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Development of Project Based Learning (PjBL)-Based E-LKPD Assisted by the Canva Application on Human Digestive System Material in Class VIII of Middle School

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Abstract

The Student Worksheets (LKPD) used in schools are currently still dominated by conventional formats that are printed, procedural, and monotonous, so that students are less motivated in learning the complex and abstract material of the Human Digestive System. This study aims to describe the development process, as well as analyze the level of validity, practicality, and effectiveness of Project Based Learning (PjBL)-based E-LKPD products assisted by the Canva application on the Human Digestive System material in grade VIII of junior high school. This research method is a research and development (Research and Development/R&D) using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The trial subjects involved media experts, material experts, 2 science teachers, and grade VIII students of Koha Christian Junior High School. Results: The results of the validation of media experts and material experts at the final stage showed a media expert validation percentage of 90.00% and a material expert validation of 89.00% which is in the valid category and is suitable for use without revision. The practicality test of the product based on teacher responses obtained an average percentage of 89% and student responses reached 82%, both of which are included in the very practical category. The effectiveness test using N-Gain analysis of the pretest and posttest values showed an average value of 0.4187 (41.87%) which is included in the moderate category. Conclusion: The PjBL-based E-LKPD assisted by the Canva application developed was proven to be valid, very practical, and quite effective in improving the cognitive abilities and learning outcomes of grade VIII junior high school students on the Human Digestive System material.

1. INTRODUCTION

1.1. Background of the Problem

Student Worksheets (LKPD) are a learning tool that plays a strategic role in guiding learning activities, developing independence, and training students' higher-order thinking skills (Prastowo, 2021). However, the reality on the ground shows that the LKPD used in schools is still largely conventional, procedural, and inadequate in developing critical thinking skills and student creativity. This condition results in low student engagement and suboptimal integration of digital literacy into learning (Afriana & Festiyed, 2022). Furthermore, a more effective strategy for implementing digital-based LKPD in schools is still needed (Wahidin, 2025).

Along with the development of educational technology, the transformation of LKPD into electronic form or E-LKPD has become a relevant innovation to address these needs. Various studies have shown that E-LKPD is effective in improving students' learning outcomes and process skills. Hasanah and Agustini (2023) found that guided inquiry-based E-LKPD was able to improve science process skills with an N-Gain of 0.75, while Amalia et al. (2023) obtained an N-Gain of 0.54. In addition, Maulidia et al. (2024) showed an increase in science learning outcomes with an N-Gain of 0.30, and Ghaisani and Setyasto (2023) with an N-Gain of 0.62. These findings indicate that E-LKPD has great potential in improving the quality of students' learning processes and outcomes.

From a pedagogical perspective, Project-Based Learning (PjBL) is a constructivist learning model that places students at the center of learning through investigative activities, problem-solving, and the production of real-world work. This model has proven effective in developing 21st-century skills, particularly the 4Cs (critical thinking, collaboration, communication, and creativity) (Karpatkin & Bowman, 2022). Empirically, the effectiveness of PjBL is also supported by meta-analyses by Chen and Yang (2018) and Balemen and Özer Keskin (2018), which show that PjBL has a significant effect on improving learning outcomes. Furthermore, Kaveh et al. (2023) reported a high effect size of g = 0.74, while Dewi et al. (2023) found an increase in cognitive learning outcomes and creative thinking skills of junior high school students of 28.6% and 31.2%, respectively. However, the implementation of PjBL in schools still faces obstacles, particularly in the availability of systematic and structured learning tools to support its implementation.

The integration of PjBL into E-LKPD provides a strong synergy in learning, as it can guide students in a systematic investigation process while providing interactive and contextual digital media. In its development, the use of digital design platforms such as Canva for Education is an effective solution. Canva enables the creation of engaging, interactive, and easily accessible teaching materials, and supports collaboration in the learning process (Alqahtani, 2023; Kern-IT, 2023; Canva Pty Ltd., 2023; Pedroso et al., 2023; Built In, 2026). Research also shows that the integration of Canva in PjBL-based learning can improve student learning outcomes (Irawati et al., 2026; Suraiya et al., 2024), as well as enhance visual literacy, numeracy, and critical thinking skills (Oktariya et al., 2023; Lisa et al., 2025).

The human digestive system is a complex and abstract subject in Biology for eighth grade junior high school, encompassing digestive organs, mechanical and chemical processes, and the role of enzymes in digestion. The complexity of the interrelationships between organs and physiological processes requires strong visualization skills to ensure a comprehensive understanding of the concept (Azizah et al., 2021; Budiman, 2021). Learning that is still dominated by textual teaching materials is considered incapable of facilitating in-depth conceptual understanding, necessitating innovation in more interactive digital technology-based learning media (Tri Maryana et al., 2021; Rusvinasari, 2022). Therefore, the development of interactive digital technology-based learning media is crucial to support optimal conceptual understanding.

The results of initial observations and interviews with science teachers indicate that 78% of teachers still use printed, procedural worksheets, 65% of students lack motivation in learning digestive system material, and there is no PjBL-based e-LKPD that is systematically developed and integrated with digital technology. This condition indicates a gap between the demands of the Independent Curriculum and learning practices in the field. Based on these problems, it is necessary to develop a Project Based Learning (PjBL)-based e-LKPD assisted by Canva that not only digitizes the LKPD but also integrates a pedagogical approach. Therefore, the research entitled "Development of Project Based Learning (PjBL)-Based E-LKPD Assisted by the Canva Application on Human

Digestive System Material in Grade VIII of Junior High School" is relevant and important to conduct.

1.2 Problem Identification

Based on the background that has been described, the following problems can be identified:

1. The LKPD used in junior high schools is still dominated by conventional formats which are less able to encourage active involvement and higher-order thinking skills (HOTS) in students.
2. The unavailability of PjBL-based E-LKPD that has been developed systematically and tested for validity, practicality, and effectiveness specifically for the Human Digestive System material for class VIII SMP.
3. The low learning outcomes of students in the Human Digestive System material are caused by the abstract concept and the lack of appropriate visualization media.
4. Lack of utilization of digital design applications such as Canva in developing interactive teaching materials at the junior high school level.
5. Teachers' limitations in developing innovative and interactive digital teaching materials

1.3 Problem Definition

In order for the research to be more focused and in-depth, this research is limited to the following:

1. This research develops PjBL-based E-LKPD assisted by the Canva application specifically for the Human Digestive System material.
2. The development model used is the ADDIE model (Analysis, Design, Development, Implementation, Evaluation).
3. Product evaluation encompasses two aspects: validity, practicality, and effectiveness, and thus does not comprehensively measure the effectiveness aspect.
4. The trial subjects were grade VIII junior high school students in the even semester of the 2025/2026 academic year.

1.4 Problem Formulation

Based on the identification and limitations of the problem, the formulation of the research problem is:

1. How is the process of developing E-LKPD based on Project Based Learning (PjBL) assisted by the Canva application on the Human Digestive System material in class VIII of junior high school using the ADDIE model?
2. What is the level of validity of PjBL-based E-LKPD assisted by the Canva application on the Human Digestive System material in class VIII of junior high school based on expert assessment?
3. What is the practicality level of PjBL-based E-LKPD assisted by the Canva application on the Human Digestive System material in class VIII of junior high school based on teacher and student responses?
4. How effective is the PjBL-based E-LKPD assisted by the Canva application on the learning outcomes of grade VII junior high school students on the Human Digestive System material?

1.5 Research Objectives

Based on the formulation of the problem that has been determined, the objectives of this research are:

1. Describes the process of developing PjBL-based E-LKPD assisted by the Canva application on the Human Digestive System material in class VIII of junior high school using the ADDIE model.
2. Analyzing the validity level of PjBL-based E-LKPD assisted by the Canva application developed based on assessments by media experts and material experts.
3. Analyzing the practicality level of PjBL-based E-LKPD assisted by the Canva application based on teacher and student responses.
4. Analyzing the effectiveness of PjBL-based E-LKPD assisted by the Canva application based on student learning outcomes

2. LITERATURE REVIEW

2.1Electronic Student Worksheets (E-LKPD)

2.1.1 Definition of E-LKPD

According to Hurrahma & Sylvia (2022) E-LKPD is a set of activity sheets arranged as a practice medium for students, which are presented digitally with a systematic structure and are worked on continuously within a certain time frame. E-LKPD is a digital form of student worksheets that contain a series of problem-solving activities to achieve the formulated learning objectives. In addition, according to Mawaddah (2022) LKS is a teaching material in paper form that includes material, summaries, and instructions for carrying out learning tasks that need to be completed by students, meanwhile, E-LKPD is packaged in a digital format that can be accessed and opened via

electronic devices and is designed to support a more interactive and flexible learning process and is equipped with material that can be easily understood by students and is able to encourage increased critical thinking.

