui angket validasi ahli (ahli konten, ahli media, dan ahli bahasa) dan angket respon mahasiswa terhadap produk. Teknik analisis data dilakukan dengan mengacu pada kriteria standar validitas dan praktikalitas e-book. Hasil penelitian diperoleh berdasarkan hasil angket validitas ahli media (98%), ahli konten (98%), ahli bahasa (91%) dengan kategori sangat valid, dan praktisi lapangan yang terdiri dari angket yang diisi oleh dosen pengampu mata kuliah biokimia (91,66%) dan mahasiswa sebagai bentuk keterbacaan dari pengguna e-book (97,86%). Oleh karena itu, dapat disimpulkan bahwa buku elektronik berbasis blended learning dengan menggunakan aplikasi sigil pada mata kuliah biokimia valid dan praktis untuk digunakan dalam kegiatan pembelajaran.</p> <p><b>Kata kunci:</b> <i>e-book, Biokimia, Blended Learning, Aplikasi Sigil</i></p>



This Biodik : Jurnal Ilmiah Pendidikan Biologi is licensed under a [CC BY-NC-SA \(Creative Commons Attribution-ShareAlike 4.0 International License\)](https://creativecommons.org/licenses/by-nc-sa/4.0/)

## INTRODUCTION

The Covid-19 pandemic that began in Indonesia at the start of 2020 significantly affected learning activities at both the school and university levels. Based on data collected by UNICEF and its partners, it was found that the pandemic had a highly negative impact on education at all levels in Indonesia (Howe et al., 2021). Initially, learning activities at universities were conducted offline, but during the Covid-19 pandemic, they were shifted online to reduce the spread of the virus. During the new normal period, however, certain learning activities began to resume offline, while others continued online. Learning activities that combine online and offline methods are referred to as blended learning (Puspitarini, 2022). This method had already existed in education, particularly at the university level, before the Covid-19 outbreak.

Blended learning is a system that combines virtual learning with web-based electronic resources (e-learning) and face-to-face instruction (Antony, G.P., Charles, D., Dziuban, Charkes, 2014; Lalima, 2017; Puri, 2018). The advantages of this method are that students can communicate freely, review teaching contents anytime and anywhere, and access the internet more easily for additional information about the contents being studied (Puri, 2018). It is also considered a 21st-century learning model (Puspitarini, 2022). However, the disadvantages of this method include limited interaction between students and lecturers, as well as among students themselves, and the fact that not all areas have reliable internet connections (Ruchi & Sunita, 2015).

The problem of poor internet connection is one of the problems that must be solved so that students can still get maximum learning contents. This problem usually occurs in students who live in areas that do not yet have adequate internet network facilities. One example is the Biology Education Study Program at Raden Fatah State Islamic University, Palembang, whose students do not only come from the city of Palembang but also from various regions in Indonesia. The results of a survey conducted on Biology Education Study Program students of the 2020 intake showed that 67% of respondents answered that they had had signal problems during online learning activities. Based on these problems, one solution that can be done is to create innovations in the learning media provided to students so that when these problems occur, students can still learn optimally.

Learning media is a tool used in learning and aims to facilitate the learning process to run more effectively and efficiently. Learning media can also be used as a means of communication to convey information from lecturers to students so that a conducive learning environment is created to improve the quality and quality of learning (Arif, et al., 2023). Learning media not only helps lecturers to convey the content being taught, but also as an added value in learning activities (Kandia et al., 2023). In addition, learning media also functions to make learning more interesting so that it can motivate students to learn, clarify teaching contents so that they will be easier to understand. Learning media is also needed to clarify abstract learning concepts so that they are easier to understand. One of the courses that has many abstract concepts and learning media is needed in conveying these concepts is the Biochemistry course.

Biochemistry is a compulsory course in the biology education study program with a weight of 3 credits consisting of 2 credits for learning biochemical theory, and 1 credit for practical activities.

Biochemistry practical activities aim to apply the theories that have been obtained during lectures. Based on the results of observations during 1 semester in the 2020-2021 academic year, lectures carried out in a blended learning manner with zoom meeting and e-learning facilities have not been able to facilitate student learning activities optimally, especially in practical activities.

