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Article

Development of Science Learning Modules with Differentiated Approach Assisted by AI Canva Human Digestive System Material to Improve Learning Outcomes

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A B S T R A C T

Science education in elementary school is essential for developing students' critical thinking and understanding of natural processes. This study aims to develop and evaluate a differentiated science learning module assisted by AI Canva on the human digestive system to improve fifth-grade students' learning outcomes in Tegal Regency. Using the ADDIE development model, this Research and Development (R&D) study collected data through questionnaires, interviews, observations, and documentation. The sample consisted of two fifth-grade classes: a control group and an experimental group. Data were analyzed using normality, homogeneity, t-tests, and feasibility assessments. The results show that the module is highly feasible, with material validation at 86.53% and media validation at 94.13%. Student learning outcomes in the experimental class increased from 81.66% (pre-test) to 100% (post-test), indicating the module's significant effectiveness. In conclusion, the AI Canva-assisted differentiated module is both feasible and effective in enhancing students' understanding of the human digestive system.

Keywords: *Development, Module, NSS, Differentiated, AI Canva.*
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INTRODUCTION

Science education in elementary school plays a vital role in shaping students' critical thinking, curiosity, and understanding of the natural world. At this foundational stage, students are introduced to basic scientific concepts that not only enhance their knowledge but also prepare them for more complex scientific reasoning in higher education levels. One essential topic in elementary science is the human digestive system, which helps students understand how their bodies function and how to maintain health through informed choices. However, challenges often arise due to varying levels of student readiness, learning styles, and engagement, which can affect overall learning outcomes.

Technology integration will support the acceleration of transformation in the field of Education. Technology integration is able to facilitate adaptive and data-based learning. Not only that, the presence of technology fosters online learning that offers mass online learning with a variety of platform options and flexible allocations and times accessed by learners. Technology is also able to present personalized learning, where technology has enabled learning that adjusts instructions, content, and learning experiences to meet the needs, interests, and abilities of individual students personally/individually. This approach aims to shift from the traditional one-size-fits-all education model and focuses on providing personalized learning paths for students.

Each student has unique learning preferences, and this reflects their tendencies in receiving, processing, and remembering information. Rahmat (2022) stated that students of the same age have differences in terms of learning readiness, interests, learning methods, and life experiences. Learning strategies that facilitate diverse learning styles—such as visual, auditory, and kinesthetic—can make it easier for students to find the learning method that best suits their learning style.

For this reason, a teacher is required to be able to integrate technological advances in the learning process carried out, namely by utilizing technology as one of the learning media. Learning media is a tool used by teachers to facilitate the process of delivering material to students in order to achieve learning objectives (Dewi S, 2023). Learning media has a fairly important role in the learning process (Zahro, et al. 2023). The selection of the right learning media which is in accordance with the needs of students and the material to be delivered will create an effective, interactive, and enjoyable learning process. Technology-assisted media is currently considered more effective and in accordance with the characteristics and needs of students so that they are able to keep up with technological developments.

Differentiated learning modules are made by referring to teaching methods by paying attention to student needs, monitoring their progress, identifying special learning needs. Each child has different curriculum standards adjusted to their needs. Differentiated learning strategies in elementary schools are carried out based on student learning needs consisting of three aspects, namely learning readiness, learning interest and student learning profile. Student learning readiness means the student's initial ability to learn new material concepts. Learning interest is interpreted as what learning is liked and desired so that learning is meaningful to students. While student learning profiles include culture, language, learning style and family circumstances.

Information and communication technology (ICT) is integrated into learning activities in the Independent Curriculum. Educators are expected to be able to keep up with the rapid developments of the times. Educators have a great responsibility to maximize their role and function in developing superior and reliable resources in preparing students to face global competition. Therefore, educators must have innovation in order to integrate technology into learning that is packaged effectively and attractively in learning. One way to integrate this technology is through the available applications, including Canva. Canva is a design service program or graphic design application used online which is designed to help people around the world create any design and publish it anywhere.

Canva has an AI feature that is very useful in using Canva. If we don't have any design ideas, we can use the AI feature to help provide interesting ideas. These features are called magic studios which have many AI features that can help. The types of features include magic shift, magic animation, magic transformation, magic media, magic expand, magic capture, magic edit, magic writing, magic design and magic eraser. The use of AI is very necessary in education because it makes it easier for teachers to compile learning devices, especially teaching modules. Artificial Intelligence can be used in the creation of science teaching modules so that they can be developed by linking the development of information technology, especially artificial intelligence AI with efforts to strengthen character education and learning assessment. The role of teachers and principals in managing the use of AI in order to achieve character education goals is very important.

The results of observations conducted at SD Negeri Bongkok 01 in science learning for grade 5 show that students in the class have low motivation to participate in learning, resulting in low academic achievement. Teachers do not understand various learning models, tend to use only one approach, and pay little attention to the characteristics of their students, making learning activities feel boring. The teaching modules used, including students worksheet, tend to be monotonous and unattractive. Science material—especially

the human digestive system—is considered difficult, so students tend to memorize the lesson without truly understanding it, as it is usually taught using abstract concepts. Some students are unable to connect what they learn with how that knowledge can be used or applied. In addition, teachers are less innovative in their teaching due to the lack of facilities and infrastructure in schools. Students' learning needs have not been fully accommodated, as teachers tend to treat all students the same in terms of learning readiness, interests, and learning profiles. As stated by Nurzaki Alhafiz (2022), teachers who rely heavily on teacher-centered learning and only use a single approach can cause boredom in the classroom. Furthermore, students become less active and creative because they are not given the freedom to engage in learning or to produce learning products of their own choosing.

Differentiated learning affects reasoning skills (Cindayana et al., 2022). It is closely related to the global education agenda, emphasizing scientific literacy associated with socio-scientific issues (Mahdiannur et al., 2022). Differentiated learning can be applied not only in the Independent Curriculum but also across various curricula. It is based on the philosophy of Ki Hajar Dewantara, which states that differentiated learning supports students by considering their talents, interests, readiness to learn, and learning styles. Since differentiated learning is student-centered, the teaching modules prepared by teachers in the Independent Curriculum should be based on this approach (Yunita et al., 2024).

