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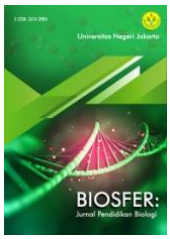

Digital flipbook module in circulatory system to facilitate student different intelligent and learning style

Rida Oktorida Khastini *, Mila Ermila Hendriyani, Mahrawi, Nurul Hayat Hibatullah

Biology Education, Faculty of Teacher Training and Education, Universitas Sultan Ageng Tirtayasa, Indonesia

*Corresponding author: rida.khastini@untirta.ac.id

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ABSTRACT

Students acquire and improve various intellectual abilities through learning process facilitated by learning methods. The study provides information on the development process of digital flipbook modules to facilitate student intelligence and learning style for the circulatory system, determine its feasibility, and students' responses. The method used was an R&D with 4D development models. It consisted of four stages: define, design, develop, and disseminate. However, this research was limited to the development stage. Development of digital flipbook modules based on nine types of intelligence: linguistic, mathematical logic, kinesthetic, visual-spatial, musical, interpersonal, intrapersonal, naturalist, and existential. The instruments used expert feasibility questionnaires (materials and media) and student response questionnaires. The result of the assessment test of experts in the material aspect was 96.4% in the very eligible category, and the media aspect was 92.8% in the very suitable category. The score of students' responses was 90,14%, in the very eligible category. Based on the analysis results, the digital flipbook module was suitable biology teaching material for the circulatory system.

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INTRODUCTION

In the era of digitalization, gadgets are a necessity in life. Gadgets are electronic devices for communicating, accessing information, and entertainment. Abdullah (2021) states that 89.93% of students always use gadgets, and this affects how they view technology as a need and a driving force behind learning. The use of technology in education, such as gadgets-based learning, has converted print textbooks into digital ones like digital modules. The selection of teaching materials, such as modules, can affect learning outcomes. Appropriate teaching materials can develop the intelligence and potential of students because each student has specific talents, and the ways to realize them are different. This is based on the knowledge that every student has special talents, skills, and learning preferences. Teachers may support growth and development on a variety of levels by using educational resources that are appropriate for these personal variations. Each student possesses numerous bits of intelligence, meaning each student's intelligence differs, called multiple intelligences (Andriani et al., 2021). The application of multiple intelligences theory in the field of education can provide great benefits. Currently, only the logical-mathematical and linguistic-verbal intelligences are emphasized in the class. Different learning environments and instructional strategies that make use of extra intelligence allow for the utilization of and application of such intelligence (Barrington, 2004).

The teacher should distinguish different learning styles among students. Each student applies the material taught in the classroom according to his or her dominant intelligence and learning style, with which a student learns most effectively. According to multiple intelligences theory, combining learning styles with dominant intelligence enhances learning processes among students (Sener & Cokcaliskan, 2018). According to the multiple intelligences theroy, learning should be active and diverse, and different teaching strategies should stress building an inclusive, dynamic learning environment that accommodates students' unique learning preferences and talents.. Teaching based on the student's preferred learning style can promote and enhance the learner's skills and strengths (Calik & Birgil, 2013).

The results of research questionnaires at three state senior high schools in Banten Province showed that each student has different intelligence and learning styles. The aims of the survey is to provide a more customized and effective learning experience that takes into account the diverse needs and abilities of the students. The information enables teachers to identify potential and map students into competent, medium, and low grades. Even though there was a discussion, student activity could have been more optimal in the learning process. Teacher activities are dominant. The discrepancy between student learning styles and the teacher's teaching style causes learning and intelligence development to be not optimal (Siregar & Hasanuddin, 2022). Sufianti (2022) states the type of multiple intelligence students reflects their learning style. In general, teachers are familiar with the term multiple intelligences. Students' multiple intelligences reflect their preferred learning methods. The concept of different intelligences is generally understood among teachers. However, the instructor only has knowledge of the cognitive, emotional, and psychomotor facets of student intelligence. Based on the preferences of the majority of students who have trouble comprehending instructor teaching materials such as textbooks, student worksheet, and PDF E-modules, One of the concept on biology is Circulatory system. It considered as an abstract. Students will learn on internal body mechanisms, and material is circulation system content is abstract material that explores internal body mechanics and those materials is challenging enough. By creating a digital flipbook module based on multiple intelligences may help students' understanding and intelligence.

