




THE FEASIBILITY OF HEYZINE-BASED E-FLIPBOOK MEDIA FOR KINGDOM MONERA SUB-MATERIAL

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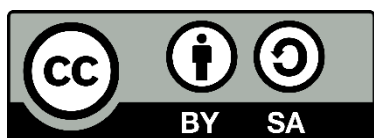
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ARTICLE INFO		ABSTRACT
Article history		<i>This e-flipbook presents the results of the antibacterial test of thorny bajakah stem extract (Caesalpinia sumatrana Roxb.) against Salmonella typhi and its related to the kingdom monera sub-material in the tenth grade of senior high school. The methodology of this research was conducted as descriptive quantitative, while the data presentation was derived from a media feasibility. The data of media feasibility was collected by using a validation sheet conducted by 5 validators. The scale used is a Likert scale with 5 aspects of validation, namely format, content, language, practicality, and effectiveness. The feasibility test results show an average Aiken's V value of 0.88 valid category with an ICC value of 0.863 very good category. Based on the results of this research, e-flipbook is suitable for use as a learning media in schools, especially in the tenth grade of senior high school.</i>
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INTRODUCTION

In the 21st century, the development of information and communication technology (ICT) is progressing rapidly over time. This is closely related to the field of education, which is also affected by technological advancements (Putra, Sidiq, & Mahlianurrahman, 2023). ICT helps simplify complex matters, for example, by displaying explanations or processes through images or videos (Singh et al., 2020). Digital media serves as a supporting resource in the educational process, particularly through its engaging presentation, which can be utilized in learning activities (Nasbey et al., 2024). Learning media can be conceptualized as a tool or means that functions as an intermediary in the conveyance of information between communicators and the communicants in the learning

process (Fahmi, Widayati, & Priwanto, 2022). Audio-visual media incorporate elements of sound and images, allowing for the absorption of material through both sight and hearing (Cahyani, Sholihah, & Meishanti, 2022). One of the audio-visual media that can be used digitally in school is an e-flipbook.

The term "flipbook" originated from a series of images on a toy consisting of paper sheets that could be flipped through. When the sheets were opened from one page to another, the images appeared to move (Aprilia, Sunardi, & Djono, 2017). The use of e-flipbook is similar to opening a page in a physical book, where pages are moved by touching (dragging) or using the navigation buttons, if available, in the e-flipbook application (Susanti, 2021). E-flipbook media can be presented with a variety of colours, ensuring visual appeal (Rahmawati, Wahyuni, & Yushardi, 2017). The e-flipbook medium is designed using the Canva application, rendered in PDF format, and subsequently converted to HTML (Hypertext Markup Language) through the Heyzine web, ensuring optimal flexibility in its application (Manzil, Sukamti, & Thohir, 2022). The Canva application is an online design platform that provides a variety of templates, including those for presentations, posters, banners, and other graphic designs (Yuliana et al., 2023).

The Heyzine website serves as an online platform for converting PDF files into an e-flipbook (Auwalayah, Sahrina, Soekanto, & Masruroh, 2023). Heyzine flipbook offers a range of effects, including the ability to flip through pages as if they were in a real book (Ahmar, Andriany, & Papendang, 2024). These learning media have been designed to be user-friendly for students, teachers, and the general public, ensuring a comfortable and easy learning experience for all. The application can be accessed through a variety of devices, including smartphones, tablets, and laptops (Erawati, Purwati, & Saraswati, 2022). A primary advantage of Heyzine e-flipbook is its integration of diverse features, including video, images, animations, audio, and hyperlinks, which enhances the multimedia aspect of the educational material (Muhaimin, Leny, & Almubarak, 2024).