Based on the description above, researchers need to conduct research on teaching materials in the form of an IPS learning module with a differentiated approach assisted by AI Canva to improve the learning outcomes of fifth grade elementary school students on the human digestive system material. With the innovation of teaching materials in the form of a differentiated IPS learning module (according to learning style) by integrating AI Canva, it is hoped that it can increase students' interest in learning with the aim of improving students' learning outcomes on the human digestive system material.

Modules are printed teaching materials designed to be studied independently by learning participants. Modules are also called independent teaching materials because they are equipped with instructions for independent learning. With modules, students can carry out learning activities without the direct presence of teachers (Kosasih, 2021:18).

A module is a teaching material that contains materials, methods, limitations, and evaluation methods that are designed systematically and attractively to achieve the expected competencies according to their level of complexity. A module is a teaching material that contains lesson materials that are arranged in book form and developed systematically using easy-to-understand language, and is used to improve the independent learning process and students' thinking skills. A printed module is one of the teaching materials that is designed and presented systematically so that users can learn with or without a teacher as a facilitator (Yanti et al., 2017). The development of information technology has a great influence on the learning process, one of which is teaching materials in the form of modules. Initially, the module was only a printed teaching material, but now it has been developed into an electronic version of the module designed with supporting software that contains interesting features in it.

Based on the explanation above, it can be concluded that a teaching module is a set of learning materials that are prepared systematically to achieve predetermined competencies. The existence of a teaching module will make it easier for students to learn a competency in its entirety. The role of the teacher from previously being a speaker or information provider will shift to being a facilitator by providing various learning resources so that learning objectives can be achieved by students. Modules can also be interpreted as a learning process on a particular topic that is arranged systematically, operationally, and directed that is used by students, accompanied by guidelines for its use for teachers. The goal is to increase the efficiency and effectiveness of learning in schools, both time, funds, facilities, and teachers to achieve goals optimally.

The function of the teaching module as a teaching material can be divided into 2, namely the function of the module as an educator and the function of the module for students. The function of the module for teachers can change the role of the teacher from a material deliverer to a facilitator who helps students understand the material presented. The module can also be used as a guide by teachers in the learning process. Furthermore, the function of the module for students can be used as a tool for independent learning Zahrotissa'adah & Sulistyowati, (2021).

According to Schöllhorn in Herwina (2021) "Differential learning is a motor aspect learning model that is grafted on the importance of movement variability and is rooted in the theory of dynamic systems of human movement". Differentiated learning is an effort to modify the learning process in the classroom to accommodate the learning needs of each individual student. The modifications in question are related to learning preparation, learning profiles, and learning interests in order to achieve maximum learning outcomes.

In the process of implementing differentiated learning strategies, teachers must be able to generate new ideas and innovations in the use of learning methods and models to increase student motivation in engaging with the entire learning process. Therefore, in an effort to improve the quality of classroom learning, the teacher's role is crucial in achieving learning success (Sukendra in Herwina, 2021). Simply put, differentiated learning is a series of informed decisions made by teachers, as learning leaders, that are focused on meeting students' learning needs (Farid et al., 2022).

Differentiation learning adjustments, according to Tomlinson in Herwina, (2021), are efforts to focus the learning series in the classroom to meet the individual learning needs of each student. towards meeting the learning needs of students, both learning interests, learning profiles, and learning readiness are examples of differentiation learning strategies. This is in line with the results of previous research which found that student learning activities can shift from passive to more active when differentiation learning strategies are used for learning (Sukendra in Herwina, (2021).

According to Marlina, (2020) the components of differentiated learning include differentiation of content, process, and product as well as learning environment. Differentiation of content is related to the material or content that will be learned by students related to the learning material. Differentiation of process refers to students' efforts to process the ideas and information obtained including how students communicate and interact with the material and how these interactions become part of determining students' learning choices.

Differentiation learning strategies can help elementary school students to succeed in their learning process, because the output of learning outcomes is in accordance with the learning needs of the students themselves. Learning outcomes produced from the entire series of student learning processes can be in the form of articles, songs, poems, infographics, posters, video performances, animated videos or other forms according to the concept of the material being studied, both individual skills and learning interests in groups.

It is important to note that learning outcomes refer to the achievements obtained by students through learning over a certain period of time. These learning outcomes include the abilities possessed by individuals according to the learning shown by individual behavior.

According to Asep Jihad, learning outcomes can be defined as changes observed in student behavior after undergoing a teaching and learning process that aligns with the learning objectives. In this context, learning outcomes include specific abilities, skills, attitudes, and behaviors that result from achieving these objectives. In other words, the type of learning outcomes depends on the objectives. Therefore, the higher the level of achievement of learning objectives, the higher the quality of learning. It can be seen that learning outcomes take the form of students' knowledge, attitudes, and skills, which are assessed according to the learning process. These learning outcomes reflect the extent to

which students have internalized and developed the competencies taught through teaching and learning activities.

Bloom's taxonomy makes learning outcomes include three domains, namely cognitive, affective, and psychomotor. The cognitive domain consists of knowledge, comprehension, application, analysis, synthesis, and evaluation. The affective domain includes attitudes of receiving, responding, valuing, organization, and characterization, and characterization. While the psychomotor domain includes the initiation, pre-routine, and routinized stages. Community factors also have an influence, such as peer relationships, and all community life in general. In the purpose of teaching formulates changes in three domains as indicators of learning outcomes. Therefore, the success of the learning process is considered proven when good values in the form of knowledge, attitudes, and skills have been achieved both in the form of knowledge, attitudes, and skills have been achieved both individually and in groups. High absorption in learning indicates that the goal has been achieved.

Artificial Intelligence can be interpreted as artificial intelligence, which refers to the process of creating or preparing machines—such as computers—to possess intelligence based on human behavior. The primary goal of Artificial Intelligence is to enable computers to perform tasks that can be carried out by humans. One component of Artificial Intelligence is expert systems, as well as web-based applications and MySQL for database processing.