Based on the opinions of experts that have been put forward, it can be concluded that E-LKPD is a learning media that contains material and practice questions, accompanied by a systematic presentation of information to help students develop critical thinking skills and train independence in the learning process to achieve learning objectives, with easy access via the internet network.

2.1.2 Characteristics of E-LKPD

According to Pebriani (2022), the electronic characteristics of student worksheets can be seen from 5 parts, namely:

a) Component
   E-LKPD is compiled by covering several components, including: identity, learning objectives, learning instructions, material summary, and student activities.
b) Appearance
   The appearance of the E-LKPD is designed according to the characteristics of students according to the level of education they are taking. The appearance is made colorful and accompanied by supporting images with the aim of motivating students in learning.
c) Material
   Learning materials are the main component of E-LKPD. The materials are tailored to the level of education pursued by students.
d) Learning Activities
   Learning activities are adjusted to the curriculum used in the school, in accordance with what is applied in learning.
e) Assessment System
   The assessment system is an E-LKPD assessment component that functions as a tool to evaluate students' understanding of the material that has been developed.

   Thus, it can be concluded that the E-LKPD developed in this study is a digital student worksheet that provides instructions for carrying out tasks that must be completed by students in learning by referring to TP, CP, indicators, and the curriculum through electronic media or the internet. The selection of materials in the development of E-LKPD with a contextual approach, researchers choose materials that are linked and adapted to everyday situations.

2.2Project Based Learning (PjBL)

Project Based Learning is a student-centered learning model where students are required to learn independently and actively and are given the stimulus to solve problems by involving a project in the learning process. The Buck Institute for Education (BIE, 2021) defines the Gold Standard of Project-Based Learning as a project-based learning practice that meets the following criteria: (1) the presence of meaningful, authentic challenges/problems; (2) in-depth and ongoing investigation; (3) student voice and choice; (4) reflection and revision; (5) criticism and feedback; and (6) a product published to a public audience.

The theoretical basis of PjBL is derived from three main streams: (1) Piaget's constructivism which emphasizes learning through direct experience and active knowledge construction; (2) Vygotsky's theory of the Zone of Proximal Development (ZPD) and scaffolding in a collaborative context; and (3) Ausubel's theory of meaningful learning which emphasizes the connection between new knowledge and existing cognitive structures (Krajcik & Shin, 2014).

The PjBL syntax according to the Gold Standard PBL (BIE, 2021) adapted for the context of science learning in Indonesia consists of six stages: (1) Essential Questions ask authentic questions that spark curiosity; (2) Project Planning (Design a Plan) plan work steps, division of tasks, and required resources; (3) Create a Schedule (Create a Schedule) create a realistic project timeline; (4) Monitor the Progress (Monitor the Progress) teachers monitor and provide guidance; (5) Testing Results (Assess the Outcome) presentation and product assessment; (6) Evaluation of Experience (Evaluate the Experience) reflection on the learning process and results.

Advantages of Project Based Learning (PjBL) Model Fitri.R et al. (2024) stated that the PjBL learning model has advantages in its implementation, namely: a) Increasing student learning motivation to improve their ability to do important tasks, and they deserve to be appreciated. b) Increasing problem-solving skills. c) Increasing student activeness in solving complex problems. d) Increasing Cooperation e) Encouraging students to develop and practice communication skills. f) Increasing students' ability in resource management g) Facilitating student involvement in learning and practicing experiences in a systematic project organization,

as well as strategic allocation of temporal and material resources, including supplies, needed for successful completion of tasks. h) Organizing and completing projects to provide students with direct learning and experience in allocating time and other resources such as equipment for tasks to be completed. i) Offering educational experiences that immerse students in diverse and intentionally structured ways, which reflect the complexity of real-world scenarios j) Helping students learn to absorb information, demonstrate knowledge, and apply it in the real world. k) Creating a happy learning environment, so that students and teachers enjoy the educational process.

2.3Canva Application in Learning

Canva (canva.com) is a cloud-based graphic design platform launched in 2013 and has now become one of the most popular visual design tools in the world with over 170 million active users. Canva for Education is a special version that provides premium features for free for teachers and students, including the ability to create virtual classes, share assignments, collaborate in real-time, and provide direct feedback on student designs. According to Putra and Filianti (2022), the advantage of Canva for Education in the usability dimension lies in its intuitive and easy-to-operate drag-and-drop interface design. These characteristics make Canva not only a design software, but also a learning medium that is accessible to educators with various levels of digital literacy, including those without a graphic design background.

In line with this, Susanto and Almanfaluti (2025) emphasized that Canva has a high level of ease of use as an online design platform that also functions as an interactive learning medium.

This platform provides various templates such as presentations, infographics, posters, worksheets, and learning videos that can be tailored to learning needs. With these characteristics, Canva is one of the educational technology innovations that supports the transformation of learning in the digital era (Alqahtani, 2023; Canva Pty Ltd., 2023; Kern-IT, 2023). Canva enables teachers to develop teaching media that are not only informative but also visually communicative, helping students understand abstract concepts through more concrete representations. This aligns with multimedia learning theory, which states that the combination of text and visuals can improve students' understanding and retention of information (Pedroso et al., 2023; Mayer, 2009).

Furthermore, Canva for Education also supports the implementation of project-based learning (PjBL), which requires active student involvement in producing learning products. Through Canva, students can collaborate in designing various digital products such as presentations, infographics, and educational posters related to the subject matter. This process encourages students to be more active in exploring information, organizing ideas, and presenting their thoughts creatively and systematically. Research shows that integrating Canva into PjBL-based learning can improve learning outcomes and student engagement in the learning process (Irawati et al., 2026; Suraiya et al., 2024).

Thus, Canva can be viewed as a digital learning tool that plays a strategic role in improving the quality of the learning process. Integrating Canva into learning activities not only simplifies material presentation but also encourages more active, collaborative, and learner-centered learning.

2.4Human Digestive System Material for Class VIII SMP

The Human Digestive System is one of the Science Understanding Elements in the Learning Outcomes (CP) of the Independent Curriculum for grade VIII junior high school. Students are expected to be able to describe the structure and function of the digestive organs, explain the mechanical and chemical processes of digestion, identify the role of digestive enzymes, and connect a healthy diet with a healthy digestive system (Kemendikbudristek, 2022).

The main concepts studied in this material include: (1) digestive organs, namely the mouth, esophagus, stomach, small intestine, large intestine, rectum, and anus; (2) digestive glands, namely the salivary glands, liver, gallbladder, and pancreas; (3) mechanical digestion processes (chewing, peristaltic movements, and churning in the stomach); (4) chemical digestion processes (the role of the enzymes amylase, pepsin, lipase, protease, and fat emulsification by bile); and (5) digestive system disorders such as gastritis, diarrhea, constipation, and gastric ulcers.

The human digestive system in Biology for eighth grade junior high school is a highly complex and abstract topic for students. This complexity lies not only in the numerous organs involved in the digestive system, but also in the interconnected functions between organs that

are interconnected in an integrated system. Each organ has a specific role in the digestive process, both mechanically and chemically, so understanding the flow of this process requires good analytical skills from students (Karim et al., 2008; Nurachmandani & Samsulhadi, 2010).

Furthermore, the digestive process involves not only physical changes in food but also complex chemical reactions catalyzed by various enzymes. The digestive system falls into the category of material that requires strong visual representation skills for more concrete understanding (Azizah et al., 2021; Budiman, 2021). Another difficulty students often face in learning this material is their poor ability to connect concepts between organs and the sequential processes that occur.

Thus, the development of interactive digital technology-based learning media is crucial to address the challenges of teaching the human digestive system. Such media is expected to not only help students grasp concepts more easily but also increase motivation to learn, strengthen active engagement in the learning process, and support the achievement of deeper, more meaningful, and more sustainable conceptual understanding.

2.5ADDIE Development Model

The ADDIE (Analysis, Design, Development, Implementation, Evaluation) model is a systematic instructional development model first developed by Dick & Carey (1978) and later refined by Branch (2009). This model is iterative and cyclical, meaning that each stage can provide feedback to the previous stage for continuous improvement (Branch, 2009).