This Heyzine media focuses on the kingdom Monera, with the subtopic being the role of bacterial material in the tenth grade. The selection of this material is based on the antibacterial test results of *Caesalpinia sumatrana* Roxb. against *Salmonella typhi*, which can be used as a learning medium, particularly in the subtopic 'the role of bacteria as a pathogenic bacterium in the material kingdom monera' at the tenth-grade level. According

to research by Ayuardini (2023), the use of e-flipbooks has been shown to significantly enhance comprehension of biological concepts related to the animal kingdom. The validation scores attained by e-flipbook averaged 80% among material experts, 60% among media experts, and 60% among linguists, indicating its potential to improve learning outcomes.

Despite the advantages of e-flipbooks, their integration into teaching and learning activities in schools remains limited. Based on an interview with the biology teacher of the tenth grade at Kemala Bhayangkari Senior High School, it was revealed that the teacher primarily uses PowerPoint and poster images as teaching aids in the classroom. However, with the advent of contemporary technological advancements, such as laptops, computers, and LCD projectors, now available in classrooms during learning activities, there is a potential for e-flipbooks to revolutionize the learning process in schools. The purpose of this research is to determine the feasibility of Heyzine-based e-flipbook media as a learning medium for the kingdom Monera sub-material in tenth-grade senior high school, inspiring a new wave of educational possibilities.

MATERIALS AND METHODS

This type of research was conducted as quantitative research using a descriptive method. This descriptive study focuses on the results obtained from the presentation of data on the feasibility analysis of e-flipbook media for the sub-kingdom Monera. This research was conducted from January to June 2024 at the Faculty of Teacher Training and Education, Tanjungpura University, Pontianak, as well as at SMAN 1 Sungai Raya, SMA Kemala Bhayangkari, and SMA Taruna Bumi Khatulistiwa. The tools applied are laptops with Canva web and Heyzine web applications. At the same time, the materials used include the results and documentation from the antibacterial test of thorny bajakah stem extract (*Caesalpinia sumatrana* Roxb.) against *Salmonella typhi*, which the researchers carried out. Additionally, biology books and journals on the material's 3-domain classification of living things, as well as reference videos from YouTube, were consulted.

The research procedure includes the development of e-flipbook media designs, preparation of validation instruments, validation of the instruments and e-flipbook media,

and data analysis. The e-flipbook media was compiled using the Canva application, a modern and versatile design tool, to create the template design and Heyzine, a cutting-edge conversion tool, to convert the PDF format into HTML for the e-flipbook format. The instrument validation sheet assessment adopts a Guttman scale, while the e-flipbook media assessment adopts a Likert scale consisting of a 1-4 scale, which includes Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1).

The data analysis stage of the media validation results utilizes Aiken's V, conducted by five validators with 4 rating scales. The validators, comprising 2 Biology education lecturers from the Teacher Training Education Faculty of Tanjungpura University and 3 Biology teachers from the tenth grade of SMAN 1 Sungai Raya, SMA Kemala Bhayangkari, and SMA Taruna Bumi Khatulistiwa, were instrumental in ensuring the practical relevance of the research. The media validation process comprises 23 criteria, divided into five assessment aspects: format, content, language, practicality, and effectiveness. The minimum coefficient value of V is 0.87, which is equivalent to $V > 0.87$ (Wahab, Istyadji, & Putri, 2021). If the final value of the calculation attains this minimum threshold, the media is declared valid. Following Aiken's V analysis, the reliability test employing ICC is categorized according to Zaki (2016), as shown in Table 1.

Table 1. The ICC Reliability categories

ICC Value	Category
$ICC < 0,4$	Bad
$0,4 \leq ICC \leq 0,75$	Good
$ICC > 0,75$	Very Good

RESULTS AND DISCUSSION

Product Development

The media was designed in advance to include a front cover, identity page, foreword, instructions for use, Table of contents, learning objectives and goals, content, exercises, bibliography, glossary, author profile, and back cover. The creation of a flowchart and a storyboard is an integral component of the media design process, as these visual representations provide a comprehensive overview of the intended media. Canva,

a versatile design tool, was used to create and save the press in PDF format. This research commenced with the media preparation stage, wherein the Canva application was utilized to create template designs. Examples of the designed media are provided in Figure 1. (a) and (b).