According to Baker, R.S. in (Rahayu et al., 2024) based on its type, Artificial Intelligence is divided into four categories, namely: Reactive Machine is a type of Artificial Intelligence with the most basic capabilities. As the name implies, this artificial intelligence technology is able to respond to Actions, but cannot store memory or learn from past experiences. In other words, this AI technology does not develop its functionality, and can only be used for more specific work. One example of a Reactive machine AI is Deep blue, IBM's chess game program that once defeated a chess champion, predicted the opponent's movements, and calculated the steps he had to take next, so he could win the match.

Self-awareness is also an AI technology that is not yet present in the present. However, compared to the Theory of Mind, Self-awareness Artificial Intelligence is much more sophisticated. Because, not only is its emotional intelligence similar, self-awareness also has a level of awareness like a whole human being. AI can be used to create various types of content. Using AI can save a lot of time and effort required in the creative process. For example, creating content with ChatGPT for websites, social media, or YouTube. In addition to ChatGPT, there are still many AI tools that can help in this regard. If you are in the visual field, you can use a number of AI websites to create images, which can be used to create product photos, create logos, or other visual design projects.

According to the Journal of Computer Information Systems paper, the virtual mentor feature is more useful than regular classroom instruction (Parinduri, 2023) If learning by Asking (LBA), also known as interactive learning will not occur. There will be two main components when using this LBA (video streaming server and web server). The management of the original video by these two components will produce the next generation of question generation which will later become one of the question data that appears and the processed video changes. The availability of virtual mentors such as LBA makes contact more efficient from a managerial and financial perspective.

According to Zebua et al. (2024), Canva is an application that has emerged amidst the rapid development of technology. The Canva application is an online design program that provides various design templates which can be used to create learning media. According to Hani et al. (2024), Canva is one of the applications widely favored by teachers for creating learning media.

Canva is an online design application that provides various graphic designs such as infographics, PPT, resumes, pamphlets, posters and so on. Canva can make it easier for teachers to design learning media, as (Hani et al., 2024) explains that Canva can make it

easier for teachers and students to carry out learning processes based on technology, skills, creativity and other benefits, this is because it can attract students' attention to learn by presenting interesting learning media and learning materials.

One of the best design tools is Canva (Trisnawati et.al., 2023). Canva is a design application that makes it easy for users to quickly and easily produce the best designs. The Canva application is an online design program that provides various graphic info, banners, bookmarks, bulletins, and so on that are provided in the Canva application. According to Parinduri, (2023) Canva is a graphic design application that bridges its users to easily design various types of creative materials online. Starting from designing greeting cards, posters, brochures, infographics, to presentations. The use of Canva is highly recommended considering that the Merdeka Curriculum contains elements of digitalization, thus encouraging teachers and students to be more creative in using various platforms available in cyberspace for teaching and learning needs.

According to Nikmah & Andriani, (2023) explains the benefits of Canva for teachers and students, namely Canva as a technology-based application, which provides a learning space for teachers who carry out learning by relying on learning media in the Canva application. The templates provided in the Canva application are quite a lot, such as PowerPoint, infographics, learning videos and so on. The use of templates in the Canva application is not only for teachers but also for students, the benefits of the benefits of the Canva application obtained are getting creative and interesting learning knowledge.

Artificial Intelligence in the Canva application is used in the Ajaib studio. Canva has an AI feature that is very useful in its use. If the user does not have it, the user can use the AI feature to help provide interesting ideas. These features are called the Ajaib studio which has AI that can help.

Natural and Social Sciences (NSS) is a science that studies living things and inanimate objects in the universe and their interactions, and studies human life and individuals as well as social beings who interact with their environment. IPA is often referred to as science. Science is a translation of the word science which means natural problems (nature). Science is knowledge that studies natural phenomena (Wijaya, 2021). Science is a way of investigation to obtain data and information about the universe using observation methods and hypotheses that have been tested (Uus Toharrudin, Sri Hendrawati in (Juhri et al., 2024)

Science learning is a translation of the English term *natural science*. When interpreted, science refers to knowledge related to nature, and literally, it is scientific knowledge that possesses rational and objective characteristics. The term *natural* refers to nature, so science can be understood as the study of all phenomena in nature, both living and non-living things (Marzuki et al., 2021). Science is divided into several branches, including chemistry, biology, physics, and meteorology. Science is not derived solely from human thought; rather, it is the result of observations or experiments conducted on Earth. Natural Science (IPA) involves a systematic approach to discovering the natural world, meaning that science is not only the mastery of a collection of knowledge in the form of facts, concepts, or principles but also a process of discovery. In addition to uncovering concepts and principles, science can also produce tangible products through various learning processes. Etymologically, science consists of the terms *science*, *knowledge*, and *nature*. *Science* means knowledge about truths, *knowledge* refers to everything known by humans, and *nature* encompasses everything that exists on Earth and in the sky. Science learning, therefore, is the study of events that occur in nature through observation and experimentation, enabling students to gain knowledge about the natural environment.

According to Pudjiastuti et al. (2023), digestion is a series of processes carried out by organs in the body to digest food, convert it into nutrients that can be absorbed by the body, and excrete food waste that cannot be digested. According to Alifah (2015), the human digestive system consists of the digestive tract and digestive glands. The digestive tract

includes the mouth, pharynx, esophagus, stomach, and small intestine—which consists of the duodenum, jejunum, and ileum—while the large intestine consists of the colon, rectum, and anus.

The food our body needs is nutritious food in sufficient quantities. Balanced nutritious food contains carbohydrates, proteins, fats, vitamins, mineral salts, and water. Carbohydrates are needed by the body as the main source of energy, because carbohydrates when digested will produce monosaccharides such as glucose. This glucose will be burned using oxygen in cells to produce energy for life. Carbohydrates oxygen in cells to produce energy for life. Carbohydrates also function as the basic ingredients for forming fats and proteins. Excess carbohydrates are stored by the body in the form of fat under the skin layer.

According to Sugiarto et al. (2023:122–123), disorders of the human digestive organs include ulcers, constipation, diarrhea, hypertension, hypotension, anemia, and dengue fever. Ulcers are caused by increased stomach acid; they can be prevented by avoiding stress and maintaining a regular diet. Constipation is caused by a lack of fiber intake and can be prevented by consuming enough fiber and drinking at least eight glasses of water per day. Diarrhea is caused by germs that enter the body through food; it can be prevented by washing hands before and after eating and by consuming hygienic food.