Basically, practical activities and theoretical learning are a complete unit in learning, especially science learning. Practical activities involve a scientific work process that is very necessary to strengthen students' understanding of the concepts being studied, so that effective and efficient practical activities are needed. Meanwhile, during the Covid-19 pandemic, practical activities carried out face-to-face have not been effective and efficient (Kismunthofiah et al., 2023). This is due to several factors, including (1) some students were not allowed by their parents to take part in practical activities on campus, (2) not all students are in the city of Palembang because learning activities are carried out online, and (3) there are restrictions on the maximum number of students in the laboratory to carry out practical activities. However, in these conditions, practical activities can be more efficient if there are learning media that can facilitate students to gain practical experience. The learning media not only contains theory but also videos of practical activities, so that students who do not take part in practical activities directly can still have practical experience by watching or viewing videos of the practical activity process and the results of applying the theory obtained during lectures. One of the learning media that can contain practical contents and videos is an e-book.

E-books are a learning medium that not only contains contents, but can also contain videos of practical activities, games, evaluation questions, and quizzes (Sarah, 2018; Shattuck, 2017; Wahl, 2018). With this e-book, of course, biochemistry learning activities, especially biochemistry practicums, will be more effective and efficient (Rosida et al., 2017). E-books can be created using the Sigil application. Sigil is an editor software that can be used to create e-books that support text, html, and epub formats (Elyas & Yudianto, 2016; Hidayat et al., 2017; Maharani et al., 2015; Sari, 2016). The advantages of creating e-books with the Sigil application are that this application can support various formats, e-books can be read on mobile and desktop and are easy to use (Maharani et al., 2015; Wirasasmita & Uska, 2017).

The novelty of this research is that Sigil allows the creation of structured e-books and supports the EPUB format. The use of this application in biochemistry education provides convenience in integrating text, images, videos, and interactive quizzes to deepen students' understanding and the e-books developed not only discuss biochemistry content scientifically but also relate it to the value of religious moderation. Based on the needs and problems in the field, researchers developed an e-book based on blended learning which can be one of the innovations in teaching contents for Biochemistry courses.

## RESEARCH METHOD

This research is development research using the ADDIE model, which consists of five stages: Analyze, Design, Develop, Implement, and Evaluate (Welty, 2007).

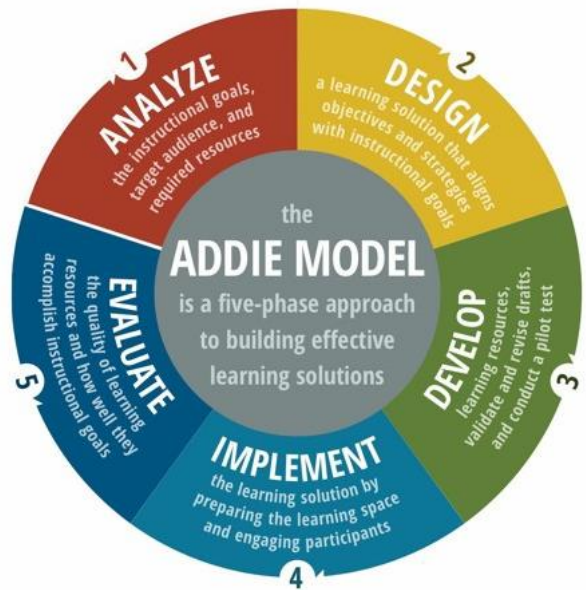


Figure 1. ADDIE Model (Source: <https://soundcloud.com/teresa-1563/the-addie-model>)

However, this study only applies the ADDIE model up to the development stage. The research produces a product in the form of an innovation in blended learning based on media, specifically an e-book created using the Sigil application for the Biochemistry course. The subjects of this study included content expert validators, media expert validators, language expert validators, and field practitioners who validated the blended learning-based e-book developed with the Sigil application. The material validation indicators are the Suitability of the Material with the Course Learning Outcomes, Material Accuracy, Material Depth, Material Contextuality, Material Updates, Material Updates, Material Presentation. Media validation includes Appearance, Writing Rules, and Graphics. While the language validation indicators are language clarity, Communicative, Dialogic and Interactive, Suitability with Student Development, Suitability with Language Rules. Media validation includes appearance, writing rules, and graphics. The assessment was carried out using a validation sheet.

The practicality stage involved 18 second-semester students from the Biology Education Study Program, Faculty of Tarbiyah and Teacher Training, at Raden Fatah State Islamic University, Palembang, who were enrolled in the Biochemistry course. The object of this study is a blended learning-based e-book created using the Sigil application for the Biochemistry course. This research was conducted from March to July 2023.

## RESEARCH RESULT AND DISCUSSION

The results of the development of e-books based on blended learning that can be one of the innovations in teaching contents in the Biochemistry course are presented as follows.