The Flip PDF Corporate application program, which has numerous functions, is used to generate and develop digital flipbook modules. It turns PDF files into flip pages. The product can then be published online via devices (Vikiantika et al., 2022). The advantages of flipbooks are complete support features, easy operation, and storage of the final product in various formats such as (.html), (.exe), (.app), and (.fbr) (Awwaliyah et al., 2021). Based on the results of the large-scale student response test, a score of 86.90% stated that using the digital flipbook module affected increasing student learning motivation because the module packaging was more attractive with pictures, videos, hyperlinks, and sound (Ramadhina & Pranata, 2022).

Adapting the teacher's teaching style to the student's preferred learning modalities is a critical component of the multiple intelligences learning approach, which makes it simpler for students to comprehend the information (Rohman, 2022). Based on the findings of the gain normality test, a score of 80% with high criteria shows that interactive teaching materials based on multiple intelligences

considerably enhance learning outcomes, develop various skills, and foster positive character attitudes in students (Agustin et al., 2021; Rozhana, 2022). The development of multiple intelligence-based digital flipbook modules from earlier study received an efficacy score of 83.33% for enhancing students' critical thinking abilities on genetic substance material and a score of 84% as good teaching material (Wijayanti & Trimulyono, 2019; Wijaya et al., 2022). This study, however, only developed five types of student intelligence. The development of a digital flipbook module for fluid material based on multiple intelligences with 3D Pageflip Pro shows a value of 96%, which is feasible and exciting as teaching material in developing students' intelligence in learning physics (Nisa et al., 2021). The drawback of Pageflip 3D flipbook media is that using modules through gadgets requires a supporting application, namely a flipbook viewer (Sari et al., 2021).

The development of digital modules based on multiple intelligences with Android Studio obtained validity values of 88.30% and 85% for Autoplay Studio so that they were declared feasible as teaching materials that attract attention and facilitate a better understanding of the material (Nisa & Setiawan, 2018; Aniati et al., 2020). The drawbacks of previous research are the incompleteness of features in Android Studio, e-modules develop seven types of student intelligence, and the final product is an application that requires ample storage space on student gadgets. The E-module research using Autoplay Studio develops nine types of students' multiple intelligences, but the final product is a computer-based application.

Therefore, the aimed of this study to develop a digital flipbook biology module to facilitate student intelligence and learning style in the circulatory system. The development of digital modules uses flipbook media based on nine types of multiple intelligences through interactive learning activities equipped with various features such as pictures, videos, music, and quizzes. This development consists of nine types of intelligence: linguistic, mathematical logic, kinesthetic, visual-spatial, musical, interpersonal, intrapersonal, naturalist, and existential (Cichocki & Kuleshov, 2021). The publication of the digital flipbook module as a website link in (.html) format, which is simpler to access without requiring large memory on the gadgets. The feasibility of a digital flipbook module developed and students' responses were also determined.

METHODS

Research Method

The research was conducted at Department of Education, Faculty of Teacher Training and Education, University of Sultan Ageng Tirtayasa from January to October 2022. The research subjects were two material experts, two media experts, and ten students of class XI IPA from one of state senior high school in Banten Province. This research method used Research and Development (R&D) with a 4D model by Thiagarajan (1974), which consisted of defining, designing, developing, and disseminating stages (Trianto, 2020). However, this study was limited to the 3D stage (define, design, and develop).The stages conducted in this research can be seen in Figure 1.