Disorders due to misalignment of the colon can also cause conditions such as constipation and diarrhea. Constipation is a disorder characterized by difficulty in defecating, caused by excessive water absorption in the colon. This condition can be prevented by consuming foods rich in fiber. In addition to bacteria, diarrhea can be caused by impaired water absorption, resulting in feces being expelled in liquid form. Another disorder of the digestive system is inflammation of the digestive tract, known as peritonitis. The best way to prevent and manage digestive disorders is by maintaining a regular diet consisting of healthy and nutritious foods.

METHOD

Types and Models of Research

The type of research used is the research and development (R&D) method. Research and development is a systematic approach used to generate new knowledge, solve problems, or develop products, processes, or services (Purnomo et al., 2024). Research and development is a type of research that can be a link or breaker of the gap between basic research and applied research (Okpatrioka, 2023).

The development model used is ADDIE, which is a learning media design model that shows the basic stages of a learning system that is easy to do (Cahyadi, 2019). ADDIE, stands for Analysis, Design, Development, Implementation and Evaluation. This model has a coherent and systematic framework in organizing a series of design research and development activities. ADDIE provides an opportunity for learning design developers to collaborate with material, media and learning design experts to produce quality products (Ranta, 2021).

The ADDIE model is still very relevant to use, because (1) the ADDIE model is a model that can adapt very well to various conditions, which allows the model to be used until now; (2) The level of flexibility of the ADDIE model in answering problems is quite high, even so the ADDIE model is an effective model to use; (3) The ADDIE model provides a general structured framework for the development of instructional interventions and the revision and evaluation at each stage (Angko & Mustaji, 2013). The ADDIE stages can be described in the form of a flow diagram that shows the reciprocal relationship of each stage, as shown in the ADDIE model development image.

Research Procedures

The development model used in this study is ADDIE but only up to the third stage, namely ADD, which includes Analysis, Design and Development.

Analysis Stage

The main activity at this stage is to analyze the need for the development of an NSS learning module with a differentiated approach. Information collection and identification also need to be done so that the resulting module is in accordance with students, learning objectives, learning materials, and learning environments. The observations carried out aim to obtain information on school conditions, teacher needs and student needs regarding teaching materials that can be used as learning resources. At this stage, the researcher conducted an analysis of the product needs needed in schools, related to the development of an NSS learning module with a differentiated approach assisted by AI Canva to improve the learning outcomes of grade V Elementary School students. The needs analysis was carried out through observation and filling out questionnaires by students, class teachers and principals.

Design Stage

At the design stage, researchers design a detailed concept of the teaching module based on existing problems. This stage starts from setting learning objectives, designing learning activity steps, learning media and assessments. This design is still conceptual and will underlie the next development process. In addition, at this stage, an instrument design is also made to measure the feasibility of the teaching module that has been developed, including validity assessment sheets and user responses, namely students and teachers. Researchers use the Canva application to create and develop NSS learning module products. At the planning stage, the preparation of the learning module structure framework covers the entire content according to the selected material, namely the human digestive system.

Development Stage

The development stage is the stage of realizing the design of the teaching module and assessment instrument. The development of the teaching module lies in the AI-assisted differentiation strategy canva in Elementary School grade V on the human digestive system material to improve student learning outcomes. After the learning module is composed, a validity test will be carried out by material experts and media experts to improve its quality. The product will be improved according to the direction and input from the validator. After being improved, the resulting learning module will be tested on students. This learning module is also equipped with a test instrument in the form of pretest and posttest questions that will be used to determine student learning outcomes. Before this test instrument is used, a validity test will be carried out to obtain a valid test instrument using the SPSS test.

Time and Place of Research

This research was conducted in the 2024/2025 Academic Year. This research was conducted at Elementary School grade V of Bongkok 01 State Elementary School and Bongkok 02 State Elementary School, Kramat District, Tegal Regency.

Research Subjects

The subjects of this study were grade V Elementary School teachers of Bongkok 01 Elementary School, Bongkok 02 Elementary School and Grade V Elementary School Students. Because the material raised in the development of the learning module is grade V Science learning material.

Sampling Techniques

The population is a generalization area consisting of objects or subjects that have certain quantities and characteristics determined by researchers to be studied and concluded. In this study, the population consisted of fifth-grade elementary school students. A sample, which is part of the population that possesses the same characteristics, should ideally represent the entire population. The sample in this study included fifth-grade students from Bongkok 01 Elementary School and Bongkok 02 Elementary School, located in the Kramat District, Nyi Ageng Gugus Serang. According to Sugiyono (2020:62), a sample is part of the number and characteristics possessed by the population, and sampling must be conducted

using a specific method based on relevant considerations. In this research, the purposive sampling technique was used. As explained by Sugiyono (2020), purposive sampling is a technique for selecting samples based on specific criteria. The selected samples consisted of 27 students from grade V of SD N Bongkok 01 and 26 students from SD N Bongkok 02, Kramat District, Tegal Regency.

Data Collection Techniques and Instruments

Data collection techniques and tools include data collection techniques and research instruments.

Data Collection Techniques

In this study, to obtain data, researchers used several methods, namely observation, questionnaires and tests. Observations were carried out to obtain an overview of the product to be made by observing the learning process and the condition of students by observing ongoing teaching and learning activities. There were two types of questionnaires used, namely to obtain information from sources regarding needs analysis and data on the feasibility of the differentiated science learning module on the digestive system material. The questionnaire was given to material experts, media experts, principals, teachers, and fifth grade students of Elementary School SD Negeri Bongkok 01 as respondents. The test method was carried out twice, namely before and after the use of the differentiated science learning module in learning using pretest and posttest questions. This activity aims to measure the improvement in student learning outcomes which is the goal of developing this module.

Data Collection Instruments

Subject Matter Expert Validation Questionnaire

The material expert validation questionnaire is used to assess and determine the feasibility of the resulting teaching module from the aspects of content, presentation, language and contextual feasibility. The information obtained through this instrument is used as input in revising the learning media that has been developed to produce a valid final product.