### **Analyze Stage**

In the analysis stage, identification and analysis are carried out with the aim of finding out the basic problems of students who have taken the Biochemistry course in Biology Education, Faculty of Tarbiyah and Teacher Training, Raden Fatah State Islamic University, Palembang. After knowing the basic problems, it can be determined how to overcome the problems in learning. The following are the steps taken at the analysis stage, including analysis of learning objectives and analysis of learning media needs in the course. The results of the analysis show that there are no biochemistry books

available that are in accordance with CPL, CPMK, Sub CPMK, who can support biochemistry learning activities at Biology Education, Faculty of Tarbiyah and Teacher Training, Raden Fatah State Islamic University. So, the e-Book developed at this stage was developed in accordance with CPL, CPMK, Sub CPMK and indicators to help students in learning. This analysis stage was also carried out in the research of Susilawati & Rusdinal (2022) on the development of e-book learning media based on integrated thematic blended learning in grade IV of Elementary School where the purpose of this analysis is related to the content contained in the e-book so that it can help students understand learning contents with very practical usage standards.

### **Design Stage**

The purpose of the design stage is to prepare a biochemistry e-book along with student worksheets and supporting learning devices during the learning activities. The components of the e-book content to be developed are the results of a study of biochemistry literature. This Design Stage aims to create an e-book design that is structured, interactive, and in accordance with learning objectives. With a mature design, the development of the e-book in the next stage (Development Stage) will be more focused and efficient, so that the final result is expected to be an effective and innovative learning media (Bintari Kartika, 2017; Cahyadi, 2019; Chrisyarani & Yasa, 2018; Harjanta & Herlambang, 2018; Hidayat & Nizar, 2021).

### **Develop Stage**

The purpose of the development stage is to develop a planned product and then validation will be carried out by content experts, content experts, field practitioners and students. Based on the validation, several formative revisions were carried out.

#### **1. Concept and Content Revision**

The components that are assessed by content experts on the e-book being developed include, content feasibility, presentation feasibility, and language feasibility. The validation of the e-book is carried out by a lecturer who is an expert in biochemistry content. The results of the quantitative data validation of content experts are briefly presented in table 1.

**Table 1. Summary of Validation Results by Content Experts**

<b>Assessed Aspects</b>	<b>Indicator</b>	<b>Total Score</b>	<b>Percentage (%)</b>	<b>Validity Level</b>
<b>Suitability of Content with Course Learning Outcomes (CPMK)</b>	The content presented is in accordance with the CPMK which must be mastered by students.	4	100%	Very Valid
	The tasks given are in accordance with the CPMK that students must master.	4	100%	Very Valid
	The questions given are in accordance with the competencies that students must master.	4	100%	Very Valid
<b>Accuracy of Content</b>	The content presented does not give rise to many interpretations.	4	100%	Very Valid
	Biochemistry content Chapter 1 The history and development of biochemistry is described correctly	4	100%	Very Valid
	Practice questions on the history and development of biochemistry are explained correctly.	4	100%	Very Valid
	Biochemistry content Chapters 2-14 are described correctly	4	100%	Very Valid

Assessed Aspects	Indicator	Total Score	Percentage (%)	Validity Level
	In independent practical activities, tools and contents are described clearly and correctly.	4	100%	Very Valid
	In independent practical activities, the work steps are described clearly and correctly	4	100%	Very Valid
	Practice questions on carbohydrate content are explained correctly	4	100%	Very Valid
<b>Depth of Content</b>	The depth of the content is in accordance with the level of student development	4	100%	Very Valid
	The content description meets the curriculum demands	4	100%	Very Valid
<b>Contextualization of Content</b>	The content presented is in accordance with everyday life	4	100%	Very Valid
	The case examples presented are in accordance with the realities of everyday life.	4	100%	Very Valid
	The images/illustrations presented are in accordance with the reality of everyday life.	4	100%	Very Valid
<b>Update of Content</b>	The content presented is in accordance with scientific developments.	4	100%	Very Valid
	The case examples presented are in accordance with the realities of everyday life	4	100%	Very Valid
	The images/illustrations presented are in accordance with the reality of everyday life.	4	100%	Very Valid
<b>Update of Content</b>	The content presented is in accordance with scientific developments.	4	100%	Very Valid
	The examples/cases presented are in accordance with the development of the situation and conditions in Indonesia.	3	75%	Valid
	The images/illustrations presented are in accordance with the development of the situation and conditions in Indonesia.	3	75%	Valid
	The content presented encourages students' curiosity	4	100%	Very Valid
	The tasks presented encourage students' curiosity	4	100%	Very Valid
	The tasks presented encourage students' curiosity to seek further information.	4	100%	Very Valid
<b>Presentation of Content</b>	Presentation of content starts from the known to the unknown	4	100%	Very Valid
	Packaging of contents in accordance with the scientific approach	4	100%	Very Valid
	There are questions that can help improve understanding of concepts related to the content	4	100%	Very Valid
	The glossary contains important terms in the text with an explanation of the meaning of the term and is written alphabetically	4	100%	Very Valid
	The summary is stated concisely and clearly so that it is easy for students to understand.	4	100%	Very Valid
<b>Number of Instruments</b>		98	98%	Very Valid

