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Practicality Test of Static Infographics on Biology Material FMIPA UNM

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ABSTRAK

Pembelajaran biologi di perguruan tinggi membutuhkan strategi inovatif agar mahasiswa dapat memahami konsep secara lebih mendalam. Salah satu pendekatan yang dinilai efektif adalah penggunaan visualisasi materi, karena mampu menyederhanakan konsep yang kompleks menjadi lebih mudah dipahami. Kondisi ini menegaskan bahwa proses pembelajaran biologi masih perlu dioptimalkan, salah satunya melalui penerapan infografis sebagai media pembelajaran yang dapat meningkatkan kejelasan dan daya tarik materi. Penelitian ini bertujuan menguji kepraktisan infografis statis yang dikembangkan secara terstruktur untuk kebutuhan pembelajaran Biologi bagi generasi Z. Validasi isi dan desain telah dilakukan pada tahap pengembangan melalui penilaian pakar, sehingga penelitian ini berfokus pada uji kepraktisan dalam uji coba terbatas. Kajian keefektifan direncanakan pada penelitian lanjutan. Penelitian ini merupakan model penelitian dan pengembangan (R&D) mengacu pada model pengembangan ADDIE. Produk penelitian yaitu infografis statis yang di uji kepraktisan pada 57 mahasiswa di matakuliah struktur dan perkembangan hewan materi sistem organ. Penelitian ini menggunakan angket sebagai instrumen. Analisis data dilakukan secara kuantitatif. Hasil penelitian menunjukkan bahwa tingkat kepraktisan infografis statis pada mata kuliah Struktur dan Perkembangan Hewan berada pada kategori praktis sebesar 51,02% dan sangat praktis sebesar 32,46%, sehingga media tersebut dinyatakan praktis. Temuan ini diharapkan dapat mengoptimalkan pembelajaran Biologi dan menjadi referensi bagi perguruan tinggi.

Kata Kunci: biologi; infografis; mahasiswa; pembelajaran; pengembangan.

ABSTRACT

Learning biology in higher education requires innovative strategies so that students can understand concepts more deeply. One approach that is considered effective is the use of material visualization, because it is able to simplify complex concepts to be more easily understood. This condition confirms that the biology learning process still needs to be optimized, one of which is through the application of infographics as learning media that can increase the clarity and attractiveness of the material. This study aims to test the practicality of static infographics developed in a structured manner for the needs of Biology learning for generation Z. Content and design validation have been carried out at the development stage through expert assessment, so this study focuses on practicality testing in limited trials. The study of the effectiveness of is planned in further research. This research is a research and development (R&D) model referring to the ADDIE development model. This research product is a static infographic that was tested for practicality on 57 students in the structure and development of animal organ system material. This study used a questionnaire as an instrument. Data were analyzed quantitatively. The results show that the practicality level of static infographics in the Animal Structure and Development course falls into the practical category at 51.02% and the highly practical category at 32.46%, indicating



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that the media is considered practical. These findings are expected to help optimize Biology learning and serve as a reference for higher education institutions.

Keywords: *biology; infographics; student; learning; development*

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INTRODUCTION

Biology education at the higher education level, especially in the Department of Biology, requires effective learning methods to facilitate the understanding of complex concepts in this field (Adnan, & Azis, 2025). One method that is considered effective is the use of visual media such as infographics that are able to simplify complex information into a form that is easier to understand and attractive to students. Infographics are learning media that combine text and graphic elements to present information visually, making complex data more accessible and interesting (Damyanov & Tsankov, 2018; Tarkhova et al., 2020). Infographics benefit as an effective communication tool by simplifying complex information and making it more digestible for the audience. This is very useful in improving message delivery (Bhat & Alyahya, 2024; Orekhova, 2021). Especially in media that are more engaging, interactive, and can be used digitally (Aslam et al, 2021). Infographics visualise data and ideas that try to convey complex information to audiences quickly and easily (Martini & Sueca, 2023; Sidiq et al., 2022). The media pairing of text and images as well as videos can increase learner motivation and encourage active and independent learning (Nurlinah et al. 2018; Asysyura et al., 2023). Classroom learning can utilize different types of infographics.