Media Expert Validation Questionnaire

The media expert validation questionnaire was used to assess and determine the feasibility of the teaching module produced from the graphic feasibility aspect. The information obtained through this instrument was used as input in revising the learning media that had been developed to produce a valid final product.

Teacher Response Questionnaire

The teacher response questionnaire was used to collect data on teacher responses to the developed teaching module. The data in this questionnaire was filled in by the teacher at the end of the trial.

Student Response Questionnaire

Student response test data is used to determine whether the research product can be responded to well by students in learning activities.

The second instrument is a test instrument which is a measuring tool that has right or wrong answers and is used to measure a person's level of understanding in the form of questions that must be completed by participants (Sihotang, 2023). This instrument is in the form of posttest and pretest questions containing questions about the digestive system in the form of multiple choices to obtain data to determine student learning outcomes. Before being used, the instrument will be subject to item analysis to determine which questions are valid using the SPSS test. The test instrument contains cognitive aspect questions according to the competencies in the learning objectives.

Data Analysis

Research data analysis was conducted after the teaching module was compiled and validated by expert validators and a trial was conducted. Statistical calculations were used to process and analyze data. The steps for statistical calculations to process data are:

Analysis of the Feasibility of Teaching Modules by Expert Validators

The assessment of the feasibility of the developed teaching module was carried out by 2 expert validators of the material and expert validators of the media using a validation sheet in the form of a questionnaire. The validators filled out the questionnaire by giving a check mark on the categories provided by the researcher based on a Likert scale consisting of 4 assessment scores as follows:

Table 1. Expert Validator Assessment Scores

Information	Score
Strongly agree	4
Agree	3
Disagree Less	2
Strongly Disagree	1

Analysis of Pretest and Posttest Questions

Item analysis is used to validate pretest and posttest questions to determine student learning outcomes using SPSS and only item fit testing is carried out.

Analysis of Teacher and Student Responses to Differentiated Modules

The developed differentiated module response is measured based on the assessment results of science teachers and students to state whether or not the product can be applied in the field based on their perceptions and experiences. The researcher formed a teacher and student response questionnaire containing questions, then the teacher and students filled out the questionnaire listed by giving a check mark to the category given by the researcher based on a Likert scale consisting of 4 assessment measures as follows:

Table 2. Criteria for Assessing the Effectiveness of Differentiated Modules

Percentage Range	Criteria
$81{,}25 < p \leq 100$	Very Worth It
$62{,}50 < p \leq 81{,}25$	Worthy
$43{,}75 < p \leq 62{,}50$	Quite Decent
$25{,}00 < p \leq 43{,}75$	Not feasible

FINDINGS AND DISCUSSION

Findings

The research results explained in this chapter include three things, namely (1) the results of the analysis of the needs of students and educators for the science learning module with a differentiated approach to improve student learning outcomes; (2) the design of the science learning module model with an effective differentiated approach to improve student learning outcomes; (3) expert assessment of the science learning module with a differentiated approach to improve student learning outcomes. The development process is carried out systematically and is easy to understand. ADDIE is a simple and systematically structured development model. The stages carried out include the ADD development steps which consist of three main stages, namely: 1) analysis, 2) design, and 3) development.

Analysis

The first stage in the ADD development model is to analyze the need for product development. In this study, the product developed is a learning media in the form of an NSS Learning Module with a differentiated approach for grade V Elementary School on the human digestive system. Based on the results of observations that have been made by researchers, there are several things that are the basis for the development of this module, including:

Analysis of media development needs in this study was conducted through observation and interview processes with teachers and fifth grade elementary school students. Based on the results of observations of the science learning process, especially on the human digestive system material, it was found that learning activities were still

conventional with a dominance of lecture methods and the use of textbooks. Teachers have not used interesting visual or digital media, and learning has not accommodated the diverse learning needs of students. This causes most students to appear passive, less enthusiastic, and have difficulty understanding abstract material such as the digestive system. In addition, there is no independent learning module that is able to adjust the level of readiness, interests, and learning styles of students, as required in the differentiated approach to the Independent Curriculum.

User analysis in media development in the study entitled "Development of Science Learning Modules with Differentiated Approach Assisted by AI Canva to Improve Learning Outcomes of Fifth Grade Elementary School Students on Human Digestive System Material" is an important step to ensure that the media developed is truly in accordance with the needs, characteristics, and context of use in the elementary school environment. In this case, the main users of learning media in the form of modules are fifth grade students as learners and teachers as learning facilitators. Fifth grade elementary school students have cognitive development characteristics that are at the concrete operational stage according to Piaget's theory, which means they find it easier to understand concepts when presented in visual form and real activities. Therefore, the developed module needs to present material with an attractive appearance, equipped with illustrations, diagrams, and interactive and contextual activities, in order to be able to improve students' understanding and interest in learning the human digestive system material.

Analysis of learning facilities and infrastructure in media development in the study "Development of Science Learning Modules with a Differentiated Approach Assisted by AI Canva to Improve Learning Outcomes of Grade V Elementary School Students on the Human Digestive System" is a very important part to ensure that the development of learning modules can run effectively and efficiently. The available facilities and infrastructure must be able to support both the module creation process by developers and the implementation of modules by teachers and students in the classroom. For this reason, the existence of technological devices and other supporting facilities is a key factor in the success of the development and use of this module.

Design

The design stage in the ADDIE research and development model is a structured step, starting with designing the concept and materials of the product to be developed. Each element of the product content is arranged in detail, while the guidelines for implementing the design or making the product are arranged clearly and in detail. At this stage, the product design is still conceptual and becomes the basis for the development process in the next stage. This stage includes:

Media selection is a crucial step to ensure that the media developed is able to support learning objectives effectively. The selection of media in the development of the science learning module with a differentiated approach in this study focuses on the need to create a more interesting, effective learning experience that is in accordance with the characteristics of diverse students. Given that each student has a different learning style, the media chosen must be able to adapt to these various needs. AI Canva was chosen as the main tool because it has the ability to produce attractive and interactive visual materials, which are in accordance with the principles of differentiated learning. By using AI-assisted Canva, learning modules can be adjusted to different levels of understanding, interests, and learning speeds of students, through features such as creating infographics, animations, and interactive visualizations that make it easier for students to understand the concept of the human digestive system. In addition, this media allows teachers to create variations of materials that can be accessed in various formats, such as text, images, and videos, which support more contextual and comprehensive learning. The selection of this media is

expected to increase student interest and involvement in the learning process, as well as facilitate them in developing a deeper understanding of the material being taught.