The total value obtained from the e-book validation results was 98, where the value category 81-100 was included in the very valid category so that it could be used or implemented without revision. This is in line with research conducted by Aditya (2018) the development of web-based mathematics

learning media on circle content for grade VIII students is valid with an average value of 3.46, Chrisyarani & Yasa (2018) also stated that the validation of learning modules on PPK-based thematic content and design with a percentage of 95%, (Wulandari, 2017) also stated the feasibility of content and media aspects in the development of old literature textbooks, namely 91.07%. Based on this, it can be concluded that the aspect of the feasibility of the content in this e-book is feasible because with a value of 98%.

## 2. Revision of Media and Learning Design

The components assessed by media experts include validity, presentation, and graphics. The results of the validation analysis are presented briefly.

**Table 2. Summary of Validation Results by Media Experts**

Aspect	Indicator	Total Score	Percentage (%)	Validity Level
Legitimacy	Accuracy of information conveyed	4	100%	Very Valid
	Compliance with Indonesian language rules	4	100%	Very Valid
	Understanding of information	4	100%	Very Valid
	Sentences do not provide double meanings	4	100%	Very Valid
Presentation	Consistency of writing and word usage	4	100%	Very Valid
	The presentation does not contain advertising elements and does not violate ethics	4	100%	Very Valid
	Suitability of the content with the title of the Biochemistry E-Book	4	100%	Very Valid
	Completeness of information	4	100%	Very Valid
Graphics	Graphics Proportional use of fonts (type and size) on the cover of the Biochemistry E-Book	4	100%	Very Valid
	Proportional use of fonts (type and size) in the contents of the Biochemistry E-Book	4	100%	Very Valid
	The layout of the text and illustrations on the cover of the Biochemistry E-Book is proportional.	4	100%	Very Valid
	The layout of the text and illustrations in the Biochemistry E-Book makes it easier for readers.	4	100%	Very Valid
	The title color contrasts with the background color	4	100%	Very Valid
	The size of the images and illustrations in the Biochemistry Book is appropriate to the content	3	75%	Valid
	The combination of colors and illustrations in the contents of the Biochemistry EBook corresponds to the order of the content presented	4	100%	Very Valid
	The color combination on the book cover is attractive	4	100%	Very Valid
	The overall display design is attractive and proportional.	4	100%	Very Valid
	<b>Number of Instruments</b>		98	98%

Based on the results of media expert validation, the results obtained were that 98% of the media were very valid and suitable for use. Media that has validation with very valid criteria can certainly improve student learning outcomes. This is evident from research conducted by (Yana & Adam, 2019) using LMS platforms such as Schoology, Canvas, and Quizlet as blended learning-based learning media can improve student learning outcomes. This is certainly also expected in this research, with valid media criteria, biochemistry e-books based on blended learning with this sigil application can also improve student learning outcomes.

### 3. Language Revision

The components assessed by language experts are seen from the aspects of clarity, communicativeness, dialogicity and interactiveness, suitability to student development, and suitability to language rules.

**Table 3. Summary of Validation Results by Linguists**

Aspect	Statement	Total Score	Percentage (%)	Validity Level
<b>Straightforward</b>	The sentences used in the Biochemistry E-Book are effective	4	100%	Very Valid
	The sentence structure in the Biochemistry E-Book is presented correctly	3	75%	Valid
	The words and sentences used in the Biochemistry E-Book are standard	4	100%	Very Valid
	The punctuation used in the Biochemistry E-Book is correct	3	75%	Valid
<b>Communicative</b>	The messages and information in the Biochemistry E-Book are easy to understand	4	100%	Very Valid
	The sentences used in the Biochemistry E-Book do not give rise to multiple interpretations	4	100%	Very Valid
	<i>The Biochemistry E-Book uses communicative language</i>	4	100%	Very Valid
<b>Dialogic and Interactive</b>	The letters and images in the Biochemistry E-Book are consistent	4	100%	Very Valid
<b>Suitability to Student Development</b>	<i>The Biochemistry E-Book developed is in accordance with the development of students' knowledge abilities</i>	4	100%	Very Valid
	<i>The Biochemistry E-Book developed is in accordance with the emotional development of students</i>	3	75%	Valid
<b>Conformity with Language Rules</b>	<i>Biochemistry E-Book has grammatical conformity</i>	3	75%	Valid
	<i>Biochemistry E-Book has conformity with the General Guidelines for Indonesian Spelling (PUEBI)</i>	4	100%	Very Valid
	The language in the Biochemistry E-Book is used effectively and efficiently	3	75%	Valid
	<i>Biochemistry E-Book uses polite language</i>	4	Very Valid	Very Valid
<b>Number of Instruments</b>		91	91%	Very Valid