A widely used form of infographics in learning is static infographics, which present information in a fixed visual form without interactivity or animation but are still effective in conveying information in a concise and engaging manner. Static infographics are a type of infographic that features one main visual designed to convey a specific message to the audience (Alrajhi, 2020). The visual graphics designed in static infographics are usually designed for print or digital display or through websites or presentation screens, without including any animation elements, movement or moving visual effects. Therefore, the end result of static infographics is generally stored in static image formats such as JPG, PNG, or GIF, or

in the form of PDF documents so that they can be easily accessed through a browser (Krum, 2014; Afifiy, 2018). According to Shemy (2022), in reading static infographics, learners can zoom in or out on the screen and scroll right and left to analyse the visual content. This process continues by analysing and understanding each component, identifying the relationship between elements, to gain a comprehensive understanding and conclude the meaning of the infographic.

Infographics are divided into three types, namely static infographics, dynamic infographics, and interactive infographics (Ferla et al., 2009; Panadero, 2017) (Putra, 2020). Static infographics display various elements such as graphs, images, photos, and charts that present information in a simple, clear, and interesting way for learners (Ferla et al., 2009; Panadero, 2017) (Shemy, 2022). Meanwhile, dynamic infographics present content with the ability to display processes or data through continuous motion or animation, rather than in the form of separate steps or blocks of information (Ismaeel & Al Mulhim, 2021). The last type is interactive infographics, which rely on reader engagement through interactions such as watching videos, selecting visual elements, or determining answers (Ismaeel & Al Mulhim, 2021). Infographics, which combine text and visual elements, have been shown to increase the appeal of teaching materials and help in strengthening students' understanding of difficult topics in biology.

The existence of infographics as learning media has been widely applied, but there is still a lot of untapped potential in developing infographics for more in-depth biology material (Elaldı & Çifçi, 2021). Many existing infographics tend to be general in nature, and are not specifically designed to support the achievement of competencies in Biology learning. In addition, the infographics used are often only illustrations that cannot specifically describe the relationship between complex biological components (Dehghani et al., 2020).

Various studies have shown that infographic media plays an important role in supporting learning and information dissemination. The use of infographics has been shown to improve reading comprehension skills, such as in class X AKL 1 students of SMKN 1 Bangli, where more than 90% answered the questions correctly (Martini & Sueca, 2023). Infographics are also effective in disseminating library information through social media and are considered to facilitate understanding (Saputri & Jumino, 2023). The use of infographics in social studies subjects has also proven effective in improving student learning outcomes (Afifah & Hafid, 2022).

Various studies have shown that infographics can improve concept understanding in various disciplines. However, most studies are general in nature and it is rare to develop a specific type of infographic for biology materials, especially at the university level. This research offers a novelty by developing static-type infographics that combine visual elements and current learning theories in the context of Biology learning in higher education. Static infographics are believed to encourage students' active learning and improve their cognitive abilities. With this media, students can build knowledge more meaningfully so that the learning process becomes more effective, efficient and practical. The purpose of this research is to produce static infographics that are structured and able to fulfil the needs of Biology learning.

METHOD

This study uses a learning media development approach with the aim of producing static infographics on organ system materials and testing its practicality aspects in Biology learning. Because the research only reaches the stage of practical testing, it is not fully categorized as a complete Research and Development (R&D) research. The research was carried out at the Department of Biology of FMIPA UNM in the second semester of the 2024 Academic Year. The research subjects consisted of 57 students of the Biology Study Program. This number is the class population involved in the related courses, so the sampling technique uses total sampling. The trial was conducted in one test group (without a comparison group), as the focus of the study was to assess the response and practicality of the developed media.

The media development procedure indirectly begins at the development stage; the research begins with the analysis and design stage, although not all stages of the ADDIE model are implemented. The analysis stage includes the identification of students' difficulties in understanding organ system material and literature review regarding the effectiveness of visualization in Biology learning. The design stage includes planning the information structure, selecting visual styles, and determining the graphic elements to be included. The next stage is development, which is the creation of static infographics based on the results of analysis and design. Media is developed through the selection of graphic elements, colors, typography, and concise, clear, and attractive information arrangements. The media used in this study is a product developed by itself, not adapted from previous

media, and has gone through an expert validation process before being tested for practicality. The last stage is a practicality test, which is carried out through providing response questionnaires to students to assess the ease of use, clarity of information, visual appeal, and potential use in Biology learning.