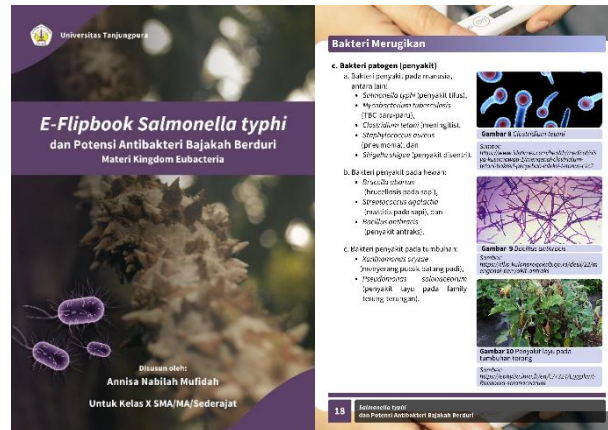
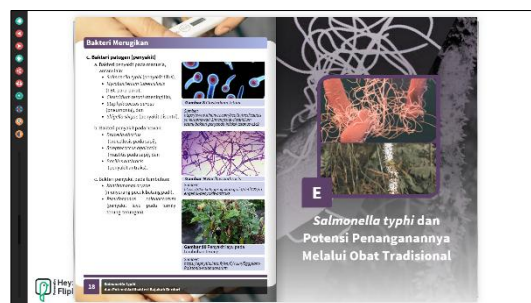
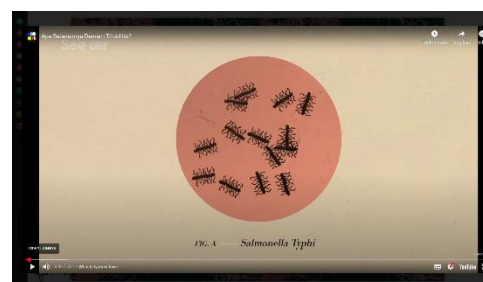


Figure 1. (a) cover of the e-flipbook; (b) material on the e-flipbook

The media preparation is divided into three systematic sections: the opening section, the material chapter, and the closing section. The final media design is then converted using the versatile Heyzine website. The conversion process utilised by Heyzine involves converting the PDF format to HTML, opening up a world of possibilities for your media design. The Heyzine platform incorporated a link into the design, enabling access to images and YouTube videos. Following the incorporation of the links, the design can be saved and accessed via a browser. Examples of media that have been converted to HTML format using Heyzine are shown in Figures 2 (a) and (b).



a



b c

Figure 2. (a) media in format HTML; (b) media integrated with image link and; (c) media integrated with YouTube

Validation Product

The resulting media were then subjected to a rigorous validation process by five validators, ensuring a comprehensive assessment. This panel consisted of 2 Biology education lecturers from the Teacher Training Education Faculty of Tanjungpura University and 3 Biology teachers from the tenth grade of SMAN 1 Sungai Raya, SMA Kemala Bhayangkari, and SMA Taruna Bumi Khatulistiwa. The media validation process comprises 23 criteria, divided into five assessment aspects: format, content, language, practicality, and effectiveness. The results of the validation analysis are presented in Table 2.

Table 2. Results of E-Flipbook Media Validation Analysis

Aspect	Criteria Assessed	Value Aiken's V	Desc
Format	1. The appropriateness of colors, writings, and images on the e-flipbook	0,93	Valid
	2. The suitability of the type and size of letters in the e-flipbook	0,93	Valid
	3. The attractiveness of the layout on each page of the e-flipbook	0,93	Valid
	4. Consistent arrangement of e-flipbook pages	1,00	Valid
	5. The attractiveness and authenticity of the image of the antibacterial test result of thorny bajakah stem extract against <i>Salmonella typhi</i>	0,73	Not Valid
Content	6. The alignment of the material with learning outcomes and objectives	1,00	Valid
	7. The consistency and clarity of the material in the e-flipbook	0,93	Valid
	8. The accuracy of information on the classification of living things in the kingdom eubacteria with currently recognized theories or appropriate concept according to experts	0,93	Valid
	9. The authenticity of information on antibacterial testing of thorny bajakah stem extract against <i>Salmonella typhi</i> as original research results	0,93	Valid
	10. The suitability of the antibacterial results of thorny bajakah stem extract against <i>Salmonella typhi</i> to support the explanation of the classification of living things material in the kingdom eubacteria section in the e-flipbook	0,87	Valid
	11. The accuracy of presenting the result of the antibacterial test of thorny bajakah stem extract	0,87	Valid