This concept is applied to develop basic performance in learning, namely in designing effective learning products. ADDIE is an instructional design that focuses on the individual, has immediate and long-term phases, is systematic, and uses a systems approach to understanding human knowledge and learning.

Effective instructional design using the ADDIE model emphasizes authentic task implementation, understanding complex concepts, and solving real-world problems. Thus, this model fosters a strong connection between the learning environment and the actual work context. An efficient and effective systems approach in the ADDIE model involves interactions between students, teachers, and the environment. Evaluation results from each learning stage have the potential to improve subsequent phases (Zamsiswa, 2024).

The ADDIE model consists of five stages, namely Analyze, Design, Development, Implementation, and Evaluation, which are used as a systematic framework in developing learning.

a) Analyze

The analysis stage is the initial step in identifying student needs, characteristics, and learning objectives. According to Sugiyono (2012), analysis is conducted through surveys, interviews, and observations to understand student conditions. The results of the analysis form the basis for learning design. For example, in the 2013 Curriculum and the Independent Curriculum, analysis is used to determine the Minimum Competency (KKM) or Minimum Competency (KKTP) based on student abilities, material complexity, and learning support.

b) Design

The design phase focuses on learning planning based on the analysis results. According to Ulrich and Eppinger (2012), design includes developing a lesson plan, selecting methods, media, and evaluation strategies. Methods are chosen based on learning objectives, such as discussions or simulations. According to Mariam and Nam (2019), formative evaluation is also designed to monitor student progress, while Purnama (2016) emphasizes the use of multimedia to enhance understanding.

c) Development

This stage produces learning products such as modules or teaching media. According to Gustiani (2019), development must be carried out carefully to ensure it is in accordance with the design. Latief (2009) emphasized the importance of trials to obtain feedback before widespread use. Richey and Klein (2007) also stated the importance of teaching guidelines for effective implementation.

d) Implementation

The implementation stage is the application of learning in the classroom. According to Ulrich and Eppinger (2012), successful implementation is influenced by teacher readiness and environmental support. Purnama (2016) emphasizes the importance of teacher training prior to implementation. Sugiyono (2012) also states that classroom conditions and technology influence learning effectiveness. Monitoring is carried out to adjust teaching strategies (Torang Siregar, 2023).

e) Evaluation

The evaluation stage aims to assess the effectiveness of learning. According to Kothari

(2004), evaluation consists of formative and summative evaluations. Tests and feedback are used to measure learning outcomes. Mariam and Nam (2019) showed that the ADDIE model can improve learning outcomes compared to traditional methods. Richey and Klein (2007) emphasized the importance of student feedback for learning improvement.

2.6 Relevant Research

Relevant research was used as a reference and comparison in this study, particularly regarding the use of LKPD, e-LKPD, and the Project-Based Learning (PjBL) model. Previous studies have shown that these three aspects contribute to improving students' learning outcomes, critical thinking skills, and 21st-century skills.

Research conducted by Hastuti, Nisa, and Harjawati (2023) shows that the use of Live Worksheet-based student worksheets (LKPD) can improve student learning outcomes in social studies. This demonstrates that digital-based LKPD can have a positive impact on a more interactive and effective learning process. Similarly, Lisa, Kristianti, and Ratu (2025) stated that Canva-based LKPD can improve students' critical thinking skills, thus utilizing technology in LKPD can support the development of 21st-century skills.

Regarding e-LKPD, research by Hurrahma and Sylvia (2022) found that Liveworksheet-based e-LKPD was effective in improving student learning outcomes. Furthermore, Hasanah and Agustini (2023) demonstrated that guided inquiry-based e-LKPD can improve students' science process skills. Similar results were also found by Amalia, Ramlawati, and Hasanuddin (2023), who stated that guided inquiry-based e-LKPD had a positive impact on science process skills.

Furthermore, Maulidia, Rusli, and Ramlawati (2024) found that using e-LKPD with the aid of a virtual laboratory improved students' science learning outcomes. Meanwhile, Oktariya, Herlina, and Abdurrahman (2023) concluded that e-LKPD with the aid of Canva improved students' numeracy and visual literacy. This demonstrates that e-LKPD combined with digital media can provide a more engaging and meaningful learning experience.

Research integrating e-LKPD with the Project Based Learning (PjBL) model has also shown positive results. Mutia, Naswir, and Miharti (2025) stated that PjBL-based e-LKPD can improve students' critical thinking skills. Furthermore, Sari and Wulandari (2025) found that implementing PjBL-based e-LKPD can significantly improve student learning outcomes. Novita Sari and Hartati (2025) also showed that PjBL-based e-LKPD can improve students' understanding of science concepts.

In a meta-analysis of research related to the PjBL model, Chen and Yang (2018) concluded that PjBL significantly impacts student academic achievement. Balemen and Özer Keskin (2018) also found that PjBL is effective in improving learning outcomes in science. Furthermore, Aifah and Astriani (2024) stated that PjBL can improve student collaboration and learning outcomes, while Novalia et al. (2025) emphasized that PjBL can enhance student learning independence.

Another study by Hulyadi et al. (2025) showed that implementing PjBL in a teaching factory can improve students' soft skills and entrepreneurial spirit. Meanwhile, Irawati et al. (2026) and Suraiya et al. (2024) showed that integrating Canva media into PjBL-based learning can improve student learning outcomes.

Based on the various research results, it can be concluded that LKPD, e-LKPD, and the Project Based Learning (PjBL) learning model play a significant role in improving the quality of learning, particularly in improving learning outcomes, critical thinking skills, and 21st-century skills for students. Therefore, this research is relevant for developing learning that integrates e-LKPD based on PjBL as an effort to improve the quality of learning.

2.7 Framework of Thinking

This research framework is built on factual conditions, innovative solutions, and expected outcomes. The actual situation shows that the student worksheets used in junior high schools are still conventional and teachers are limited in developing innovative digital teaching materials.

The solution offered is the development of a Canva-assisted PjBL-based E-LKPD that is systematically developed using the ADDIE model. This E-LKPD is expected to be able to: (1) present Digestive System material visually and interactively so as to minimize misconceptions; (2) guide students through PjBL syntax in meaningful authentic projects; and (3) increase student motivation and learning engagement. The resulting product is comprehensively validated by experts and tested on real users

before being designated as a final product and evaluated for its effectiveness.

3. RESEARCH METHODS

3.1 Type and Design of Research

This research is a type of research and development (R&D), better known as research and development (R&D). Research and development methods are used to produce specific products and test their effectiveness (Sugiyono, 2017). The goal of research and development is to create products in various fields of learning and education, generally aimed at meeting specific needs.

This research and development (R&D) aims to produce a valid and practical Canva-assisted PjBL-based E-LKPD product for learning the Human Digestive System in class VIII of junior high school. The development model used is the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) developed by Branch (2009), for the following reasons: (1) it is systematic and structured; (2) each stage has a clear output; (3) evaluation is carried out formatively and summatively; and (4) it has been widely used and proven effective in developing digital teaching materials.

3.2 Research Procedures Using the ADDIE Model

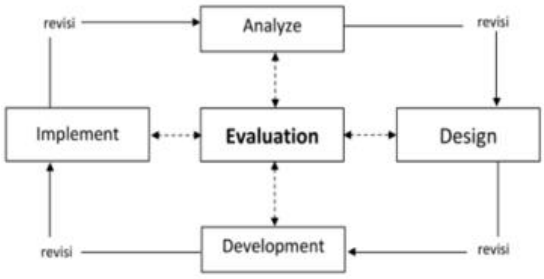

Figure 3.1 ADDIE Development Model (Branch ,2009)
Source: Instructional Design: The ADDIE Approach

1. Analysis Stage

The analysis phase aims to identify actual conditions and development needs. Activities include:

a) Needs Analysis: Semi-structured interviews with eighth grade science teachers and learning observations to identify gaps between ideal conditions and the actual conditions of the teaching materials used.
b) Student Analysis: Study of the characteristics of class VIII students includes age, learning style, digital literacy skills, and access to technological devices.
c) Curriculum Analysis: Review of Learning Outcomes (CP), Learning Objective Flow (ATP), and Independent Curriculum Teaching Modules for the Human Digestive System material.
d) Material Analysis: Identification of essential concepts, relationships between concepts, and common misconceptions in the Human Digestive System material based on literature studies.