Data collection techniques in this study were adjusted to the aim of measuring the practicality of static infographic learning media on Biology material. Practicality data was obtained through a student response questionnaire on the use of media that had been developed. Data analysis is carried out to organise and classify data into patterns and basic description units (Tanzeh, 2010). The data obtained was analyzed using descriptive statistics, namely by calculating the average score (mean) of each assessment aspect to determine the practicality level of static infographic learning media.

Practicality assessments include aspects of content suitability, accuracy of information, visualization and images, layout and aesthetics, creativity and originality, structure and flow of information, use of learning resources, and group collaboration (if the media is created in groups). The category of media practicality level is determined based on score interpretation criteria according to (Riduwan, 2018). The scores obtained from the student questionnaire are then converted into percentages, and the percentages are interpreted into specific categories. Percentages between 81% to 100% are categorized as very practical, while percentages of 61% to 80% fall into the practical category. The percentage of 41% to 60% indicates the category is quite practical, while the percentage of 21% to 40% is categorized as less practical. The percentage of 0% to 20% is included in the category of impractical. Learning media is declared practical if the calculation results are in the category of "practical" or "very practical" according to these criteria.

RESULT AND DISCUSSION

The following are the results of the practicality test of static infographics based on indicators.

Content Suitability

The results of the practicality test of the content suitability indicator can be seen in table 1.

Table 1. Content suitability

Criterion	Very Agree		Agree		Neutral		No Agree		Very Not Agree	
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
1. The infographics displayed are according to the topic of the course.	36	63.16	20	35.09	1	1.75	0	0	0	0.00
2. The content of the infographic supports the learning objectives conveyed by the lecturer.	24	42.11	30	52.63	3	5.26	0	0.00	0	0.00
3. Infographics help me understand the lecture material more focused.	21	36.84	27	47.37	9	15.79	0	0.00	0	0.00
Average	47.37		45.03		7.60		0.00		0.00	

Based on Table 1, in the first criterion, the majority of students chose the category of strongly agree (63.16%), which shows that static infographics are seen as very appropriate for the topic of the lecture. This high response indicates that the information presented in the infographic is in harmony with the material discussed in the lecture, so that students feel that the content they see is really relevant to what they are learning. In the second criterion, most students chose the agree category (52.63%), which means they assessed that the infographic content supports the learning objectives that have been set by the lecturer. This indicates that students do not only see infographics as companion illustrations, but as learning media that help them understand what is a learning outcome. In the third criterion, the agreed response (47.37%) was also the most dominant, indicating that infographics help students to focus more on understanding the core material and organizing information better.

If the three criteria are analyzed as a whole, then the content suitability indicator shows that static infographics are in the practical category based on the predetermined practicality criteria (Riduwan, 2018). This finding is in line with the

opinion of (Nkosikulu, 2024) who states that infographics are an efficient means of presenting information in a targeted and impactful manner so that it can prevent excessive cognitive load and ensure that each element has a meaningful contribution to the learning experience. Similarly, Lyra et al. (2016) emphasized that well-designed infographics are able to direct and focus readers' attention, thus potentially increasing knowledge acquisition.

Information Accuracy

The results of the practicality test of the information accuracy indicator can be seen in table 2.

Table 2. Accuracy of information

Criterion	Very Agree		Agree		Neutral		No Agree		Very Not Agree	
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
1. The information in the infographic is easy to understand.	17	29.82	28	49.12	12	21.05	0	0.00	0	0.00
2. Data or information presented in the infographic is factually accurate.	20	35.09	31	54.39	6	10.53	0	0.00	0	0.00
3. The language used in the infographic is clear and not confusing.	16	28.07	31	54.39	9	15.79	1	1.75	0	0.00
Average		30.99		52.63		15.79		0.58		0.00

Table 2 on the information accuracy indicator for the first criterion, the highest value is in the agree category at 49.12%, indicating that respondents feel the information presented in infographics is quite easy to understand. In the second criterion, the highest value is in the agree category as well, with a percentage of 54.39%, indicating respondents' trust in the accuracy of the content in the infographic. Meanwhile, in the third criterion, the highest percentage was also in the agree category, at 54.39%, indicating that the majority of respondents considered the language in the infographic to be quite clear and communicative.