The selection of media formats in developing science learning modules with a differentiated approach is very important because the media chosen must be in accordance with the learning objectives, student characteristics, and the learning context itself. In this study, the use of AI Canva as a tool to develop learning modules aims to improve the learning outcomes of fifth grade elementary school students in the human digestive system material. Therefore, the selection of media formats must consider several important aspects, such as ease of access, visual appeal, content diversity, and suitability with the differentiated approach applied in learning.

The preparation of practice questions and answers in the development of the science learning module with a differentiated approach in this study is an important step to ensure that students can measure their understanding of the material that has been taught, as well as provide an opportunity for them to reflect on what has been learned, especially in the human digestive system material. Practice questions are designed not only to evaluate students' cognitive understanding, but also to support the application of a differentiated approach, which allows students with different levels of ability and learning styles to get challenges that are appropriate to their respective levels of understanding.

The design of the NSS (Natural and Social Sciences) learning module with a differentiated approach in the study entitled "Development of an NSS Learning Module with a Differentiated Approach Assisted by AI Canva to Improve Learning Outcomes of Grade V Elementary School Students on the Human Digestive System" is arranged systematically, innovatively, and responsively to the diverse learning needs of students. This module is designed by integrating the principles of differentiated learning, where each component in the module, both learning objectives, activities, materials, media, and assessments are designed to adjust to the student's learning profile, including their learning style, level of readiness, and interest in the material. This approach aims to create an inclusive, adaptive, and challenging learning experience according to the individual needs of students in grade V Elementary School.

Development

Next, the researcher compiles the script with the application program that has been prepared. This stage is the media production stage where the media creation process is adjusted to the previously created script. The final result of this stage is a product that will be tested. At this stage, the media that has been created is also checked and validated by media experts and material experts so that it can be used in the learning process. The following are the development stages:

The stages of product creation in the research "Development of Science Learning Modules with Differentiated Approach Assisted by AI Canva to Improve Learning Outcomes of Elementary School Grade V Students on Human Digestive System Material" are carried out through a systematic and structured process following the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation), especially at the Development stage. This stage is the core process in which previously created learning concepts and designs are implemented into a real form in the form of a complete learning module. The stages of product creation begin with collecting all the components that have been designed, such as learning objectives, main materials, differentiated activities, visual formats, and assessments. These components are then processed into a complete module that is thematically and multimodally integrated.

The product trial stage in the research on the Development of Science Learning Modules with a Differentiated Approach Assisted by AI Canva is a crucial step in ensuring the feasibility, effectiveness, and functionality of the module before it is implemented more widely. This trial was carried out through several systematic stages and focused on the

achievement of learning objectives, ease of use by teachers, and students' appeal and understanding of the human digestive system material. The initial trial stage was carried out on a limited basis (limited trial) in one fifth grade in Elementary School as an experimental group. In this stage, the previously designed module was used directly by the teacher in the learning process during several meetings, which covered all learning components from apperception, presentation of material, differentiated activities, to assessment.

Feasibility and Effectiveness Analysis of the Differentiated Approach Science Learning Module Assisted by AI Canva

Feasibility Data Analysis of the Differentiated Approach Science Learning Module Assisted by AI Canva

Analysis of Expert Validation Feasibility Data for Learning Materials

The analysis of the feasibility data from validation by learning material experts is an evaluative stage that aims to assess the extent to which the content of a learning product, such as the Science Learning Module, has met scientific standards, has the right relevance, and is in accordance with the needs of the learning process. This validation is carried out by an expert in the material field to ensure that the content delivered is in line with the achievement of learning objectives, the applicable curriculum, and the competencies that must be mastered by students. The findings from this analysis process play an important role as a basis for making improvements to the product before it is used in the trial stage for users.

Table 3. Expert Validation of Development Materials for the Science Learning Module with a Differentiated Approach

Assessment Aspects	Validator			Total Score	Skor Makss	Presentase (%)	Ket.
	1	2	3				
Content Eligibility	41	37	44	122	144	84,72%	Valid
Presentation	32	28	33	93	108	86,11%	Very Valid
Linguistics	32	28	35	95	108	87,96%	Very Valid
Contextual	33	28	34	95	108	87,96%	Very Valid
Amount				**405**	**468**	**86,53%**	Very Valid

Based on the validation results, the content feasibility aspect obtained a total score of 122 out of a maximum score of 144, with a percentage of 84.72% included in the "Valid" category. The presentation aspect obtained a total score of 93 out of a maximum score of 108 with a percentage of 86.11% indicating the "Very Valid" category. Furthermore, the linguistic aspect obtained a score of 95 out of a maximum score of 108, resulting in a percentage of 87.96% which is also included in the "Very Valid" category. Likewise, in the contextual aspect, the score obtained was 95 out of 108 with the same percentage of 87.96% and the "Very Valid" category. Overall, the total score obtained from all aspects of the assessment was 405 out of a maximum score of 468, with an average percentage of 86.53%.