2. Design Stage

The design phase produces a comprehensive blueprint for the E-LKPD before the production process begins. Activities undertaken include:

a) Preparation of a concept map of the Human Digestive System material according to the Independent Curriculum CP.
b) Designing an E-LKPD storyboard per page that includes layout, visual elements, PjBL activities, and assessment instruments.
c) Determination of PjBL syntax (Gold Standard BIE, 2021) which will be integrated in each E-LKPD session.
d) Designing contextual, authentic project activities
e) Development of validation instrument grid and practicality

3. Development Stage

At this stage, the E-LKPD prototype is produced and validated. Activities include:

a) E-LKPD production uses Canva for Education based on the storyboard and prototype that have been designed, including the preparation of material text, development of infographics, image selection and creation of work steps.
b) Validation of Material Expert by one of the lecturers (Dr.) of Science Education, FMIPA, Manado State University uses a validation sheet that includes aspects, namely suitability with CP/ATP, accuracy of concepts, adequacy of material coverage, quality of PjBL activities, and quality of evaluation questions.
c) Media Expert Validation by one of the lecturers (Prof) of Science Education, Faculty of Mathematics and Natural Sciences, Manado State University, using a validation sheet that includes aspects, namely visual appearance, navigation, readability, use of

color, image/video quality, and interactivity.

d) Revise the prototype based on the validator's suggestions and input until an E-LKPD is obtained that is declared valid.

4. Implementation Stage

E-LKPD products that have been declared valid are implemented through two trial stages:

a) Small Group Trial: Conducted on 10 grade VIII students purposively selected to represent high, medium, and low ability categories. Data collected included student responses to ease of use, clarity of instructions, attractiveness of the display, and usefulness of the E-LKPD.
b) Field Trial: Conducted with a full eighth-grade class (30 students) at a partner school. At this stage, student and teacher response data were collected.

5. Evaluation Stage

Evaluation is carried out at two levels:

a) Formative Evaluation: carried out continuously at each stage of ADDIE to ensure product quality before proceeding to the next stage.
b) Summative Evaluation: conducted after implementation to assess the overall level of user satisfaction (student and teacher responses).

3.3Test Subjects

The trial subjects in this study consisted of three stages. In the expert validation stage, the subjects involved were material experts and media experts selected using purposive techniques based on their respective expertise, with a total of 2 people, namely 1 material expert and 1 media expert each. Next, in the small group trial, the research subjects were 8th grade junior high school students who were selected purposively to represent high, medium, and low abilities, with a total of 10 students. In the final stage, namely the field trial, the research subjects consisted of 8th grade junior high school students and science teachers who were also selected purposively, involving 1 class with a total of 30 students and 2 science teachers.

3.4Data Types

The data collected in this study consists of:

1. Qualitative Data: Comments, suggestions, and input from expert validators and trial respondents used as material for product revision.
2. Quantitative Data: Expert validation scores (using Guttman/Likert scale), student and teacher response scores (4-point Likert scale).

3.5Research Instruments

The research instruments used consist of:

1. Material Expert Validation Sheet
   Assess the following aspects: (a) suitability of the material with the CP/ATP Merdeka Curriculum; (b) accuracy and currency of the concept; (c) depth and breadth of the material; (d) quality of PjBL activities; (e) quality of evaluation questions; and (f) integration of the Pancasila Student Profile character values.
2. Media Expert Validation Sheet
   Assess aspects: (a) display design (layout, color, typography); (b) image and graphic quality; (c) ease of navigation; (d) interactivity; and (e) device compatibility.
3. Student Response Questionnaire
   5-point Likert scale (1 = Strongly Disagree; 5 = Strongly Agree), assesses the following aspects: ease of use, clarity of material, attractiveness of appearance, clarity of PjBL activity instructions, and usefulness of E-LKPD.
4. Teacher Response Questionnaire
   5-point Likert scale, assessing aspects: suitability to the curriculum, ease of implementation in the classroom, quality of PjBL activities, adequacy of learning time, and quality of assessment instruments.

3.6Data collection technique

Table 3.1. Data Collection Techniques

No.	Jenis Data	Teknik Pengumpulan	Instrumen	Responden
1	Validitas produk	Angket tertutup dan review dokumen	Lembar validasi ahli	2 validator
2	Kepraktisan (siswa)	Angket tertutup	Angket respons siswa	30 peserta didik
3	Kepraktisan (guru)	Angket tertutup dan wawancara	Angket dan pedoman wawancara	2 guru IPA
4	Data kualitatif proses	Observasi & dokumentasi	Lembar observasi & catatan lapangan	Peserta didik & guru

3.7 Data Analysis Techniques

1. Validity Analysis
   The data analysis technique for the validity of the E-LKPD product being developed is carried out in the following manner:
   a) Grouping answers based on questionnaire

questions

b) Assigning scores to respondents' answers. The scoring used in the questionnaire uses a 5-point Likert scale.

Table 3.2. Validation Questionnaire Scores

Pilihan Jawaban	Skor
Tidak Sesuai (TS)	1
Kurang Sesuai (KS)	2
Cukup Sesuai (CS)	3
Sesuai (S)	4
Sangat Sesuai (SS)	5

c) Calculate the percentage of questionnaire answer scores for each question using the following formula:

$$\%X_{in} = \frac{\Sigma S}{S_{maks}} \times 100\% \quad \text{(Sudjana, 2005)}$$

Keterangan:
$\%X_{in}$ = Persentase jawaban responden pada angket
ΣS = Jumlah skor jawaban
S_{maks} = Skor maksimum yang diharapkan

Next, to calculate the average percentage of answer scores for each questionnaire to determine the level of suitability of the content and construct of the e-LKPD being developed, the following formula is used:

$$\%Xi = \frac{\Sigma \%X_{in}}{n} \times 100\% \quad \text{(Sudjana, 2005)}$$

Keterangan:
$\%Xi$ = rata-rata presentase jumlah terhadap pernyataan pada angket
$\Sigma \%X_{in}$ = jumlah presentase jawaban terhadap semua pernyataan pada angket
n = jumlah pernyataan pada angket

d) Interpreting Interpreting the validation criteria for the product percentage analysis from the expert validation results using the interpretation from (Arikunto, 2013) based on Table 3.4 below.

Table 3.4. Analysis Validation Criteria Percentage

Presentase	Tingkat Kevalidan	Keterangan
70-100	Valid	Layak tidak perlu direvisi
51-75	Cukup Valid	Layak/revisi sebagain
26-50	Kurang Valid	Kurang layak / revisi sebagain
<26	Tidak Valid	Tidak layak/revisi total

2. Questionnaire Response Data Analysis

To analyze teacher and student response data to e-LKPD based learning
the project being developed, the following steps are taken:

a) Grouping answers based on questionnaire questions

b) Assigning scores to respondents' answers. The scoring used in the questionnaire uses a 5-point Likert scale.

Table 3.5. Questionnaire Response Scores

Answer Options	Score
Not Suitable (TS)	1
Less Suitable (KS)	2
Quite Suitable (CS)	3
Appropriate (S)	4
Very Good (SS)	5

The value of the resulting data is a percentage of the average value per indicator from the respondents' answers. The average value is calculated using the formula:

$$\bar{x} = \frac{\Sigma x}{n} \quad \text{(Arikunto, 2010)}$$

Keterangan:
$\bar{x}$: nilai rata-rata
Σx : jumlah nilai skor
N : jumlah individu skor

From the calculation of the score for each question, the percentage of respondents' overall answers is found using the following formula:

$$P = \frac{\Sigma x}{\Sigma x_i} \times 100\% \quad \text{(Asyhari \& Silvia, 2016)}$$

Keterangan:
P : Persentase
Σx : Jumlah jawaban responden dalam satu item
Σxi : jumlah nilai ideal dalam item

The validation criteria used can be seen in Table 3.7 below.