The results of the validation analysis from language experts obtained a value of 91% with a very valid category, meaning that the biochemistry e-book using the Sigil application is very valid in terms of language for students and is suitable for use in learning activities. The results of research conducted by Arham & Dwiningsih (2020), the feasibility of interactive multimedia based on blended learning developed as a learning medium for the main content of biochemistry in terms of language were obtained consecutively 78%-80% and this category is included in the feasible category. Thus, we can conclude that in terms of language, the biochemistry e-book based on blended learning with the sigil application is very valid.

### 4. Field Practitioner Revision

The components assessed by field practitioners are the feasibility of the content and the quality of the photos. Field practitioners are lecturers in charge of the Biochemistry course at the Biology

Education Raden Fatah State Islamic University, Palembang. Based on the results of the analysis of the content feasibility indicator, the e-book has a content feasibility value of 100%, meaning that the e-book is very suitable for use. The results of the analysis of the product image quality indicator obtained a value of 83% in the very practical category and overall for the feasibility of the content and image quality obtained 91.66%, thus it can be said that the resulting product is very practical and suitable for use.

## 5. Conducting a Trial

The e-book trial was conducted after improvements based on suggestions given by content experts, media experts and field practitioners. The trial was conducted on a group of students of the Biology Education, FITK, Raden Fatah State Islamic University, Palembang who had taken the Biochemistry course, totaling 18 people. The following are the results of the e-book analysis based on student responses presented in table 4.

**Table 4. Student Response Questionnaire Analysis Results**

Aspect	Indicator	Number of Respondents	Score Maximum	Number of Scores	Percentage (%)	Practicality Level
<b>Content</b>	Biochemistry E-Book is interesting to learn	18	4	100	100%	Very Practical
	Biochemistry E-Book is presented systematically/sequentially so it is easy to understand	17	4	98	98%	Very Practical
<b>Language</b>	The language used in the communicative Biochemistry E-Book	17	4	98	98%	Very Practical
	The language used in the Biochemistry E-Book is clear and does not have double meaning and is not ambiguous	18	4	100	100%	Very Practical
	language and punctuation according to EYD	18	4	100	100%	Very Practical
	Sentences and paragraphs in the Biochemistry E-Book are effective and cohesive.	18	4	100	100%	Very Practical
<b>Design</b>	The type and size of letters used are easy to read	17	4	98	98%	Very Practical
	The spacing between words and paragraphs is clear	17	4	98	98%	Very Practical
	The images in the Biochemistry E-Book are clear and attractive.	16	4	95	95%	Very Practical
	The images presented clarify the concepts conveyed.	15	4	94	94%	Very Practical
	The images/illustrations presented are accompanied by image captions.	18	4	100	100%	Very Practical
	The images presented are in accordance with the	15	4	94	94%	Very Practical

Aspect	Indicator	Number of Respondents	Score Maximum	Number of Scores	Percentage (%)	Practicality Level
	topic of the Biochemistry E-Book.					
	The layout of titles, subtitles and illustrations is consistent	17	4	98	98%	Very Practical
	Layout and form of proportional images/illustrations	18	4	100	100%	Very Practical
	The colors on the cover of the Biochemistry EBook are harmonious, balanced and matching.	16	4	95	95%	Very Practical
<b>Number of Instruments</b>		255	60	97,86	97,86%	Very Practical

The research results must be presented clearly and appropriately. Tables should be proportional and not blurry when enlarged. Tables must be redesigned and should not be the result of screenshots or similar methods. Each table in the article must have a description and should not appear abruptly in the article. An example of a table display can be seen in Table 1. Images should also be proportional and not blurry when enlarged. An example of an image display can be seen in Figure 1. It is recommended that if the data in tables and images (e.g., graphs) are similar, the author should choose only one of them.

In the discussion section, avoid including theoretical reviews again. The discussion section should include the author's arguments and must add references from research journals to compare the findings of this study with previous relevant studies. Once again, the author must "compare" their research findings with the results of previous relevant studies. If necessary, the discussion can include the strengths and weaknesses of the research.