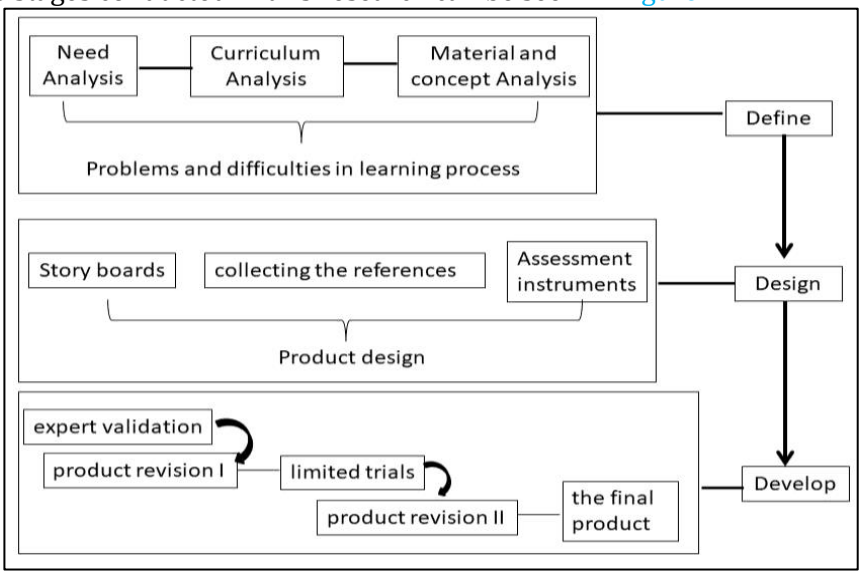

Figure 1. The stages conducted in the research

Procedures

The define stage includes the needs, curriculum, material and concept analysis to identify the problem and learning difficulties faced by students. Performing a needs analysis entails determining the difference between the existing and desired state. It takes into account things like the students backgrounds, prior knowledge, as well as what they need to know and be able to perform. In this stages the learning requirements also defined. A comprehensive investigation of current standards, curricula, and educational objectives constitutes curriculum analysis. Examining textbooks, lab resources, multimedia content, and other instructional materials that will assist student learning constitutes material analysis in the context of biology learning materials.

The second stage is the design which aims to make an initial design of the digital flipbook module. The design stage includes creating storyboards which helps visualize the end product and identify potential design improvements. Storyboards can also point up potential areas for the design to be improved or refined. In this stage, collecting the references were carried out entails assembling a range of multimedia materials that will be used to improve the learning experience within the flipbook, such as pictures, diagrams, videos, and animations. These allusions enhance the module's visual appeal and engagement, enhancing the content's vibrancy and appeal to a variety of learners. Product design involves conceptualizing and planning the flipbook's user interface as well as its overall appearance are part of the product design phase. Choosing color palettes, typography, navigational components, and interactive features are all part of this process. By making the content aesthetically pleasing and simple to navigate, the design should be in line with the targeted multiple intelligences and improve the user experience. Preparing the assessment instruments carried out by creating quizzes, interactive tasks, or other activities that let students apply what they've learned about the biology principles covered in the flipbook constitutes developing evaluation instruments. These tests can be made to accommodate various intelligences, making sure that each student's strengths are taken into account during the evaluation process. Assessments give information on the students' comprehension and assist determine how successful the teaching materials are (Andrade 2019). During the phase initial products were developed by adding material, multimedia components, interactive features, and assessment tools to the flipbook. With the intended multiple intelligences and learning objectives in mind, and make sure the content was presented in a logical and interesting way..

The third stage is development. At this stage, experts validate the digital flipbook module based on multiple intelligences and continue until it becomes a final product that is declared feasible. The development stages include expert validation, product revision I, limited trials, product revision II, and the final product.

Data Analysis

The data collection technique in this study used a type of instrument as a questionnaire: needs analysis, expert feasibility test, and student response test. Data analysis was carried out in a quantitative descriptive manner as follows. (1) Data processing results of needs analysis using descriptive method. (2) Data processing of expert test assessment results and student response tests using quantitative methods through a Likert scale measurement of 1-5 with categories (1) deficient; (2) less; (3) enough; (4) reasonable; (5) very good (Arikunto & Jabar, 2018). Furthermore, the calculation of data with the following formula (Purwanto, 2013).

$$NP = \frac{R}{SM} \text{ x } 100\ \%$$

Information:

NP = Acquired Value
R = Score Obtained
SM = Maximum Score
100 = Fixed Number

The eligibility criteria for the digital flipbook module are as follows, namely scores 0-20% (very inappropriate), 21-40% (not eligible), 41-60% (reasonably eligible), 61-80% (eligible), and 81-100 % (very eligible) (Arikunto & Jabar, 2018).