Based on the information accuracy indicator, infographics are practical to use in learning. Infographics are appropriate tools that ensure that people learn the key points in the subject matter quickly, and they acquire textual information at their own pace. Infographics as a newer and more popular type of information

visualization can support learning. Infographics make complex information easier to digest by 'chunking' it into smaller pieces (Afify, 2018; Manchester & Roberts, 2024). Infographics, short for 'information graphics', are designed to communicate a specific set of fact-like information to a specific audience by turning complex and abstract concepts into intuitive knowledge (Smiciklas, 2012).

Visualization and Images

The results of the practicality test of the visualization indicators and images can be seen in table 3.

Table 3. Visualisations and Images

Criterion	Very Agree		Agree		Neutral		No Agree		Very Not Agree	
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
1. Visual elements such as images, graphs, and icons help me understand the content of the material.	21	36.84	29	50.88	7	12.28	0	0.00	0	0.00
2. The infographic look is not confusing.	13	22.81	31	54.39	13	22.81	0	0.00	0	0.00
3. Visual design on an interesting and informative infographic.	23	40.35	26	45.61	7	12.28	1	1.75	0	0.00
Average		33.33		50.29		15.79		0.58		0.00

Table 3 on the visualisation and image indicators for the first criterion, the highest value was in the agree category at 50.88%, indicating that most respondents felt the visual elements helped their understanding of the material. In the second criterion, the agree category is also the highest with a percentage of 54.39%, indicating that the visual design is considered quite clear and easy to understand. Meanwhile, in the third criterion, the highest score was in the strongly agree category at 45.61%, reflecting respondents' high appreciation of the visual appeal and information value of the infographics used.

Based on the visualisation and image indicators, infographics are practical to use in learning. Static infographics focus on visualising information in a concise and direct manner and the design is tailored to be read in one go, not in stages (Hamid et al., 2020). According to Lestari and Dodi (2023), infographics can be used as learning media with various visual elements contained in it. These visual elements

can make someone interested in reading a text. Infographics as a visual and reduced narrative of complex information and data through images and icons, and graphics. So as a creative and innovative learning tool, infographics through simple and complex scientific concepts can be conveyed in the form of attractive images, graphs, charts, and texts that make it easier for someone to understand a concept (Mustafa 2021; Shemy, 2022). In particular, friendly and positive designs with bright colours and familiar illustrations are preferred (Pill et al., 2023).

Layout and Aesthetics

The results of the practicality test of the visualization indicators and images can be seen in table 4.

Table 4. Layout and Aesthetics

Criterion	Very Agree		Agree		Neutral		No Agree		Very Not Agree	
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
1. The infographic is neatly organized and easy to follow.	23	40.35	23	40.35	10	17.54	1	1.75	0	0.00
2. The color selection in the infographic does not interfere with readability.	18	31.58	31	54.39	7	12.28	1	1.75	0	0.00
3. Overall, the infographic looks professional and attractive.	22	38.60	27	47.37	7	12.28	1	1.75	0	0.00
Average		36.84		47.37		14.04		1.75		0.00

Table 4 on the layout and aesthetics indicator shows that, for the first criterion, the highest percentage comes from the combined categories of strongly agree and agree, with a total of 40.35%, indicating that most respondents appreciate the neatness and well-organized arrangement of the infographic. If you need a more detailed or more academic-style interpretation, I can expand it. For the second criterion, the highest value was in the agree category at 54.39%, indicating that most respondents felt the colour combination was quite comfortable and supported readability. As for the third criterion, the strongly agreed category again received the highest percentage of 47.37%, confirming that many respondents considered the visual appearance of infographics to appear with professionalism and strong aesthetic appeal.