Based on the results of the field analysis of e-books from 18 student respondents, where in general they filled in the very valid category with a score of 4, so that an average value of 97.86 was obtained, meaning that the biochemistry e-book based on blended learning using the Sigil application is very practical for use in biochemistry learning activities.

The addition of moderation values and Islamic values is one of the most important things in learning media including biochemistry e-books with the aim of students, especially the Raden Fatah State Islamic University of Palembang. The purpose of adding religious moderation values and Islamic values has a broad purpose, ranging from the formation of individual character to the development of a more harmonious and peaceful society. This is an important step in strengthening harmony between religious communities and promoting tolerance in a diverse society. Moderation in learning media helps students learn to appreciate different perspectives, backgrounds, and beliefs. Contents that are moderated avoid bias or presentation that can be detrimental to certain groups, so that all students feel accepted and appreciated. In learning, teachers can adopt methods that demonstrate universal values, such as mutual respect, cooperation, and fairness, so that students learn to appreciate differences and develop empathy (Darmayanti & Maudin, 2021; Islamy, 2022; Rizkiyah & Istiani, 2021; Rusmiati et al., 2022; Sasongko et al., 2024).

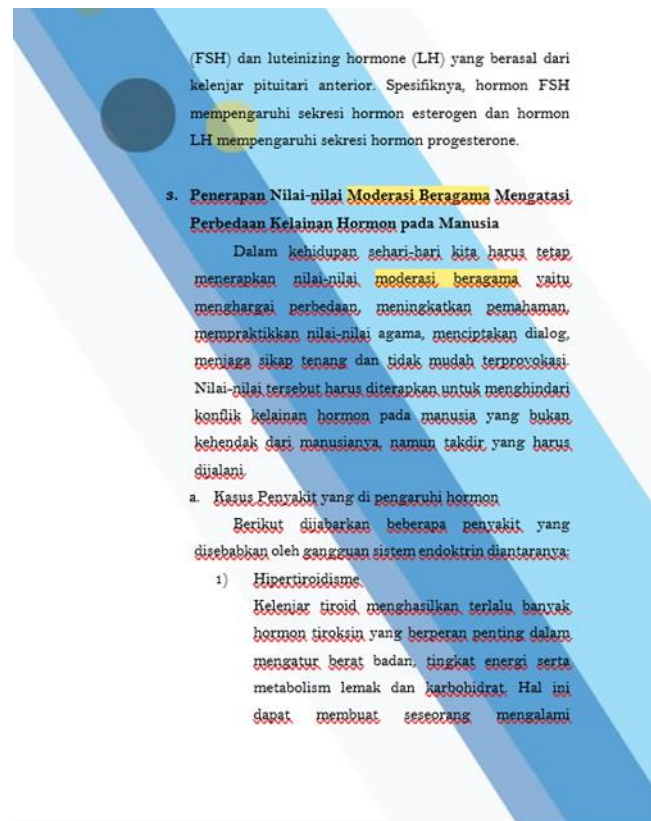


Figure 2. Adding Religious Moderation Values to Biochemistry Content

## CONCLUSION

The biochemistry e-book produced is valid, practical, and effective for use in learning. This is evident from the validation value of content experts (98%), validation of media experts (98%), validation of language experts (91%). Based on the validity value filled in by the validator, the biochemistry e-book product can be categorized as very valid. The biochemistry e-book based on blended learning using the sigil application is also included in the very practical category as seen based on the value of educational practitioners (91.66%), and the readability test filled in by students (97.86%). Suggestions that can be given related to this research are: for lecturers who teach biochemistry courses, they can use this e-book for biochemistry teaching and learning activities and for students, they can use this e-book as a reference content for learning biochemistry.

## ACKNOWLEDGEMENT

The author would like to express his deepest gratitude to all parties who have contributed to this research. Thank you to the validators, content experts (Deny Setiawan, M.Pd), media experts (Primadya Anantyarta, S.Si., S.Pd., M.Pd.), and language experts (Helsa Rahmatika, M.Pd.) who have provided valuable input in the development of this blended learning-based e-book. We also express our appreciation to the field practitioners and students of the Biology Education Study Program, Faculty of Tarbiyah and Teacher Training, Raden Fatah State Islamic University, Palembang, who have participated in the practical trial stage. Without the help and support of all parties, this research would not have been completed properly. This article is the output of the research cluster for coaching/capacity based on output cost standards with funding sources for the 2023 budget year of the

BLU DIPA at the research and community service institution, Raden Fatah State Islamic University, Palembang.