RESULTS AND DISCUSSION

Define Stage

The define stage included needs, curriculum, and materials analysis. The results of the needs analysis stated that each student has a different intelligence. Therefore the teacher's learning process must be adapted to the needs of students through differentiated, diverse learning. Differentiated learning is a learning process that accommodates students' needs according to their talents and learning styles (Wahyuni, 2022). Every student has a variety of learning styles, but the teacher's teaching style dominates lectures and discussions. The discrepancy between student learning styles and the teacher's teaching style makes the learning process and intelligence development not carried out correctly (Siregar & Hasanuddin, 2022). Sufianti (2022) states that the type of multiple intelligence students reflects their learning style.

The circulation system was considered as a complex material in biology, so students need help understanding teaching materials. The teaching materials used were textbooks, student worksheets, and PDF E-modules. Since the source of the instructional materials is not created by the instructor, there is a strong probability that there will be preparation variations that do not match the features of the students and that will have an impact on how intelligently the students develop. In line with Khastini et al (2019) that there are many modifications need to be done since the learning materials that are already on the market typically do not match the circumstances of the school or the characteristics of the students. Siregar (2022) states that in teaching academic units, the development of appropriate teaching modules is guided by the skills and characteristics of the students. A good learning process can intensify students' multiple intelligences by positioning students as centers of learning (Setiawan et al., 2022). As a result, it necessitates instructional tools that facilitate simple comprehension of the subject matter while maximizing intelligence, such as a digital flipbook module based on multiple intelligences.

Analysis of the 2013 curriculum determined the core competencies (KI) and basic competencies (KD) formulated in the achievement indicator of competency (IPK) and the learning objectives achieved. The results of the KD formulation on the material of the human blood circulation system include the domains of cognitive competence (KD 3.6) and psychomotor (KD 4.6). Material analysis refers to various sources of text books and journals to adjust the depth of student material used in Class XI Biology books (Irnaningtyas, 2016). The fundamental component of the analysis was created as a macro structure e.g The circulatory system's function, constituents of the circulatory system, blood group system, Types of Circulation, disorders, and technology of the circulation system.

Design Stage

The design stage was the initial design process of the digital flipbook module based on multiple intelligences. This stage begins with creating a storyboard that details each module path (Hidayat et al., 2020). The second stage was collecting references as material sources for the human blood circulation system along with supporting specifications such as pictures, videos, experiment activities, and test questions, as well as preparation of supporting software such as Flip PDF Corporate for module creation and Canva for cover graphic designs. The third stage is product design. The first part of the module consists of a cover, copyright page, preface, table of contents, multiple intelligences page, competency analysis, and instructions for use. Figure 2 showed the cover page of flipbook digital module.

The content section consists of three material sub-chapters: the blood circulation system, human blood components, abnormalities, and technology in the blood circulation system. The digital flipbook module develops nine types of multiple intelligences: linguistics, mathematical logic, kinesthetic, visual-spatial, musical, interpersonal, intrapersonal, naturalist, and existential (Mahmood et al., 2022). The integration of multiple intelligences aims to make learning varied, enjoyable, and student-oriented so that there is an optimal increase in learning outcomes according to students' various bits of intelligence (Khaliq et al., 2021). The development of teaching materials based on multiple intelligences has high effectiveness in increasing student learning achievement and multiple abilities (Anwar et al., 2020; Rozhana & Anwar, 2022). The integration aspect of multiple intelligences can be seen in the digital flipbook module.