Based on the layout and aesthetic indicators, infographics are practical to use in learning. According to (Majooni et al. (2018), the right arrangement of visuals and graphics can provide coherence for infographic design. A coherent layout is essential in guiding a person from one part of the infographic to another related part based on the flow of the infographic. There are various approaches in identifying the structural components of infographics that focus on content segmentation or important characteristics in terms of font usage, layout arrangement to organise content presentation, and arrangement of important information; all of these are important features of a well-designed infographic (Fragou & Papadopolu, 2020).

Creativity and Originality

The results of the practicality test of the creativity and originality indicators can be seen in table 5.

Table 5. Creativity and Originality

Criterion	Very Agree		Agree		Neutral		No Agree		Very Not Agree	
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
1. Infographics showcase creative and unusual ideas.	28	49.12	28	49.12	10	17.54	1	1.75	0	0.00
2. Infographics have a unique approach to presentation.	14	24.56	34	59.65	8	14.04	1	1.75	0	0.00
3. I feel more interested in learning because of the innovative infographic display.	14	24.56	29	50.88	14	24.56	0	0.00	0	0.00
Average		26.90		53.22		18.71		1.17		0.00

Table 5 on the creativity and originality indicator for the first criterion, the highest values are found in two categories at once, namely strongly agree and agree, each with the same percentage of 49.12%, indicating that respondents highly appreciate the element of creativity displayed. For the second criterion, the agree category obtained the highest percentage of 59.65%, indicating a strong recognition of the uniqueness of the presentation approach in infographics. As for the third criterion, the highest score was also in the agree category with a percentage of 50.88%, showing that the innovative aspect of the infographic contributed to the respondents' increased interest in learning.

Based on the creativity and originality indicators, infographics are practical to use in learning. According to Scoot et al. (2016), the clear purpose of information graphics (infographics) is to communicate key messages in an engaging way. So the appeal of infographics lies in the fact that they convey the maximum amount of content in the least amount of space, while remaining precise and clear (Dunlap & Lowethal, 2016).

Information Structure and Flow

The results of the practicality test of the structure and information flow indicators can be seen in table 6.

Table 6. Information Structure and Flow

Criterion	Very Agree		Agree		Neutral		No Agree		Very Not Agree	
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
1. The information in the infographic is presented in a logical and structured manner.	18	31.58	29	50.88	10	17.54	0	0.00	0	0.00
2. I easily follow the order of information displayed in the infographic.	15	26.32	30	52.63	12	21.05	0	0.00	0	0.00
3. Infographics have clear opening, filling, and closing sections.	13	22.81	28	49.12	14	24.56	2	3.51	0	0.00
Average		26.90		50.88		21.05		1.17		0.00

Table 6 on the information structure and flow indicator for the first criterion, the highest percentage is in the agree category with a value of 50.88%, indicating that the majority of respondents consider the flow of information in infographics to be quite systematic. For the second criterion, the agree category again occupies the highest position with a percentage of 52.63%, indicating that the flow of information used is easy to understand. In the third criterion, the agree category also obtained the highest score of 49.12%, which reinforces the finding that the narrative structure of infographics has been well designed.

Based on the information structure and flow indicators, infographics are practical to use in learning. According to (Ferla et al., 2009; Panadero, 2017)

Alamsyah et al. (2025), static infographics help a person focus more on understanding the material if the information is organised in a concise and systematic manner and allow the delivery of complex information simply through the integration of text and images. Moore & Purchase (2011) reveal that infographics can be easier to read if effective visuals are applied in their structure. Parameters such as balance in the placement of text and graphics are essential in making infographics aesthetically pleasing to the eye. Static infographics are easier to understand and familiar, simpler than interactive versions, with lower visual complexity, and better in terms of clarity, essentiality, and functionality (Locoro et al., 2017).

Utilization of Learning Resources

The results of the practicality test of the learning resource utilization indicator can be seen in table 7.