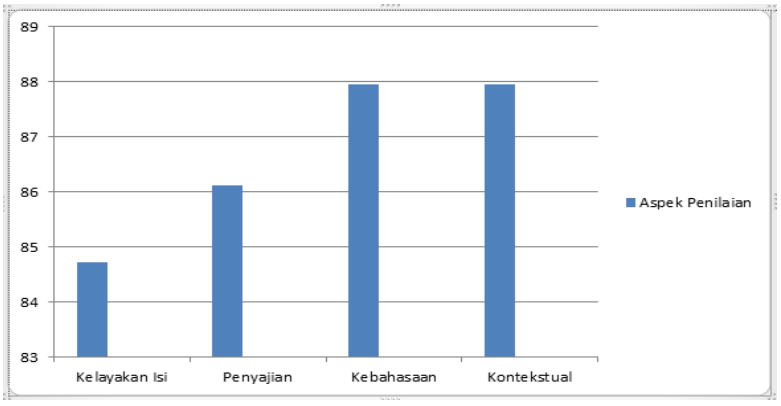

Figure 1 Bar Chart of Expert Material Assessment Results Data

Analysis of Validation Feasibility Data of Learning Media Experts

Media validation is carried out with the aim of obtaining input and evaluating the learning media that has been developed, based on the aspects that have been determined. In this study, the validation process was carried out by experts in the field of learning media. If the validation results indicate that the media product in the form of a module is not yet feasible or is only feasible with revision notes, then improvements are needed according to input from the experts. However, if the learning media has been declared feasible by media experts and material experts, then the module can proceed to the next trial stage.

Table 4. Media Expert Validation for Developing Learning Media NSS Learning Module with Differentiated Approach

Assessment Aspects	Validator			Total Score	Skor Maks	Presentase (%)	Ket.
	1	2	3				
Module Size	8	6	8	22	24	91,66 %	Very Valid
Cover Design	28	27	27	82	84	97,62 %	Very Valid
Module Content Design	68	62	71	201	216	93,05%	Very Valid
Amount				305	324	94,13%	Very Valid

Overall, the total score of all aspects is 305 out of a maximum score of 324, with a validity percentage of 94.13%, indicating that this NSS learning module is very valid to be used as a learning medium. This validation strengthens that graphically and visually, the module has met very good quality standards.

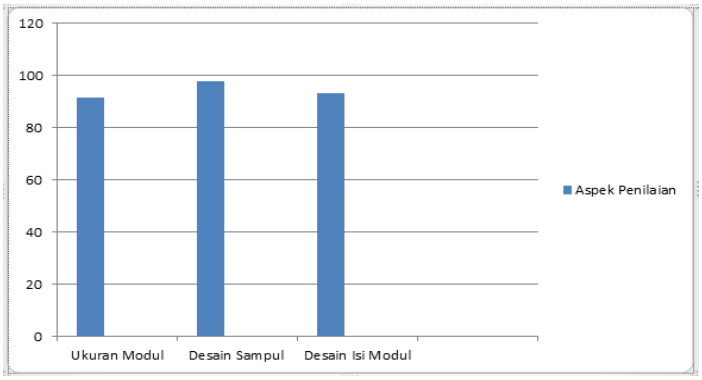

Figure 2 Data Bar Diagram of Media Expert Assessment Results

Data Analysis of the Effectiveness of the Science Learning Module Media with a Differentiated Approach Assisted by AI Canva

Analysis of Student Learning Outcomes

Before conducting the T-test, the researcher first conducted a normality test on the data from the validation of the material. The normality test is a statistical technique that aims to determine whether the data being analyzed follows a normal distribution. Decision making in this test is based on the significance value (sig), namely: (1) if the sig value > 0.05, then the data is considered to be normally distributed, and (2) if the sig value < 0.05, then the data is declared not normally distributed.

Table 5. Validation of Material Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
N	0,327	4		0,718	4	0.612

The validity test of the test items is said to be valid if the calculated r value is greater than the table r value. Based on the results of the trial of 20 multiple-choice questions, it was obtained that 18 questions were included in the valid category, namely questions number 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 20. Meanwhile, 2 questions, namely

numbers 7 and 19, were categorized as invalid. In other words, most of the questions compiled have met the validity criteria and are suitable for use as learning evaluation tools.

Table 6. Question Reliability

Cronbach's Alpha	N of Items
0.718	20

Reliability testing provides assurance that the measurement instruments in the Science Learning Module are not only relevant but can also be used repeatedly with consistent results. This is very important to measure the effectiveness of the book in supporting student learning.

Experimental Class

Based on the data listed in Table 6, it can be seen that out of a total of 34 students who took the pre-test, 27 students managed to achieve the completion criteria with an average score of 73.88. This shows that the percentage of learning completion reached 85.18%, while 7 other students had not achieved the completion criteria, with a percentage of incompleteness of 14.82%. Meanwhile, in the implementation of the post-test which was attended by 27 students, all participants managed to achieve the completion criteria, with an average score of 81.66% and a learning completion rate of 100%. There was not a single student who did not complete it, so the percentage of incompleteness was 0%. Thus, it can be concluded that there was an increase in student learning outcomes after taking part in the learning process using the Science Learning Module media with the AI Canva Differentiated Approach, which is indicated by an increase in the percentage of completeness of 14.82% from the pre-test to the post-test. This indicates that the learning media developed is able to improve students' understanding and achievement of the material taught.

Control Class

Based on the percentage of students' learning completion after the product was implemented in learning (posttest) of 100% ≥ 80%, the quality of the learning media developed as reviewed from the results of the analysis of students' learning outcomes is in the effective criteria used to improve student learning outcomes, as evidenced by the value or learning outcomes obtained by students increasing. While the data on the learning outcome data of the control class shows that the percentage of students' learning completion who did not use media also increased, from the percentage of completion in the pre-test of 59.09% there was an increase in the percentage of completion in the post-test reaching 72.73%.

N-Gain Score Test Analysis

The N-Gain Score test is used to measure changes in student learning outcomes, with calculations that compare the difference in pretest and posttest scores to the potential maximum score. The results of this calculation are categorized into three levels of effectiveness, namely: high (N-Gain ≥ 0.7), medium (0.3 ≤ N-Gain < 0.7), and low (N-Gain < 0.3).

Table 7. N-Gain Test Result Data for Experimental Class and Control Class

Class	N	Average value		Score	
		Pretest	Posttest	%N-Gain	Category
Eksprimen	27	73,88	81,66	0,36	Currently
Kontrol	26	68,18	74,54	0,31	Currently

The development of media in the form of an NSS learning module with a differentiated approach assisted by AI Canva which has previously gone through a validation process by media experts and material experts, then continued to the field trial stage to determine its effectiveness and acceptance among students. This trial involved 27 fifth grade elementary school students as research subjects. Evaluation of student responses in this trial includes three main aspects, namely: (1) the quality of the learning media itself, (2) the level of student understanding of the material presented, and (3) the benefits or usefulness of the learning

media. Complete data regarding student responses to the media developed are presented in Table 4.11, while details of the recapitulation of the results of student responses as a whole can be found in the appendix.