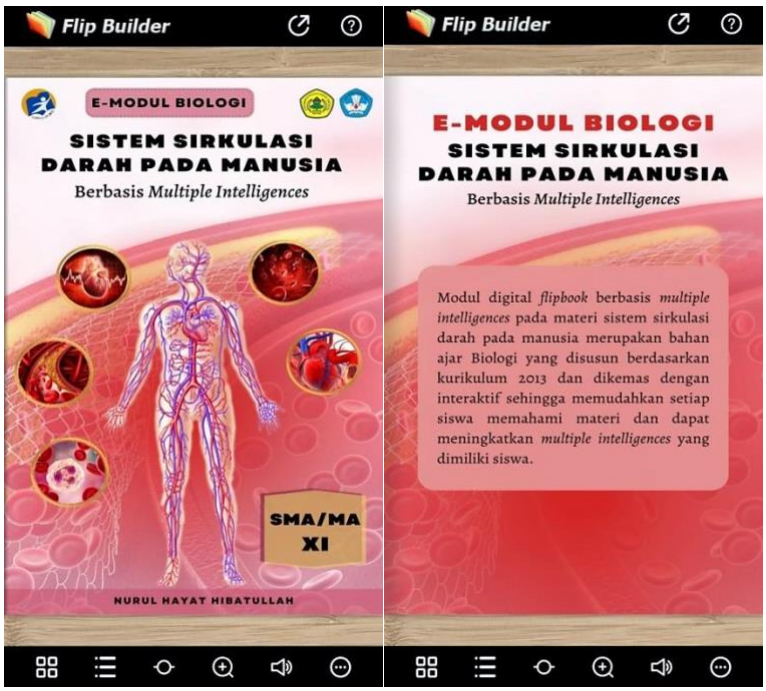

Figure 2. Display of the flipbook digital module cover

Linguistic intelligence is the ability to utilize and analyze words to effectively communicate ideas both verbally and in writing. Al-Qatawneh et al (2021) stated this intelligence involves well-developed verbal skills in verbal and nonverbal language. This intellect is highly skilled in linguistic and auditory processing, and it enjoys word play as well as reading, writing, listening, and speaking. In the flipbook module, Linguistic intelligence includes material content, biology information columns, biological treasures, independent exercises in the form of crosswords, evaluation questions, summaries, and self-reflection journals Through interactive text highlighting, audio narrating, and text-to-speech features, the e-flipbook improve verbal-linguistic intelligence. Reading, listening, and repeating allow learners to interact with the material, fostering language growth and understanding..

Logical mathematical intelligence includes the ability to use numbers and logic in solving problems. This dominant intelligence is interested with data-involving activities such as collecting, organizing, analysis, interpretation, and conclusion. Besides that, interested on various patterns, mathematical problem solving, and strategy games. Previous study conducted by Bracero-Malagón et al (2022) showed the relationships between logical–mathematical intelligence and mathematical competence with physical fitness of the students that enable students to be successful in an academic context. The e-flipbook facilitate students' logical and mathematical intelligence through interactive simulations, problem-solving situations, and quizzes. These exercises foster logical reasoning, analytical thinking, and critical thinking. In the flipbook module, the intelligence includes finding logical concepts such as material related to blood flow velocity and blood pressure, analytical exercises, and logical thinking in experiments.

The capacity to solve issues and communicate emotions using all of one's bodily parts is known as kinesthetic intelligence. In addition, González-Treviño et al (2020) stated that kinesthetic intelligence includes the capacity to use one's entire body or specific body parts to solve difficulties. It is the capacity to synchronize physical motion with mental processes. People with this dominant intelligence have a strong interest in tasks that require physical activity, such as doing something by hand, touching others while speaking, and enjoying demonstrations while imparting information. The flipbook module contains instructions for students to complete individual experiments, such as calculating the pulse, while group experiments such as blood type checks, blood pressure measures, and observations of blood cell types are also provided.

The capacity to properly visualize pictures in the form of dimensions can be defined as spatial visual intelligence. Drawing, painting, movies, videos, maps, diagrams, and designing games like riddles are all interests of dominant people. Visual intelligence includes presenting the ability to observe and interpret images, videos, and concept maps. Musical intelligence is the ability to develop

and express form music and sound such as rhythm, pitch, rhythm, melody and innotance. Intelligence dominant is interested in activities that involve music such as listening to music. Musical intelligence in the module includes the instruction for singing the song through videos related to the circulation material and composing the song lyrics related to the material. Through auditory upgrades, such as background music that enhances the information, musical intelligence is fostered. The immersive environment that is produced by this feature appeals to students who are sensitive to audio stimuli.

Interpersonal and Intrapersonal intelligence are two different type intelegence. Interpersonal intelligence is the ability to understand and interact with other individuals. This intelligence is sensitive to feelings, moods, character, and temperament another individual. This dominant intelligence is interested in activities that involving groups, learning while interacting, empathizing, life social, and shared responsibility. Interpersonal intelligence includes group experiment activities, and let us discuss. While intrapersonal intelligence is the ability to make accurate perceptions of one self. This intelligence is able to understand and manage emotions as well Knowledge of strengths, weaknesses, and decision making. This dominant intelligence is interested in activities that involve reflection self-analysis, time management, and independence. The intrapersonal intelligence includes filling in self-reflection journals, self-evaluations, independent experiments, and letting us practice.