Aspect	Criteria Assessed	Value Aiken's V	Desc
Language	12. The suitability of practice questions to assess the understanding of the tenth grade senior high school students regarding the presentation	0,67	Not Valid
	13. The accuracy of writing words and sentences in the e-flipbooks	0,87	Valid
	14. Ease of understanding of words and sentences for the tenth grade of senior high school students	0,93	Valid
	15. The suitability of information about the results of antibacterial test of thorny bajakah stem extract against <i>Salmonella typhi</i> to increase vocabulary and language skills of the tenth grade senior high school students	0,93	Valid
	16. The suitability of writing punctuation, foreign terms, and sentences with the guidelines of Refined Spelling (EYD)	0,80	Not Valid
Practicality	17. The sentences employed must be clear and devoid of any multiple interpretations or racial elements	0,93	Valid
	18. Practicality of using e-flipbooks in devices online and can be connected to other applications	0,67	Not Valid
	19. The suitability of instructions for use to increase the practicality of using e-flipbook media in learning	0,87	Valid
	20. The repeated use of e-flipbooks in online and offline learning	0,93	Valid
	21. The suitability of presenting the results of the antibacterial test of thorny bajakah stem extract against <i>Salmonella typhi</i> to increase the practicality of a more comprehensive understanding of the material	0,93	Valid
Effectiveness	22. The effectiveness of using e-flipbooks in both individual and group learning	0,93	Valid
	23. The effectiveness of using e-flipbooks to assess students' understanding with the presentation of practice questions	0,80	Not Valid

The data analysis yielded an average of 0.88 valid categories for the e-flipbook validation, thereby substantiating its validity. The results were obtained by aggregating Aiken's V value for each statement item and then dividing it by the number of statement items contained. Based on the result of Aiken's V analysis on the format aspect, it has an average value of 0.90 with a valid category; the content aspect has an average value of 0.89 with a valid category, the language aspect has an average value of 0.89 with a valid category, and the practicality aspect has an average value of 0.85 with an invalid category. The effectiveness aspect has an average value of 0.87 with a valid category. Following

Aiken's V analysis, the data were subjected to a reliability assessment utilizing the interclass correlation (ICC) method. This analysis was conducted using the statistical software SPSS 27, with categories referring to Zaki (2016). The results, which strongly support the validity of the instrument, are presented in Table 3.

Table 3. ICC Analysis Results

	<i>Intraclass Correlation</i>
Single Measures	0,214 ^a
Average Measure	0,863 ^c

Based on the results of the ICC reliability analysis using SPSS 27, the average value (average measure) was 0.863, indicating an outstanding category across the five assessment aspects. This high level of agreement between raters in assessing e-flipbook media provides a strong reassurance of its reliability. The validation of media was conducted using five elements of assessment: format, content, language, practicality, and effectiveness.

The results of Aiken's V in the aspect format represent four valid criteria and one invalid criterion. Aiken's V results show a value of 0.93–1.00, indicating its validity; however, one aspect shows a value of 0.73, which is not within the acceptable range for validity. The invalid criterion identified in the format aspect is found in item no. 5, namely the attractiveness and authenticity of the image of the antibacterial test result of thorny bajakah stem extract against *Salmonella typhi*. This can be attributed to the lack of variety in the documentation of antibacterial test research outcomes within the e-flipbook medium.