Table 3.6. Percentage of Response Criteria

Presentation	Criteria
80.1% - 100%	Very high
60.1% - 80.0%	Tall
40.1% - 60.0%	Currently
20.1% - 40.0%	Low
0.0% - 20.0%	Very Low

3. Data Analysis of Pretest and Posttest Score Results

The pretest and posttest scores were converted into grades. These scores were then used to calculate the n-Gain to determine the extent to which students' critical thinking skills had improved.

a) Calculation of student grades
Student ability improvement includes improvements in factual, conceptual, and procedural abilities as indicated by the scores obtained by students in the student knowledge test (pretest and posttest). The scoring techniques for pretest and posttest scores are as follows:

$$\text{Nilai siswa} = \frac{\text{jumlah skor jawaban yang diperoleh}}{\text{jumlah skor maksimal}} x\ 100\%$$

b) Calculating N-Gain
To determine the extent of the increase in students' critical thinking skills, a normalized Gain (n-Gain) value analysis was carried out. The increase in the score is calculated based on the normalized gain comparison or N-Gain <g> using the Hake (1999) formula, namely:

$$N\text{-}Gain = \frac{\text{nilai posttest} - \text{nilai pretest}}{\text{nilai maksimal} - \text{nilai pretest}}$$

$$\langle g \rangle = \frac{(\%\langle posttest \rangle - \%\langle pretest \rangle)}{(100 - \%\langle pretest \rangle)}$$

Keterangan:
<g> = rata-rata N-Gain
%<posttest> = rata-rata persentase posttest
%<pretest> = rata-rata persentase pretest

The results of the normalized gain (N-Gain) are interpreted to indicate an increase in student abilities with the criteria as presented in Table 3.8 below.

Table 3.8 n-Gain Categories

Besarnya n-Gain	Kategori
$g \geq 0{,}7$	Tinggi
$0{,}3 \leq g < 0{,}7$	Sedang
$g < 0{,}3$	Rendah

4. RESULTS AND DISCUSSION

4.1Development Results

The results of the development in this study will produce a valid and effective PjBL-based E-LKPD assisted by Canva on the Human Digestive System material in Grade VIII and to see the responses of students and teachers to the E-LKPD developed by researchers. Validity will be seen from the results of media expert validators and material expert validators. Furthermore, to see the effectiveness, namely by conducting a field trial by conducting a pretest and posttest, from the results of the pretest and posttest will determine the level of effectiveness that has been developed. Then to see the practicality seen from the field trial consisting of 10 students selected by the teacher randomly.

4.1.1. Development Procedure

The E-LKPD development process uses ADDIE steps which consist of five stages, namely Analysis, Design, Development, Implementation, and Evaluation with the following descriptions.

1. Analysis

The initial stage in developing the PjBL-based E-LKPD for the human digestive system is the process of gathering information from educators and students. This initial research includes curriculum analysis, analysis of student characteristics and learning problems, and analysis of materials.

1) Curriculum Analysis

The curriculum analysis stage is carried out to find out the curriculum used in schools, see the Learning Outcomes (CP) and learning objectives and find out the materials studied in class VIII at junior high school. Christian KohaThis stage is carried out to align with the applicable curriculum. This activity is continued by reviewing learning outcomes which will then be used as considerations when compiling the E-LKPD. The results of the curriculum analysis stage are SMPChristian Kohaimplementing the independent curriculum according to Permendikbudristek Number 12 of 2024. Based on the learning outcomes contained in the independent curriculum, researchers decided to take the human digestive system material with learning outcomes at the end of Phase D, one of which is that students are able to identify and explain various organ systems in living things (especially humans), analyze the relationship between organ structure and function, and relate them to efforts to maintain health. Learning Objectives: Students can identify the organs of the digestive system (mouth, esophagus, stomach, small intestine, large intestine, anus) and digestive glands correctly. Students can explain the mechanical and chemical digestion processes in each organ correctly, demonstrating an understanding of the flow of food digestion. Meanwhile, contextual learning topics where learning topics will always be linked to students' daily lives. For example: Why can we feel hungry

and full?, What happens to food after we eat? Why do we get stomach aches if we eat carelessly? Learning will use real examples from the surrounding environment, simple relevant health cases, or through demonstrations and mini-practices that can be done in class.

2) Analysis of Student Characteristics and Learning Problems

Based on observations and interviews conducted at Koha Christian Middle School, it was found that the learning process in Grade VIII for the Human Digestive System tends to be conventional, with teachers still predominantly using lecture and question-and-answer methods. Teachers use printed worksheets that are procedural and monotonous. In addition, teachers use textbooks and media shared directly from YouTube to student WhatsApp groups. Students expressed a lack of motivation in learning the Digestive System material.

3) *Material Analysis*

The curriculum used at Koha Christian Middle School is the independent curriculum. Material analysis was conducted to determine the material needs in developing teaching materials, including in developing E-LKPD. The material on the human digestive system was chosen by the researcher because it is one of the compulsory materials in the science subject in grade VIII. In addition, the procedural text material was chosen by the researcher because it is closer to everyday life.

2. Design

In the design stage, the researcher designed an attractive e-LKPD based on PjBL for the human digestive system in grade VIII at Koha Christian Middle School. This activity was carried out systematically by establishing objectives, describing learning activities, designing learning materials, designing learning tools, namely LKPD, and evaluating learning outcomes in the subsequent development process.

1) Product Specifications

The developed E-LKPD product is an interactive digital teaching material that can be accessed via computers, tablets, or smartphones via an online link. The E-LKPD was developed using the Canva for Education platform, resulting in an attractive, flexible, and user-friendly interface for students. The content structure in the E-LKPD is structured based on the six Gold Standard Project Based Learning (PjBL) syntaxes from BIE (2021), namely: (1) essential questions, (2) project planning, (3) scheduling, (4) project monitoring, (5) results testing, and (6) evaluation and reflection. The material presented focuses on the human digestive system in accordance with the Learning Outcomes (CP) of the Independent Curriculum for grade VIII SMP, which includes the digestive organs, mechanical and chemical digestion processes, the role of enzymes, and disorders of the digestive system. In addition, the E-LKPD is equipped with various supporting media elements such as informative texts, digestive organ infographics, concept maps, PjBL work steps, structured worksheets, and a glossary to aid student understanding. The language used is communicative Indonesian, in accordance with EYD, and adapted to the characteristics of class VIII SMP students.

2) Product Prototype

After product specifications, the next stage is the product prototype, in the form of an E-LKPD. Dalle et al. (2019) explain that a prototype is a physical model that represents a real product as a visualization so that developers can test the design. The following is the E-LKPD prototype developed by the researchers. Product Link: https://canva.link/01dpoxodb07kzkm. Developer Application created with graphic design websitewww.canva.com

3. Development

The development stage includes product creation, E-LKPD validation, and E-LKPD practicality testing. Instrument validation is used in the validation process. The validation instrument uses a questionnaire with a Likert scale. Validation consists of two stages: media validation and material validation.

1) E-LKPD Development

During the development phase, the E-LKPD will follow the structure of the prototype. The LKPD designed by the researcher will utilize the PjBL steps in each learning process. Once the product is completed, it will be validated by a team of experts to determine its suitability for use in learning. The tasks in the LKPD designed by the researcher will be based on PjBL in each learning process. The developed LKPD consists of forty-six pages. The E-LKPD product is attached.

2) Expert Validation

The next stage is expert validation, which

is divided into media expert validation and material expert validation.

Media Expert Validation

The media validation assessment includes aspects of content quality, image quality, and the effect of the Student Worksheet on learning strategies. The media expert validation process was carried out by a lecturer from the Science Education Faculty of Mathematics and Natural Sciences, Manado State University. Media validation was carried out by the validator assessing the Student Worksheet using a questionnaire (attached questionnaire) prepared by the researcher. The validation results then provide suggestions and improvements to the developed Student Worksheet. The following is the data obtained from the calculated validation results.

Table 4.2. Final Stage Media Validation Results

No	Statement	Score
1	Attractive cover design and appropriate to the material	5
2	The color selection is harmonious and comfortable to look at.	4
3	Neat and consistent layout	5
4	Easy to read font type and size	5
5	Illustrations/images support the material	4
6	LKPD is easily accessible in digital form	5
7	Clear page navigation/order	4
8	The display does not confuse the user	4
9	Consistency between text, images, and activities	5
10	Media supports students' independent learning	5
11	LKPD encourages active student involvement	4
12	Interesting and varied activities	4
13	Media facilitates student exploration	4
14	Using Canva increases traction	5
15	LKPD provides an interactive learning experience	4
16	The display supports PjBL steps	4
17	Visualization helps understand the project	5
18	Media facilitates group work	4
19	Visual language is easy for students to understand	5
20	LKPD attracts students' interest in learning	5
Amount		90
Presentation		90.00%
Category		Valid

Media Expert Validator Recommendations	
Validation Results	Worth testing without revision
Improvement Suggestions	LKPD can now be used for research

Subject Matter Expert Validation

The next validation stage is material validation.. At this stage, validation of the material expert is carried out by one of theLecturer of Science Education, Faculty of Mathematics and Natural Sciences, Manado State University. Material validation was carried out by the validator assessing the LKPD using a questionnaire (attached questionnaire) prepared by the researcher, then the validation results contained suggestions and improvements to the LKPD being developed. The following is the data obtained from the results of the validation of the material expert that has been calculated.