Naturalist intelligence is the ability to recognize and categorize flora and fauna environment, able to understand and enjoy the environment, and maintain their environment. This dominant intelligence is attracted to activities that involve the environment or nature. Naturalist intelligence includes the information on the utilization the medicinal plant among traditional community (Elfrida et al., 2021) and the secret utilization behind the Kantong Semar plant (*Nepenthes mirabilis*) which can be used as a medicinal plant for for the circulation system disorders (Erwinsyah & Due, 2022).

The last intelligence in the flipbook module is existential intelligence. The intelligence is the ability related to sensitivity in answering the question of human existence. Strategy to develop this intelligence by giving belief about religion in material charge, so that individuals can contemplate the existential aspects of everything learned. Existential intelligence includes the biological treasure column containing Islamic information related to the material. The final section consists of an evaluation, answer keys, scoring guidelines, bibliography, glossary, and biodata of the constituents. The fourth stage is the preparation of assessment instruments for the feasibility of teaching materials consisting of 3 questionnaires, namely for media experts, materials, and student responses.

Prior to this study, no previous research had concentrated on the creation of a flipbook that directly addressed the circulatory system. Other flipbooks have been available, but they have generally focused on a different theme, such as genetics (Wijayanti & Trimulyono (2019). In comparison to previous flipbooks, the e-flipbook product design with features addressing many intelligence characteristics might in fact provide a distinctive and thorough learning experience.The e-flipbook takes traditional learning materials to a new level by seamlessly integrating features that align with the theory of multiple Intelligences. This theory acknowledges that learners possess diverse intelligences, each contributing to their unique ways of understanding and processing information. The e-flipbook leverages this concept design to create an immersive and engaging learning experience that addresses various learning preferences and strengths. The key benefit of e-flipbooks is their comprehensive approach to accommodate various learning styles and intelligences on a single platform. The product design as a solution, goes above and beyond traditional learning tools by incorporating the Multiple Intelligences principles. A deeper and more fulfilling learning experience is ultimately promoted when learners are given the freedom to explore, interact with, and flourish in ways that play to their unique strengths.

Develop Stage

The development stage is the feasibility validation stage of the digital flipbook module based on multiple intelligences by material experts and media experts, three FKIP Untirta lecturers and one teacher at SMAN 2 Pandeglang. The results of the feasibility assessment are in tables 1 and 2.

Table 1.
Results of assessment by material experts

No	Aspect	Value	Category
1.	Content Eligibility	90%	Very Eligible
2.	Presentation	96,3%	Very Eligible

3.	Language	97,5%	Very Eligible
4.	Multiple Intelligences	98,9%	Very Eligible
	Total	96,4%	Very Eligible

The results of the assessment by material experts obtained a score of 96.4% in the very decent category (Arikunto & Jabar, 2018). According to material experts, the digital flipbook module is by the KI and KD guidelines in the 2013 curriculum. The presentation of the material is per scientific truth, and there is a diversity of learning resources (Masithah et al., 2022). The contents of the systematic material include instructions for use, pictures, videos, and interactive quizzes that immediately show results so that the digital flipbook module is exciting and has implications for increasing interest in learning (Hamid & Alberida, 2021; Rismayanti et al., 2022).

The language in the module is according to student development. The writing of sentence structures in the material is by Indonesian and PUEBI language rules. The module's language component is crucial since it affects students' perspectives on how to grasp the meaning of phrases (Munandar et al., 2021). A good sentence must follow PUEBI, communicative language, accuracy in the structure, and use of terms (Lazuardi et al., 2022). The digital flipbook module based on multiple intelligences has facilitated students' intelligence through various activities in the module.