## REFERENCES

- Aditya, P. T. (2018). Pengembangan Media Pembelajaran Matematika Berbasis Web Pada Materi Lingkaran Bagi Siswa Kelas VIII. *Jurnal Matematika Statistika Dan Komputasi*, 15(1), 64. <https://doi.org/10.20956/jmsk.v15i1.4425>
- Antony, G.P., Charles, D., Dziuban, Charkes, R. G. (2014). *Blended Learning Research Perspective*. Routledge.
- Arham, U. U., & Dwiningsih, K. (2020). Kelayakan Multimedia Interaktif berbasis Blended Learning pada Materi Pokok Kimia Unsur. *UNESA Journal of Chemical Education*, 4(November), 274–282.
- Arif, K., Cetinkaya, F., & Khairuna, K. (2023). Benefits of Learning Media in The Learning and Teaching Process at University. *Jurnal Eduscience (JES)*, 10(2). <https://doi.org/10.36987/jes.v10i2.4780>
- Bintari Kartika, S. (2017). Desain Pembelajaran Model Addie Dan Implementasinya Dengan Teknik Jigsaw. *Prosiding Seminar Nasional Pendidikan*, 87–102. <http://eprints.umsida.ac.id/432/>
- Cahyadi, R. A. H. (2019). Pengembangan Bahan Ajar Berbasis Addie Model. *Halaqa: Islamic Education Journal*, 3(1), 35–42. <https://doi.org/10.21070/halaqa.v3i1.2124>
- Chrisyarani, D. D., & Yasa, A. D. (2018). Validasi modul pembelajaran: Materi dan desain tematik berbasis PPK. *Premiere Educandum : Jurnal Pendidikan Dasar Dan Pembelajaran*, 8(2), 206. <https://doi.org/10.25273/pe.v8i2.3207>
- Darmayanti, & Maudin. (2021). Pentingnya Pemahaman dan Implementasi Moderasi Beragama dalam Kehidupan Generasi Milenial. *Syattar: Studi Ilmu-Ilmu Hukum Dan Pendidikan*, 2(1), 40–51.
- Elyas, & Yudianto, H. (2016). Mudahnya Buat Buku Digital Bersama Sigil. In *In H. Subagyo (Ed.), SEAMEO SEAMOLEC*.
- Harjanta, A. T. J., & Herlambang, B. A. (2018). Rancang Bangun Game Edukasi Pemilihan Gubernur Jateng Berbasis Android Dengan Model ADDIE. *Jurnal Transformatika*, 16(1), 91. <https://doi.org/10.26623/transformatika.v16i1.894>.
- Hidayat, R., Erwadi, Sari, V. R., & Purnama, A. V. R. (2017). Pemanfaatan Sigil Untuk Pembuatan E-Book (Electronic Book) dengan Format EPub. *Jurnal Nasional Teknologi Dan Sistem Informasi*, 3(1), 1–8. <https://doi.org/10.25077/teknosi.v3i1.2017.1-8>.
- Hidayat, F., & Nizar, M. (2021). Model Addie (Analysis, Design, Development, Implementation and Evaluation) Dalam Pembelajaran Pendidikan Agama Islam. *Jurnal Inovasi Pendidikan Agama Islam (JIPAI)*, 1(1), 28–38. <https://doi.org/10.15575/jipai.v1i1.11042>.
- Howe, J. W., Kudus, S., & Anandita, A. Della. (2021). The Impact of the COVID-19 Pandemic on Children's Learning in Indonesia. *UNICEF Indonesia*, 1–18. [https://www.unicef.org/indonesia/media/15231/file/Issue Brief - The Impact of the COVID-19 Pandemic on Children's Learning in Indonesia.pdf](https://www.unicef.org/indonesia/media/15231/file/Issue%20Brief%20-%20The%20Impact%20of%20the%20COVID-19%20Pandemic%20on%20Children's%20Learning%20in%20Indonesia.pdf)
- Islamy, A. (2022). Pendidikan Islam Multikultural Dalam Indikator Moderasi Beragama Di Indonesia. *Jurnal Analisa Pemikiran Insaan Cendikia*, 5(1), 48–61. <https://doi.org/10.54583/apic.vol5.no1.87>
- Kandia, I. W., et al. (2023). The Strategic Role of Learning Media in Optimizing Student Learning Outcomes. *Journal of Education Research* 4(2),508-514. DOI : 10.37985/jer.v4i2.193.
- Kismunthofiah, et al. (2023). Practicumma: an Open Platform for Online Practicum at Eleventh Grade Science Students. *Jurnal Pendidikan Matematika dan IPA*.

<https://doi.org/10.26418/jpmipa.v14i2.56126>.