Table 8. Results of Student Response Data Analysis in Field Trials

No	Indicator Response	Maximum Score	Total Score	Percentage (%)	Category
1	Learning	432	394	91,20	Very Good
2	Quality	540	502	92,96	Very Good
3	Function	324	298	91,97	Very Good
4	Display	540	512	94,81	Very Good
	Total	**1836**	**1706**	92,91	Very Good

There are four main indicators analyzed, namely learning, quality, function, and appearance, with a total of 27 students and using a Likert scale of 1–4. The overall maximum score from all indicators is 1836, while the total score obtained from student responses reached 1706. This shows that overall the learning media obtained a satisfaction percentage of 92.91% which is categorized as "Very Good."

Discussion

Development of the Science Learning Module media with the AI-Assisted Differentiated Approach Canva uses the ADD (Analysis, Design and Development) development model as developed by Dick and Carry (1996). In this development model, the development procedure is more systematic, where each step that will be taken refers to the previous step so that at the end of the development it will produce an effective product for use.

In the early stages of development, the analysis stage is first carried out to support the learning media development procedure. The analysis is carried out by conducting observations in the field to analyze findings in the field in the form of learning processes or curriculum, user analysis and analysis of facilities and infrastructure to find existing problems so that it is necessary to develop a learning media. In the design stage, researchers prepare an initial design before developing learning media. At this stage, researchers prepare a material map, competency map, media content outline and media script. The next stage, the development stage, is the stage where the product is ready to be developed according to the design that has been prepared in the previous stage. The next stage is construct validity. In this construct validity, the instruments used are the results of the student learning outcome improvement questionnaire trial and the test of the question item instrument of 27 experimental class students and 26 control class students of grade V Elementary School. The test results of the student learning outcome improvement questionnaire and the test of the question item instrument of the human digestive system material are then processed using statistics to find the validity of the material and the validity of the media.

This section functions to analyze and interpret the results of the development of the Science Learning Module with the Differentiated Approach Assisted by AI Canva in the context of implementing the stages of the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The focus of the discussion includes an evaluation of the development process, product effectiveness, and its implications for improving the learning outcomes of grade V Elementary School students.

The first stage discussed is the needs analysis. At this stage, the study identified students' needs in the digestive system material, especially in terms of learning outcomes. Data obtained from interviews, observations, and questionnaires showed that students needed learning media that explicitly integrated the development of learning outcomes with technical competencies, because these aspects are often underemphasized in regular learning. At the analysis stage, the study highlighted the urgent need to improve the

learning outcomes of fifth grade elementary school students, especially those related to the human digestive system material.

The analysis stage in the ADDIE development model is needs analysis, which is an important process to identify learning problems and formulate needs that must be met so that product development can be targeted and effective. In this study, needs analysis was carried out comprehensively to explore various information related to the actual conditions of learning NSS (Natural and Social Sciences) in grade V Elementary School, especially on the Human Digestive System material. The analysis process includes data collection through direct observation in class, interviews with teachers and students, and distribution of needs questionnaires to students and educators.

During the learning process, all fifth grade students from Bongkok 01 Elementary School and Bongkok 02 Elementary School were actively involved. The results of the study showed that the implementation of the Science Learning Module made a significant contribution to improving students' understanding of the concept of the material, as well as helping them relate the material to the context of everyday life. Teachers involved in this activity conveyed positive changes in students' learning approaches, which were seen from the increase in their activeness and involvement in the learning process. Based on the results of observations during the implementation, this module was also proven to be able to encourage students to develop critical and reflective thinking skills. Students began to realize weaknesses in their learning process, while also seeking strategies to overcome them independently. These findings indicate that the Science Learning Module does not only function as a teaching medium, but also becomes an effective means of forming students' characters who are resilient, reflective, and responsible for their learning process.

The discussion focuses on the findings of data analysis that show a significant increase in student learning outcome competencies. This increase is evidenced by quantitative data from the evaluation results before and after using the module, and is reinforced by qualitative data collected through interviews and student reflections. In addition, the discussion also includes the module revision process carried out based on input from students and teachers, including improving case examples and adding illustrations to clarify the content of the material. Furthermore, an analysis of the effectiveness of the module was carried out by combining quantitative and qualitative approaches. Quantitative data was obtained from the results of a comparison of pretest and posttest scores which showed an increase in the average student score. Meanwhile, qualitative data from interviews and reflections showed that students felt more confident and ready to learn the next material after using this module. Feedback from teachers and students was also used as a basis for future module development, such as adding more challenging case studies and developing a digital version to increase accessibility. This entire revision process reflects the researcher's commitment to continue to maintain the relevance and usefulness of the product for students.

CONCLUSIONS

Based on the research, it can be concluded as follows: the development of a science learning module with a differentiated approach assisted by AI Canva on the Human Digestive System material involves several key components. These include (1) a needs analysis comprising student needs, user analysis, and analysis of facilities and infrastructure—each with distinct details, all of which are reflected in the resulting enrichment book; (2) the module design, which is available in A4 (210 x 297 mm), A5 (148 x 210 mm), and B5 (176 x 250 mm) sizes, and includes a book cover (with title, illustrations, and author's name), an introductory section (title page, foreword, user instructions, and table of contents), a content section (digestive system material, knowledge components, and student worksheets), and a final section (bibliography and author identity); (3) validation

tests conducted by three experts—material, learning, and media—yielded high results: 86.53% for material, 94.13% for media, and 92.6% for learning aspects, indicating that the enrichment book meets student and educator needs effectively; and (4) the NSS learning module model with a differentiated approach assisted by AI Canva, built upon a validated prototype, has proven effective, as evidenced by student learning outcomes in the experimental class improving from 81.66% in the pretest to 100% in the posttest.

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