Table 2.
Results of assessment by media experts

No	Aspect	Value	Category
1.	Graphics	93,5%	Very Eligible
2.	Usability	90%	Very Eligible
	Total	92,8%	Very Eligible

The results of the assessment by media experts obtained a score of 92.8% in the very decent category (Arikunto & Jabar, 2018). According to media experts, the appearance of the digital flipbook module based on multiple intelligences is attractive, and the cover fits the material concept of the blood circulation system. Larasati et al. (2020) state that the module cover is the main attraction, so a harmonious combination of colors, images, and sizes is needed. The placement of titles, subtitles, sentences, and illustrations is clear, consistent, and proportional to facilitate understanding of the material. Marsela et al. (2022) state that the module layout's size and elements must be harmonious and balanced. Utilizing videos and pictures supports understanding of the material and increases the effectiveness of student learning (Putri et al., 2021). The digital flipbook module is easily accessed online via a gadget. Features in the module, such as zoom and page shift, work well per its characteristics: self-instruction and user-friendly (Karima et al., 2021).

The following phase was a small experiment on ten students in class XI IPA at SMAN 2 Pandeglang. According to Arikunto (2014), a limited-scale test included between 4 and 14 participants. The results of the student response test assessment are in table 3.

Table 3.
The results of the student response test assessment

No	Aspect	Value	Category
1.	Interest	90%	Very Eligible
2.	Theory	88%	Very Eligible
3.	Language	89,4%	Very Eligible
4.	Usability	94,4%	Very Eligible
	Total	90,14%	Very Eligible

The assessment results of the student response test obtained a score of 90.14% in the very decent category (Arikunto dan Jabar, 2018). The appearance of the digital flipbook module based on multiple intelligences attracts students' attention. The contents of the systematic module material include pictures, videos, and interactive problem exercises. Masithah et al. (2022) state that structured teaching materials make it easier for stud/ents and teachers to understand the implementation of

learning. The contents of the material and evaluation based on multiple intelligences have facilitated the intelligence possessed by students.

The use of an electronic flipbook in the learning process has an impact on the learning outcomes and process of the students. Due to the customized learning /experience the e-flipbook offers, children learn more effectively as they interact with the information that appeals to student. When students engage with material through their preferred intelligence pathways, they are more likely to retain and apply it. Students' engagement in the learning process is increased by incorporating interactive components, which stimulate active participation. The e-flipbook fosters an atmosphere that is conducive to learning, which raises motivation, self-efficacy, and general satisfaction.

There are several aspect that become the strenght of a multiple intelligences e-flipbook developed. The e-flipbook improves learning outcomes, engagement, and skill development. It delivers a more inclusive and individualized learning experience by taking into account different learning preferences. The product's adaptable architecture allows for a variety of learning methods, guaranteeing that every student may participate fully. Flexibility is a source for learning in the e-flipbook. Individualized learning journeys are made possible by the ease and simplicity with which students may use the e-flipbook. Simulators and other interactive components foster participation and provide an immersive learning environment. The e-flipbook bridges the gap between theoretical learning and practical application by catering to diverse intelligences. The use of language, the accuracy of sentence structure, and consistent typefaces make the digital flipbook module based on multiple intelligences easy to understand. Munandar et al. (2021) state that the language aspect is essential to pay attention to in the module because it influences students' mindsets in understanding the contents of sentences. The digital module is easy to access on the gadget, and all module features function correctly per its characteristics: self-instruction and user-friendly (Karima et al., 2021).

Along with the strengths, the produced e-flipbook also has certain weaknesses. The success of the uses depends on pupils having access to the right technology and the internet, which may lead to disparities. Despite being flexible, some subjects could be harder to adapt to all facets of intelligence. However, careful consideration of resource allocation and technical accessibility is necessary for its successful implementation

CONCLUSION

Development of digital flipbook modules (MODIF) to facilitate student intelligence and learning style on the circulatory system for class XI SMA was carried out using the R&D method with 3D models consisting of defining, designing, and developing stages. The results of the feasibility assessment of the module get an average score of 96.4%, very eligible criteria on the material aspect, and a value of 92.8%, very eligible criteria on the media aspect. Student response tests on the digital module obtained an average score of 90.14% with very decent criteria. Based on these results, a multiple intelligences-based digital flipbook module (MODIF) for high school students is very suitable as a biology teaching material. For recommendation it is essential before desimination process of digital flipbook modules , it is necessary to proceed to the large-scale trial stage to see the module's effectiveness in learning. All subject matter has the potential to use the elements of multiple intelligences, not just the concept of circulation system.

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