Table 4.3. Final Stage Material Validation Results

No	Statement	Score
1	Materials in accordance with Learning Outcomes/Learning Objectives	5
2	The concept of the human digestive system is presented correctly.	5
3	The material covers organs, functions, and the complete digestive process.	4
4	The material has an appropriate depth for eighth grade students.	5
5	The material is linked to students' daily lives	4
6	E-LKPD contains clear Project Based Learning (PjBL) syntax	4
7	There are contextual problems/projects	4
8	Activities encourage student cooperation/collaboration	4
9	Activities to train critical and creative thinking	5
10	E-LKPD produces student project products/results	4
11	The presentation of the material is arranged in a coherent manner	5
12	Learning objectives are conveyed clearly	4
13	Project activity steps are easy to understand	5
14	Activities in LKPD are interrelated	4
15	The language used is easy for students to understand	5
16	The term IPA is used appropriately	4
17	Sentences are clear and do not have double meanings	4
18	The presentation of the material supports understanding of the concept.	5
19	Canva integration helps with learning	4

	interactivity		

No	Statement	G1	G2
		Score	Score
1	The material is in accordance with the learning outcomes of science for class VIII	5	5
2	The digestive system material is presented correctly	5	4
3	Materials are appropriate to the level of student development	4	4
4	The material is linked to students' daily lives	4	4
5	The material helps students understand the concept of the human digestive system.	4	4
6	PjBL steps are presented clearly	5	5
7	Project activities are in accordance with learning materials	4	4
8	Project activities can train students' cooperation	5	5
9	Activities encourage students to think critically and creatively	4	4
10	E-LKPD helps students be active in learning	5	4
11	The language used is easy for students to understand	5	5
12	The sentences used are clear and do not give rise to double meanings.	4	4
13	The term IPA is used appropriately	4	4
14	Attractive E-LKPD display	5	5
15	Pictures and colors help students' understanding.	4	4
16	Using Canva supports the learning process	5	5
17	The layout of the text and images is neatly arranged	4	4
18	E-LKPD is easy to use in science learning	5	5
19	E-LKPD helps teachers in delivering material	4	4
20	E-LKPD is suitable for use in science learning for class VIII	5	5
Amount		90	88
Presentation		90%	88%
Category		Very high	

20	E-LKPD attracts students' interest in learning	5
Amount		89
Presentation		89.00%
Category		Valid
Material Expert Validator Recommendation		
Validation Results	Worth testing without revision	
Improvement Suggestions	-	

Educator (Teacher) Response

In this stage, the researcher administered a response questionnaire to two teachers, with several assessment aspects recorded on the teacher response sheet. The results of the teacher responses will then be used as considerations for improving the E-LKPD to produce better LKPDs. The following are the results of the teacher response questionnaire assessment.

Table 4.4. Results of Educator (Teacher) Responses

No	Statement	G1	G2
		Score	Score
1	The material is in accordance with the learning outcomes of science for class VIII	5	5
2	The digestive system material is presented correctly	5	4
3	Materials are appropriate to the level of student development	4	4
4	The material is linked to students' daily lives	4	4
5	The material helps students understand the concept of the human digestive system.	4	4
6	PjBL steps are presented clearly	5	5
7	Project activities are in accordance with learning materials	4	4
8	Project activities can train students' cooperation	5	5
9	Activities encourage students to think critically and creatively	4	4
10	E-LKPD helps students be active in learning	5	4
11	The language used is easy for students to understand	5	5
12	The sentences used are clear and do not give rise to double meanings.	4	4
13	The term IPA is used appropriately	4	4
14	Attractive E-LKPD display	5	5
15	Pictures and colors help students' understanding.	4	4
16	Using Canva supports the learning process	5	5
17	The layout of the text and images is neatly arranged	4	4
18	E-LKPD is easy to use in science learning	5	5
19	E-LKPD helps teachers in delivering material	4	4
20	E-LKPD is suitable for use in science learning for class VIII	5	5
Amount		90	88
Presentation		90%	88%
Category		Very high	

4. Implementation

This implementation phase includes several trial stages of the E-LKPD, which has been declared feasible for testing based on expert validation assessments. This phase aims to determine its practicality through student and teacher responses to the developed product and also to assess its effectiveness through pretest and posttest results. Products that have been declared feasible will be piloted on eighth-grade students at Koha Christian Middle School.

Individual Trial Phase

The individual trial phase involved 10 students with varying cognitive abilities. Overall, the individual trial results were categorized as very high according to the Likert scale achievement level table by Sugiyono (2019). The instrument is attached.

Table 4.5. Individual Trial Results

No	Student Name	Amount	Percentage	Category
1	AND T	82	82%	Very high
2	LSG R	80	80%	Tall
3	LLP	77	77%	Tall
4	PKP K	77	77%	Tall
5	YRP M	75	75%	Tall
6	AE L	81	81%	Very high
7	FG M	75	75%	Tall
8	AA T	84	84%	Very high
9	EAJ T	89	89%	Very high
10	CAB T	79	79%	Tall
	Average	80	80%	Very high

Field Trial

The field trial phase was conducted to determine the practicality and effectiveness of the PjBL-based E-LKPD developed by examining the results of the initial (pretest) and final (posttest) tests, as well as to determine student responses to the product developed by the researchers. These results can be seen in the tables below.

Table 4.6. Pretest and Protest Data

No	Student Name	Pretest Value	Posttest Score
1	KJP	72.22	86.11
2	E..P.KW	75.00	88.89
3	CLO	77.78	94.44
4	PG	61.11	77.78
5	TER	75.00	86.11
6	MPS	61.11	77.78
7	WG L	66.67	88.89
8	FA	61.11	77.78
9	Mr. D	61.11	75.00
10	SL L	61.11	72.22
11	AC T	66.67	83.33
12	ACW	66.67	83.33
13	CW P	61.11	75.00
14	JI T	61.11	77.78
15	VV S	63.89	75.00
16	KS R	66.67	77.78
17	JS T	63.89	72.22

No	Student Name	Pretest Value	Posttest Score
18	FAL T	63.89	72.22
19	R.W	63.89	75.00
20	MA R	66.67	77.78

The following data shows student responses to the E-LKPD developed by 20 eighth-grade students of Koha Christian Middle School. The questionnaire responses covered several assessment aspects written on the student response sheet. The questionnaire responses used a Likert scale. The questionnaire responses were used to determine the practicality of the E-LKPD developed by the researcher. Therefore, the results of the student response data processing will be explained in the practicality sub-chapter.

Table 4.7 Student Response Data to E-LKPD

No	Student Name	Amount
1	KJP	73
2	E..P.KW	81
3	CLO	81
4	PG	80
5	TER	89
6	MPS	80
7	WG L	87
8	FA	86
9	Mr. D	76
10	SL L	76
11	AC T	87
12	ACW	86
13	CW P	83
14	JI T	85
15	VV S	82
16	KS R	83
17	JS T	85
18	FAL T	80
19	R.W	84
20	MA R	83

5. Evaluation

The evaluation stage is the final step in the ADDIE model. This stage is carried out to obtain the final results of the development of E-LKPD carried out by researchers to determine the practicality and effectiveness of the developed E-LKPD. To determine the practicality of E-LKPD requires data generated from student response instruments to LKPD. Then to determine the feasibility of E-LKPD obtained from the assessment of 20 students of class VIII Koha Christian Middle School, namely by pretest and posttest. Effectiveness data is obtained by looking at the difference in pretest and posttest scores calculated using the N-Gain formula using the SPSS 25 application. In the analysis stage, the evaluation is in the form of suggestions from the supervising lecturer regarding the selection of topics that will be developed by researchers.

The development phase also received evaluation from expert media and material validators in the form of a questionnaire assessment, which also received suggestions and comments from the validators. Finally, the final evaluation, which is the implementation of the E-LKPD for students, includes student response questionnaires, which can be used to improve the E-LKPD to become a better one.