Table 7. Utilisation of Learning Resources

Criterion	Very Agree		Agree		Neutral		No Agree		Very Not Agree	
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
1. Infographic lists the data sources used.	13	22.81	52.63		22.81		1.75		0.00	
2. I believe in the information in infographics because the source is clear.	11	19.30	59.65		21.05		0.00		0.00	
3. The infographic shows that it was compiled using valid references.	16	28.07	50.88		21.05		0.00		0.00	
Average		23.39	54.39		21.64		0.58		0.00	

Table 7 on the information structure and flow indicator for the first criterion, most respondents chose the agree category with a percentage of 52.63%, indicating that most users are aware of the existence of data sources on infographics. For the second criterion, the agree category also has the highest score with 59.65%, reflecting the trust in the validity of the information presented. Meanwhile, in the third criterion, the agree category obtained the highest value of 50.88%, confirming that users consider the references used in infographics to have fulfilled the element of validity.

Based on the indicators of learning resource utilisation, infographics are practical to use in learning. According to Daviss and Quinn (2014), the strength of infographics is reflected in a clear purpose and style, as well as a clear format and evidence. This means that the reader can clearly understand the purpose of the infographic, the style represents the author's purpose, data sources and information should be shared, drawn in a format that allows interactivity. Infographics are defined as graphical visual representations of research findings or in this case having valid sources, including abstract visuals, informative graphics, or other visual summaries used in academic publications (Fereira et al. 2022).

Collaboration within the group

The results of the practicality test of the collaboration indicators in the group can be seen in table 8.

Table 8. Collaboration within the group

Criterion	Very Agree		Agree		Neutral		No Agree		Very Not Agree	
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%
1. Infographic creation involves the contribution of all group members.	20	35.09	30	52.63	7	12.28	0	0.00	0	0.00
2. Each member of the group has a role in the preparation of the infographic.	20	35.09	31	54.39	6	10.53	0	0.00	0	0.00
3. Teamwork in creating the infographics proceeded well and fairly.	18	31.58	32	56.14	7	12.28	0	0.00	0	0.00
Average		33.92		54.39		11.70		0.00		0.00

Table 8 on the indicator of group collaboration shows that, for the first criterion, the majority of respondents selected the agree category (52.63%), indicating that the process of creating infographics involved collective participation from all group members. This response is reasonable because students were explicitly assigned to complete the infographic task in groups, which required each member to contribute to the development of the final product. For the second criterion, the highest percentage also fell into the agree category (54.39%), reflecting students' perceptions that the distribution of tasks among group

members was carried out fairly and proportionally. Meanwhile, the third criterion again showed the highest percentage in the agree category (56.14%), suggesting that students experienced a harmonious and equitable collaboration process throughout the infographic development activity.

Based on the indicator of collaboration in groups, the use of infographics can be categorised as practical in the learning process. This finding is consistent with Nkosiukulu (2024), who explains that in a group setting, infographics function as shared cognitive artefacts that serve as focal points for collaborative discussion and understanding. The visual richness of infographics encourages collective interpretation, analysis, and synthesis of information, fostering a community of collaborative learners who contribute to shared knowledge building. Furthermore, the activity of designing infographics can enhance students' collaborative skills, which are essential for supporting social learning (Jaleniauskiene & Kasperuniene, 2022).

CONCLUSION

Based on the results of the research, it can be concluded that the static infographic developed is practically used as a learning medium in Biology courses in universities. This is shown by the percentage of positive responses of students who are in the agree category of 51.02 followed by strongly agree at 32.46, with the practicality score being in the practical category. The positive response was seen mainly in indicators related to content suitability, accuracy of information, visualization and images, layout and aesthetics, and structure and flow of information, indicating that students rated infographics as easy to understand, informative, and systematically presented. In addition, students also felt good cooperation in groups during the infographic creation process, in line with the assignments that were carried out in groups.

Thus, the static infographic developed is suitable for use as one of the alternative learning media that is innovative, especially to support the presentation of material in a more concise and structured manner. The findings of this study are limited to the practical aspect, so they cannot be used to conclude the effectiveness or improvement of learning outcomes. Further research is needed to test the aspects of effectiveness, appeal, and impact of infographics on students' understanding of concepts.

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