This validity aspect format includes the appropriateness of colours, text, and images on the e-flipbook; The suitability of the type and size of letters in the e-flipbook; the attractiveness of the layout on each page of the e-flipbook; and the Consistent arrangement of e-flipbook pages. The present standpoint aligns with Kustandi et al. (2021), as the criteria inform the selection of font type and size for readability and clarity in digital media. The e-flipbook is presented with a variety of images tailored to the content of each material, ensuring the achievement of learning objectives and increasing the appeal of the media. The color composition is presented with a white background and dark fonts based on ease of reading and aesthetic value (Martadireja & Hafizah, 2025).

The results of Aiken's V in the content aspect represent six valid criteria and one invalid criterion. Aiken's V results show a value of 0.87–1.00, indicating its validity;

however, one aspect shows a value of 0.67, which does not necessarily mean it is invalid. The invalid criteria identified in the content aspect are found in item no. 12, specifically the suitability of practice questions to assess the understanding of tenth-grade senior high school students regarding the presentation. This can be caused by the presented practice questions, which are not specific and are challenging to understand.

The content was sourced not only from textbooks, but also from other sources, such as academic journals, YouTube videos, and antibacterial test results, which can expand scientific knowledge (Mulyono & Ampo, 2021). The presentation of the e-flipbook on the role of bacteria contains information from the latest research results on the use of thorny bajakah stem extract (*Caesalpinia sumatrana Roxb.*) against the *S. typhi* bacteria. Research conducted by Satriani, Ashaq, and Bahri (2024) suggests that selecting appropriate materials has the potential to significantly enhance the learning process. This optimistic view is further supported by the potential of the e-flipbook to encompass not only textbooks but also other additional sources, including research materials, which can support teaching materials, particularly on the sub-topic of the role of bacteria in the kingdom Monera.


The results of Aiken's V in the language aspect represent four valid criteria and one invalid criterion. Aiken's V results show a value of 0.87–0.93, indicating its validity. However, one aspect shows a value of 0.80, which is not considered valid in this context, as it relates to the accuracy of writing words and sentences according to Refined Spelling (EYD), and the ease of understanding words and sentences by avoiding multiple interpretations and racial elements. According to Erawati (2024), the presentation of the material employs clear sentences that avoid multiple interpretations, enabling students to understand the information contained easily. The invalid points may occur due to errors in spelling or punctuation.

The results of Aiken's V in the practicality aspect represent three valid criteria and one invalid criterion. Aiken's V results show a value of 0.87–0.93, indicating its validity. However, one aspect shows a value of 0.67, which does not necessarily indicate its validity. The practicality aspect, which includes the practicality of using the media and its repeated use in learning, is a key factor in determining the media's effectiveness. According to Syarifah, Windiyani, and Suchyadi (2023), e-flipbook media can be used individually or in groups, providing easy access through smartphones, laptops, and

similar devices to enhance students' learning activities. The invalid criteria identified in the practicality aspect are found in item no. 18, specifically the practicality of using e-flipbooks on online devices that can be connected to other applications, with a value of 0.67. This can be caused by the fact that using media online requires a good internet connection and the availability of quota or Wi-Fi; therefore, a stable signal is necessary.

The results of Aiken's V in the effectiveness aspect represent one valid criterion and one invalid criterion. Aiken's V results show a value of 0.93, indicating its validity; however, one aspect shows a value of 0.80, which is not considered valid—the effectiveness aspect, which includes the effectiveness of using e-flipbooks in learning. According to Pratiwi et al. (2024), electronic learning media can be used individually or in groups to facilitate the learning process. The invalid criteria identified in the effectiveness aspect are found in item no. 23, which is the effectiveness of using e-flipbooks to assess students' understanding with the presentation of practice questions. This can be caused by the lack of specificity in the presentation of some questions, which requires improvement to make the presentation questions more straightforward. Based on the validation results, suggestions and comments for improvement are provided by the e-flipbook media validator. The results are presented in Table 4.