1) Practicality of E-LKPD

Data for the practicality assessment of the developed E-LKPD was taken from the results of a student response instrument to the product. The instrument assessment used a Likert scale with a value range of one to five.

The following is a table of the calculated practical results.

Table 4.8 Practical Results of E-LKPD

No	Student Name	Amount	Percentage	Category
1	KJP	73	73%	Tall
2	E..P.KW	81	81%	Very high
3	CLO	81	81%	Very high
4	PG	80	80%	Tall
5	TER	89	89%	Very high
6	MPS	80	80%	Tall
7	WG L	87	87%	Very high
8	FA	86	86%	Very high
9	Mr. D	76	76%	Tall
10	SL L	76	76%	Tall
11	AC T	87	87%	Very high
12	ACW	86	86%	Very high
13	CW P	83	83%	Very high
14	JI T	85	85%	Very high
15	VV S	82	82%	Very high
16	KS R	83	83%	Very high
17	JS T	85	85%	Very high
18	FAL T	80	80%	Tall
19	R.W	84	84%	Very high
20	MA R	83	83%	Very high
	Average	82%	82%	Very high

"The results of the teacher and student response questionnaire analysis that placed this E-LKPD in the very practical category indicate that the developed learning tool meets the usability aspect in the field. This success is in line with

research conducted by Tatanggihe et al. (2023) in the development of Student Worksheets (LKPD) based on Project Based Learning (PjBL). In their study, the use of a systematically structured PjBL model is able to facilitate the needs of students in organizing project tasks independently or in groups. In addition, this high practicality is also supported by the use of the Canva application as a development platform. Canva provides interactive visualizations, comfortable color contrast, and a neat layout, thus overcoming the weaknesses of conventional printed teaching materials that tend to be procedural and monotonous. The ease of flexible digital access through electronic devices allows students to explore materials without being limited by the classroom, which ultimately increases the efficiency and practicality of project-based learning."

Descriptive Statistics

	N	Minimum	Maximum	Mean	Standard Deviation
Ngain_Score	20	.23	.75	.4187	.13492
Gain_Percent	20	23.07	74.98	41.8705	13.49220
Valid N (listwise)	20				

2) Effectiveness of E-LKPD

The following effectiveness data was obtained from students' pretest and posttest results on the Human Digestive System. All data were then calculated using the N-Gain formula with SPSS.

Table 4.9 Results of E-LKPD Effectiveness

No	Student Name	Pretest Value	Posttest Score
1	KJP	72.22	86.11
2	E..P.KW	75.00	88.89
3	CLO	77.78	94.44
4	PG	61.11	77.78
5	TER	75.00	86.11
6	MPS	61.11	77.78
7	WG L	66.67	88.89
8	FA	61.11	77.78
9	Mr. D	61.11	75.00
10	SL L	61.11	72.22
11	AC T	66.67	83.33
12	ACW	66.67	83.33
13	CW P	61.11	75.00
14	JI T	61.11	77.78
15	VV S	63.89	75.00
16	KS R	66.67	77.78
17	JS T	63.89	72.22
18	FAL T	63.89	72.22
19	R.W	63.89	75.00
20	MA R	66.67	77.78
Amount		1,317	1,594
Average		65.83	79.72

Table 4.10 N-Gain Categories

Skala	Kategori
g≤ 0.70	Tinggi
0,7 > g ≥ 0.30	Sedang
g, 0,30	Lemah

Table 4.11 Statistical Description of N-Gain Results

Based on the results of the descriptive analysis, the N-Gain Score value was obtained with an average of 0.4187 with a minimum value of 0.23 and a maximum of 0.75, and a standard deviation of 0.13492. Meanwhile, N-Gain in percentage form showed an average of 41.8705% with a minimum value of 23.07% and a maximum of 74.98%, and a standard deviation of 13.49220.

The N-Gain calculation shows a result of 0.4187 (41.87%), which is included in the moderate category. This indicates that the increase in student abilities after using the Project Based Learning (PjBL)-based E-LKPD is at a fairly good level. Thus, it can be concluded that the use of the PjBL-based E-LKPD developed is quite effective in improving students' abilities and learning outcomes in the Human Digestive System material.

These results are relevant to the empirical findings of Surya et al. (2024), which showed that the implementation of the Project-Based Learning (PjBL) model significantly impacted student learning outcomes. Through the implementation of PjBL steps, students are encouraged to be actively involved and independent in designing projects, as well as to collaborate in solving problems during the learning process.

In the Human Digestive System material

which is known to be complex, abstract, and difficult to observe directly, interactive E-LKPD acts as a scaffolding that helps students connect theoretical concepts with more concrete learning experiences. The integration of PjBL syntax in E-LKPD allows students to build their understanding through systematic investigation and project completion activities. According to Sugiyono (2014), the effectiveness of a treatment in experimental research can be determined by comparing the results before (pretest) and after (posttest) the treatment is given. Therefore, the increase in learning outcomes obtained after using PjBL-based E-LKPD indicates that the developed tool has a positive influence on student learning outcomes.

4.2 Discussion

The discussion in this study refers to the problem formulations listed at the beginning of the chapter, namely the development process, validity level, practicality level of the LKPD, and effectiveness of the developed LKPD. The following is a description of each problem formulation.

1. E-LKPD Development Process

This research is a RnD (Research and Development) development research that aims to determine the development process, practicality, and effectiveness of PjBL-based E-LKPD on the human digestive system material for grade VIII. According to Sugiyono (2015) RnD is a research method used to produce certain products, and test the effectiveness of these products. The product developed in this research is a PjBL-based E-LKPD. Where learning is centered on students by using illustrations in learning at Koha Christian Middle School. In accordance with Permendikbud No. 65 of 2013 concerning Elementary and Secondary Education Process Standards, learning activities are fully directed at developing the domains of knowledge, skills, and attitudes as a whole through a scientific approach and reinforced learning that produces work based on problem solving (project-based learning). Project-Based Learning (PjBL) is a learning model that uses projects/activities as the core of learning. Students explore, assess, interpret, synthesize, and provide information to produce various forms of learning outcomes. Project-Based Learning is a learning model that uses problems as the first step in gathering and integrating new knowledge based on real-life experiences. Project-Based Learning is designed for use with complex problems that require students to investigate and understand them.

This development research uses the ADDIE model developed by Dick and Carey, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. This development model was chosen because ADDIE has quite complex stages. This is in line with Mubarok (2020), who argues that the ADDIE model is suitable for use in developing LKPD because this model clearly outlines the stages and requires researchers to evaluate each stage to minimize errors.

The first stage, namely analysis, includes curriculum analysis, students, learning issues, and materials. The analysis results show that Koha Christian Middle School uses the Independent Curriculum in accordance with Permendikbudristek Number 12 of 2024, with student learning outcomes of being able to identify human organ systems and their relationship to health. The human digestive system material was chosen because it is mandatory material for grade VIII and is close to everyday life. Furthermore, the results of observations and interviews indicate that learning is still conventional with lecture methods, the use of monotonous printed worksheets, and limited learning media, resulting in students being less motivated to learn.

The second stage is the design of an e-LKPD based on Project Based Learning (PjBL) for the human digestive system for class VIII of Koha Christian Middle School. The product was designed with an attractive and interactive display.Canva for Educationso it can be accessed via computer or smartphone. The E-LKPD structure is structured based on the Gold Standard PjBL syntax, which includes trigger questions, project planning, scheduling, monitoring, testing results, and evaluation and reflection. The material is supplemented with text, infographics, concept maps, worksheets, and a glossary in accordance with the Grade VIII Independent Curriculum. Furthermore, a product prototype was created as an initial visualization of the E-LKPD design, which can be accessed throughhttps://canva.link/01dpoxodb07kzkm

The third stage is the development stage. In the development stage, the E-LKPD product was created, validated, and tested for practicality using a Likert-scale questionnaire consisting of media and material validation. The developed E-

LKPD followed a prototype structure with the implementation of Project Based Learning (PjBL) steps and consisted of 46 pages. After the product was completed, validation was carried out by media experts and material experts from the Science Education lecturers of the Faculty of Mathematics and Natural Sciences, Manado State University using a questionnaire to assess feasibility and provide suggestions for improvement. Next, a response test was conducted by two teachers through an assessment questionnaire to obtain input for improving the E-LKPD to make it more suitable for use in learning.