- Lalima, K. L. D. (2017). Blended Learning: An Inovative Approach. *Universal Journal Of Educational Research*, 5(1), 129–136.
- Maharani, P., Alqodri, F., & Cahya, R. A. D. (2015). Pemanfaatan Software Sigil sebagai Media Pembelajaran E-Learning yang Mudah, Murah dan User Friendly dengan Format Epub sebagai Sumber Materi. *Seminar Nasional Teknologi Informasi Dan Multimedia*, 6(8), 25–30.
- Puri, S. . (2018). Pengembangan Media Pembelajaran berbasis Blended Learning pada Mata Kuliah Tailoring. *E-Journal*, 7(3), 8–15.
- Puspitarini, D. (2022). Blended Learning sebagai Model Pembelajaran Abad 21. *Ideguru: Jurnal Karya Ilmiah Guru*, 7(1), 1–6. <https://doi.org/10.51169/ideguru.v7i1.307>
- Rizkiyah, T., & Istiani, N. (2021). Nilai Pendidikan Sosial Keberagamaan Islam Dalam Moderasi Beragama Di Indonesia. *POROS ONIM: Jurnal Sosial Keagamaan*, 2(2), 86–96. <https://doi.org/10.53491/porosnim.v2i2.127>
- Rusmiati, E. T., Alfudholli, M. A. H., Shodiqin, A., & Taufiqurokhman, T. (2022). Penguatan Moderasi Beragama di Pesantren untuk Mencegah Tumbuhnya Radikalisme. *ABDI MOESTOPO: Jurnal Pengabdian Pada Masyarakat*, 5(2), 203–213. <https://doi.org/10.32509/abdimoestopo.v5i2.2162>
- Rosida, Fadiwati, N., & Jalmo, T. (2017). Efektivitas Penggunaan Bahan Ajar E-book Interaktif dalam Menumbuhkan Keterampilan Berpikir Kritis Siswa. *Jurnal Pembelajaran Fisika*, 5(1).
- Ruchi, S., & Sunita, S. (2015). Implementation of Blended Learning In Classroom: a Review paper. *Internasional Journal Of Scientific and Reasearch publication. Internasional Journal Of Scientific and Reasearch Publication*, 20(1).
- Sarah, C. (2018). Pemanfaatan E-Book sebagai Sumber Belajar Mahasiswa STKIP Bina Bangsa Getsempena Banda Aceh. *Tugas Akhir*, 1–26.
- Sari, A. S. (2016). Pengembangan Buku Digital melalui Aplikasi Sigil pada Mata Kuliah Cookie dan Candys. *Jurnal Science Tech*, 1(2), 46–53.
- Shattuck, C. (2017). *Ebook vs PDF: What's the Difference?* <https://mybookcave.com/authorpost/ebook-vs-pdf-whats-the-difference>
- Sasongko, D. F., Budianto, E. W. H., Arkaan, D. U., & Herawati, A. (2024). Internalisasi Nilai Moderasi Beragama Dalam Sistem Ekonomi Syariah Pada UMKM Halal Melalui Produk Pembiayaan Syariah. *Martabe: Jurnal Pengabdian Masyarakat*, 7(4), 1303–1320.
- Susilawati, T., & Rusdinal. (2022). Pengembangan Media Pembelajaran E-Book Berbasis Blended Learning Tematik Terpadu Di Kelas Iv Sekolah Dasar. *Jurnal Cakrawala Pendas*, 8(2), 378–387. <https://doi.org/10.31949/jcp.v8i2.2285>
- Wahl, J. (2018). *What is an eBook? Understanding Why They Work and How to Make Your Own*. <https://learn.g2.com/what-is-an-ebook>
- Wirasasmita, R. H., & Uska, M. Z. (2017). Pengembangan Media Pembelajaran berbasis Buku Digital Elektronik Publication (EPUB) menggunakan Software Sigil pada Matakuliah Pemrograman Dasar. *Jurnal Pendidikan Informatika*, 1(1), 11–16.
- Wulandari, Y. (2017). Kelayakan Aspek Materi Dan Media Dalam Pengembangan Buku Ajar Sastra Lama. *Gramatika STKIP PGRI Sumatera Barat*, 3(2). <https://doi.org/10.22202/jg.2017.v3i2.2049>
- Yana, D., & Adam. (2019). Efektivitas Penggunaan Platform LMS sebagai Media Pembelajaran Berbasis Blended Learning Terhadap Hasil Belajar Mahasiswa. *Jurnal Dimensi*, 8(1), 1–12. <https://doi.org/10.33373/dms.v8i1.1816>