Table 4. E-Flipbook Media Revision Based on Suggestions and Comments from Validators

Before Revision	After Revision
 <p>Instructions for use are not appropriate, because there are unnecessary images.</p>	 <p>Instructions for use are appropriate without unnecessary images.</p>
 <p>Colors are not yet appropriate and the arrangement of chapters and subchapters is not alphabetical.</p>	 <p>Colors are appropriate and the arrangement of chapters and subchapters are alphabetical.</p>
 <p>The spelling of the word “applying”</p>	

is less precise.

Sistem Klasifikasi Tiga Domain	
Pada sistem klasifikasi tiga domain enam kingdom, organisme pada domain berbeda mengandung bentuk rRNA unik dan ribosom yang berbeda, serta karakteristik lainnya yaitu:	
Bakteri	<ul style="list-style-type: none"> • Ribosom 70S; • RNA polimerase (bertanggung jawab atas sebagian besar transkripsi mRNA) mengandung 5 protein; • Prokariota bersel tunggal (uniseluler) tanpa membran inti, mitokondria, atau kloroplas; • Anaerob ataupun aerob; • Memiliki dinding sel yang tersusun atas peptidoglikan; • Kingdom Eubacteria.
Arkea	<ul style="list-style-type: none"> • Ribosom 70S; • RNA polimerase mengandung antara 8 dan 10 protein mirip ribosom eukariotik; • Uniseluler, prokariot tidak ada membran internal seperti nukleus; • Ekstremofil; • Memiliki dinding sel, namun tidak tersusun atas peptidoglikan; • Kingdom Archaeobacteria.
Eukarya	<ul style="list-style-type: none"> • Ribosom 80S; • RNA polimerase mengandung 12 protein; • Multiseluler, memiliki nukleus dan organel internal; • Eukarya tidak memiliki dinding sel, kecuali pada sel tumbuhan dan tersusun atas poliakardid; • Kingdom Protista, Fungi, Plantae, dan Animalia.

The use of semicolons (;) is less precise.

The spelling of the word “applying” is replaced by “categorizing”.

Sistem Klasifikasi Tiga Domain	
Pada sistem klasifikasi tiga domain enam kingdom, organisme pada domain berbeda mengandung bentuk rRNA unik dan ribosom yang berbeda, serta karakteristik lainnya yaitu:	
Bakteri	<ul style="list-style-type: none"> • Ribosom 70S; • RNA polimerase (bertanggung jawab atas sebagian besar transkripsi mRNA) mengandung 5 protein; • Prokariota bersel tunggal (uniseluler) tanpa membran inti, mitokondria, atau kloroplas; • Anaerob ataupun aerob; • Memiliki dinding sel yang tersusun atas peptidoglikan; • Kingdom Eubacteria.
Arkea	<ul style="list-style-type: none"> • Ribosom 70S; • RNA polimerase mengandung antara 8 dan 10 protein mirip ribosom eukariotik; • Uniseluler, prokariot tidak ada membran internal seperti nukleus; • Ekstremofil; • Memiliki dinding sel, namun tidak tersusun atas peptidoglikan; • Kingdom Archaeobacteria.
Eukarya	<ul style="list-style-type: none"> • Ribosom 80S; • RNA polimerase mengandung 12 protein; • Multiseluler, memiliki nukleus dan organel internal; • Eukarya tidak memiliki dinding sel, kecuali pada sel tumbuhan dan tersusun atas poliakardid; • Kingdom Protista, Fungi, Plantae, dan Animalia.

The use of semicolons (;) is appropriate.



There is no instruction on the parts of thorny bajakah.



There is instruction on the parts of thorny bajakah.