The next stage is the implementation stage, which includes individual trial activities, field trials, and teacher and student responses. The E-LKPD media aspect obtained a percentage of 90.00% and the E-LKPD material aspect obtained a percentage of 89.00% with a valid category, namely worthy of being tested without revision. Next, assessing the results of teacher and student responses, teacher responses consisting of G1 obtained a percentage of 90% and G2 obtained a percentage of 88% with a very high category. Overall, student responses involving 10 people to the e-LKPD-based LKPD obtained an average of 80 with a percentage of 80% in the very high category. Next, the field trial involved 20 eighth-grade students at Koha Christian Middle School. The field trial obtained a result of 0.4187 (41.87%) with a moderate category. This shows that the increase in student abilities after using E-LKPD based on Project Based Learning (PjBL) is at a fairly good level.

The final stage in ADDIE is evaluation. Evaluation is conducted simultaneously during the implementation of activities at each stage. In the analysis stage, the evaluation takes the form of suggestions from the supervising lecturer regarding the topic selection that the researcher will develop. The development stage also receives evaluation from media and material expert validators in the form of an assessment using a questionnaire that also receives suggestions and comments from the validator. Finally, in the final evaluation, namely the evaluation of the E-LKPD implementation stage for students, the evaluation in the form of student response questionnaire results can be used to improve the E-LKPD to become a better E-LKPD.

The evaluation used in this study is summative evaluation. Summative evaluation according to Rusdi (2019) is carried out at the end of the product trial by collecting data or information in the form of field trial data as well as student and practitioner responses to determine the practicality and effectiveness of the product developed. The effectiveness of the PjBL-based E-LKPD obtained an average of 82% in the very high category according to the Likert scale achievement level table by Sugiyono (2019). Meanwhile, the results of the LKPD effectiveness are seen from the calculation of the field trial. N-gain difference between posttest and pretest. Thus, it can be concluded that the PjBL-based E-LKPD developed is quite effective in improving students' abilities and learning outcomes in the Human Digestive System material. While overall student responses at the stage obtained an average of 82 with a percentage of 82% in the very high category.

2. Practicality of E-LKPD

The practicality level of the Student Worksheet (LKPD) was obtained from student response data in a field trial involving 20 students. According to Nieven (in Subakti, 2021), if there is consistency between the curriculum and the learning process, then the learning device is said to be practical if the respondents stated that the learning device can be used in learning, as indicated by the questionnaire or questionnaire (appreciation) by students. Seen from Table 4.4, which consists of 20 statement items, namely the feasibility of the display received a score of 90 respondents 1 and 88 respondents 2 with a very high score. Overall, the average teacher response was 89% and in the very practical category. Meanwhile, the results of student responses in Table 4.7, which contains 20 statement items, so that student responses got an average of 82.0% in the very high category.

3. Effectiveness of E-LKPD

The effectiveness in this study was seen by looking at the difference in the N-Gain value of the initial and final tests of each aspect of cognitive and psychomotor values. Sundayana, R. (2015)., defines if the developed LKPD is declared effective if the learning objectives contained in it are achieved. For the initial test, the teacher's score is taken while the final test uses the developed LKPD. The calculation of product effectiveness is calculated using the N-gain formula using the SPSS 28 application. The

following is a diagram of the results of the average pretest and posttest scores of students.

Based on the results of the descriptive analysis, obtained in table 4.11 the N-Gain Score value with an average of 0.4187 which is included in the medium category, with a minimum value of 0.23 and a maximum of 0.75 and a standard deviation of 0.13492. These results indicate that there is an increase in student abilities after learning using E-LKPD based on Project Based Learning (PjBL) on the Human Digestive System material. The average N-Gain indicates that the increase in student learning outcomes is at a fairly good level, although it has not yet reached the high category.

When viewed in percentage form, the average N-Gain is 41.8705% with a minimum value of 23.07% and a maximum of 74.98% and a standard deviation of 13.48220.This range of values indicates a variation in improvement between students, with some students experiencing low to very high levels of improvement. This can be influenced by differences in initial abilities, levels of activity, and student involvement in the project-based learning process implemented through E-LKPD. Overall, these results indicate that E-LKPD based on Project Based Learning is quite effective in improving student learning outcomes in the Human Digestive System material. The N-Gain value which is in the medium category indicates that this learning medium has had a positive impact on student understanding, but there is still opportunity for further improvement so that learning effectiveness can reach the high category through the development of more optimal learning strategies.

The high feasibility, practicality, and effectiveness of the Project Based Learning (PjBL)-based E-LKPD product assisted by the Canva application are strongly supported by several relevant previous research results from the Postgraduate Science Education group of Manado State University (UNIMA). First, the successful integration of project-based learning syntax in activating students' potential and learning outcomes is in line with the findings of Tuwo and Palilingan (2023) regarding the implementation of Project-Based Learning (PjBL) in Physics and Science learning to improve postgraduate students' scientific creativity. The study confirmed that the intervention of project-based tasks in science instruction significantly provides broader exploration space for students to construct their understanding independently. In this study, the application of the PjBL model was proven to be able to trigger the active participation of eighth-grade junior high school students, foster the ability to work together in completing real projects, and boost their conceptual understanding as evidenced by the average N-Gain score obtained which was in the moderate category.

The significance of reconstructing science teaching materials to be more innovative through the E-LKPD format also has a theoretical and empirical basis that aligns with research conducted by Cosmas and Roring (2022) on the development of science learning tools based on Problem Based Learning to improve students' Higher Order Thinking Skills (HOTS). Their research results confirmed that structuring independent teaching materials that train problem orientation or project work is directly proportional to improvements in students' cognitive performance, reasoning, and critical thinking skills. In the context of developing this E-LKPD material on the Human Digestive System, the arrangement of components of objectives, project instructions, and interactive evaluations in the worksheets is not merely an administrative complement, but transformed into an effective strategic guide in guiding students out of conventional-procedural learning patterns and towards active thinking activities.

Furthermore, the demand for digital transformation in providing interactive and adaptive teaching materials—which in this study is realized through the selection of the Canva application as the basis for the visual design of E-LKPD—is reinforced by the research results of Saroinsong and Tuerah (2024) regarding the effectiveness of using virtual laboratories and simulation media in overcoming misconceptions of abstract science concepts. Saroinsong and Tuerah's (2024) research highlights the importance of engineering and optimizing interactive technology platforms to help visualize science materials that tend to be abstract and complex. In the development of this E-LKPD, the use of graphic features, layout, color, and the integration of multimedia components in Canva has proven successful in bridging the delivery of material on the human digestive system—such as the mechanical-chemical digestion mechanism and related organs—in a more concrete, engaging, and easily understood way for students. The combination of powerful digital visualization and a student-centered learning model is significantly

able to minimize learning obstacles for students in schools.

Overall, the integration of the three postgraduate lecturers' research studies further strengthens the theoretical and practical standing of the product developed. This Canva-assisted PjBL-based e-LKPD was not only declared valid and practical based on the expert team's assessment and user response questionnaire, but also has very strong empirical relevance to the research roadmap for contemporary science learning innovations in the UNIMA Postgraduate environment.

5. Conclusion and Suggestions

A. Conclusion

Based on the results of research and development of E-LKPD based on Project Based Learning(PjBL) assisted by the Canva application on the Human Digestive System material for class VIII SMP, it can be concluded that:

1. The e-LKPD development process was conducted using the Research and Development (R&D) model with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model. The resulting product is a PjBL-based e-LKPD structured according to project-based learning syntax, digitally packaged using Canva, and aligned with the Merdeka Curriculum. The development process, which included needs analysis, design, expert validation, trials, and evaluation, went smoothly.
2. The validity level of E-LKPD based on the results of the E-LKPD media validation obtained a percentage of 90.00% and the validation of E-LKPD material obtained a percentage of 89.00% with a valid category, namely it is worthy of being tested without revision.
3. The practicality of the E-LKPD, based on teacher and student responses, was categorized as very practical. Teacher responses averaged 89%, and student responses reached approximately 82%, indicating that the E-LKPD is easy to use, engaging, and applicable to classroom learning.
4. The effectiveness of E-LKPD based on the N-Gain test results showed an average value of 0.4187 (41.87%), which is included in the moderate category. This indicates that the use of PjBL-based E-LKPD is quite effective in improving student learning outcomes on the Human Digestive System material, although there is still room for improvement to reach the high category.
5.

B. Suggestion

1. It is hoped that this E-LKPD learning can be used in other schools.
2. Middle school science learning should create LKPD by integrating learning models and utilizing technology in learning.

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