Latihan Soal

Instruksi

- Baca soal dengan baik dan cermat
- Tulislah jawaban secara tepat
- Kerjakan secara efektif dan efisien

Soal

1. Pada sistem klasifikasi makhluk hidup 3 domain 6 kingdom, kingdom Monera diklasifikasikan menjadi Archaeobacteria dan Eubacteria. Berdasarkan pernyataan tersebut jelaskan pengklasifikasian 3 domain makhluk hidup!
2. Jelaskan perbedaan kingdom Archaeobacteria, Eubacteria, Protista, Fungi, Plantae dan Animalia berdasarkan ciri-ciri yang dimiliki!
3. Kingdom Eubacteria mencakup bakteri yang diketahui memiliki peranan sebagai patogen maupun non patogen. Salah satu jenis bakteri patogen ialah *Salmonella typhi* yang dapat menyebabkan penyakit tifus. Bagaimanakah *Salmonella typhi* dapat menginfeksi tubuh inangnya?
4. Buatlah laporan tertulis mengenai solusi dalam mengatasi bakteri patogen yaitu *Salmonella typhi* dan *Pseudomonas solanaceorum* dengan memanfaatkan jenis tumbuhan obat di sekitar!

The writing and presentation of practice questions is less precise and specific.

Latihan Soal

Instruksi

- Baca soal dengan baik dan cermat
- Tulislah jawaban secara tepat
- Kerjakan secara efektif dan efisien

Soal

1. Jelaskan pengklasifikasian tiga domain makhluk hidup beserta pengelompokan jenis kingdom pada sistem tiga domain!
2. Jelaskan perbedaan kingdom Archaeobacteria, Eubacteria, Protista, Fungi, Plantae dan Animalia berdasarkan ciri-ciri yang dimiliki!
3. Kingdom Eubacteria mencakup bakteri yang diketahui memiliki peranan sebagai patogen maupun non patogen. Salah satu jenis bakteri patogen ialah *Salmonella typhi* yang dapat menyebabkan penyakit tifus. Bagaimanakah *Salmonella typhi* dapat menginfeksi tubuh inangnya?
4. *Salmonella typhi* dan *Pseudomonas solanaceorum* merupakan jenis bakteri patogen. Berdasarkan efek yang diakibatkan dari kedua bakteri tersebut, buatlah laporan tertulis terkait pemanfaatan jenis tumbuhan obat di sekitar pada penanganan penyakit dari kedua bakteri patogen!

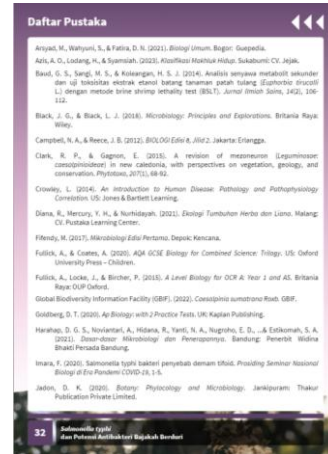
Adapun pada penulisan laporan format yang digunakan, yaitu:

- Laporan diketik dengan ukuran kertas A4, margin normal dengan jumlah halaman maksimal 5 halaman,
- Font yang digunakan yaitu TNR (12pt), spasi 1,5 dengan rata kanan kiri,
- Hutan laporan terdiri atas latar belakang masalah, rumusan masalah, tujuan masalah, pembahasan, kesimpulan dan saran,
- Isi pembahasan merujuk pada sumber yang relevan (10 tahun terakhir),
- Isi pembahasan dapat dicantumkan gambar yang sesuai.

The writing and presentation of practice questions is specific.



The writing of the bibliography is less precise, there are bullets.



The writing of the bibliography is adequate, there are no bullets.



The writing of the glossary is less precise, there is no provision of alphabetical dividers, there are still minimal terms.



The writing of the glossary is adequate, there is provision of alphabetical dividers and the number of terms in the glossary is increased.

CONCLUSION

The research findings, as substantiated by validation using Aiken's V method, indicate that the e-flipbook achieved an average score of 0.88, which is categorized as valid. This high validity score provides a strong foundation for the e-flipbook's effectiveness. Moreover, an ICC analysis with SPSS 27 obtained an average value (average measures) of 0.863 in the "outstanding" category. This research indicates that the e-flipbook media developed is valid and can be used as a feasible learning medium. It is essential to recognize that aspects identified as invalid can be potentially enhanced. This enhancement is crucial to optimizing the utility of the e-flipbook media

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