Vol. XI No. 1 June 2025
DOI: https://doi.org/10.19109/bioilmi.v11i1.28270
E-ISSN: 2527-3760
Page: 13 - 25

Analysis and Reconstruction of Laboratory Activity Design Digestive System Material

Foniman Saragi[1], Bambang Supriatno[2*], Widi Purwianingsih[2]

[1]*Postgraduate Biology Education, Faculty of Mathematics and Natural Sciences Education, Universitas Pendidikan Indonesia*
[2]*Biology Education, Faculty of Mathematics and Natural Sciences Education, Universitas Pendidikan Indonesia*

**bambangs@upi.edu (Corresponding Author)*

ARTICLE INFO

***Article history*:**
Received: 14/05/2025
Revised: 22/05/2025
Accepted: 26/06/2025

***Keywords*:**
Biology Practicum
Digestive System
Knowledge Construction
LAD Reconstruction
Meaningful Learning

ABSTRACT

Digestive system material is an essential part of the biology curriculum for Grade XI senior high school. Eventhough the material is critical, many existing LADs fail to facilitate the transformation of students' factual knowledge into conceptual understanding, which limits the development of higher-order thinking skills and scientific reasoning. Therefore, this study is conducted to to analyse and reconstruct Laboratory Activity Design (LAD) on digestive system material in grade XI senior high school to improve the effectiveness of practicum-based learning. The research method used is descriptive with the ANCORB approach (Analyse, Test, Reconstruct, and Create LAD). LAD analysis was conducted using a Vee Diagram developed by Novak and Gowin, including focus questions, objects or events, concepts and theories, data recording and transformation, and knowledge claims. The analysis showed that the initial LAD had several weaknesses, such as unclear focus questions, lack of object identification, and limited concepts. Based on these findings, LAD was reconstructed to be more structured, focusing on the link between theory and practice. The reconstruction results are expected to improve students' conceptual understanding and facilitate the process of scientific knowledge construction effectively in learning the digestive system.

INTRODUCTION

Digestive system material is a very important part of the biology curriculum for grade XI senior high school. The digestive system plays a major role in maintaining the balance of the body by processing food into energy needed by the body (Sutomo & Anggraini, 2010). Therefore, an in-depth understanding of the processes in the digestive system not only helps students in understanding biology material but also provides practical knowledge related to a healthy lifestyle. In addition, this material also provides insight into the relationship between the health of the body and the food consumed. Learning about the digestive system is a basic step to equip students with knowledge on how to maintain optimal body health.

One way to provide students with an understanding of the digestive system material is by conducting laboratory activities based on practical experiments (Burattin et al., 2024; Siregar & Supriatno, 2024). Laboratory activities allow students to be directly involved in observations and experiments that demonstrate how the digestive process works in the human body. It is explained by Novak & Gowin (2006) that practicum is an important part of the learning process that allows students to develop conceptual understanding through direct experience. Practical activities are not just experimental activities, but also a tool to connect theory with reality through observation, investigation, and reflection. In the context of digestive system material, students not only learn from theory, but can also see exactly how food is digested in the digestive organs. Laboratory

activities provide an important bridge between the concepts taught in the classroom and the reality of everyday life (Millar, 2004). This helps students to understand more deeply and apply the knowledge they learnt.

In its implementation, the Laboratory Activity Design (LAD) is generally the main reference for students in carrying out practical activities in the laboratory (Jannah et al., 2024). This document is prepared in the form of systematic operational steps to guide students during the practicum implementation process (Ridwan et al., 2024). As part of the learning tools, LAD can be creatively designed by teachers who carry out the role of learning facilitator, to ensure that the practicum process runs effectively and in accordance with learning objectives (Marwa et al., 2023).

The quality of practicum in the laboratory is largely determined by the teacher's ability to design and design laboratory activities effectively and meaningfully (Rima et al., 2020). A competent teacher is able to identify learning objectives, select appropriate materials and tools, and develop experimental procedures that encourage students to think critically, exploratively, and reflectively (Jufri et al., 2023; Rustaman, 2005). Careful planning includes integration between theory and practice, time management, and anticipation of potential risks and obstacles during implementation. Planning practicum activities that are not optimal will have an impact on the success of the practicum activities carried out. Often the expected object events do not appear in practical activities which will have an impact on the failure of knowledge claims by students (Qisthi & Supriatno, 2023).

A good laboratory activity design will help students to transform factual knowledge into conceptual knowledge (Wahidah et al., 2018). This transformation process occurs when students not only observe or follow procedures, but are also actively involved in formulating hypotheses, collecting data, analysing results, and drawing conclusions based on scientific understanding. In other words, students build concepts independently tridwahrough direct experience that is linked to theories that have been or are being learnt. This kind of activity encourages meaningful learning, where new information is integrated into existing cognitive structures, not just memorised (Novak & Gowin, 2006). Therefore, the laboratory does not only function as a place of practice, but also as a learning environment that allows students to reflect, validate, and construct their own knowledge. The understanding gained by students will be deeper and longer lasting compared to passive and theoretical learning. However, it should be emphasised that this kind of activity is not only done in the laboratory but also outside the laboratory (Millar, 2004).

The importance of the quality of laboratory activity design in directing practicum activities makes me interested in analysing the Laboratory Activity Design (LAD) used in learning, especially on digestive system material. The effectiveness of LAD used in learning the digestive system needs to be examined further. Some aspects that are of concern in this analysis include: analysis of the clarity of the focus question, the appearance or absence of objects/events, the relevance of concepts and theories, the implementation of practical procedures, whether knowledge and value claims are facilitated in practical activities.

Analysis of the Laboratory Activity Design (LAD) is an important step to evaluate the extent to which the document supports an effective learning process. Through this analysis, various weaknesses or deficiencies in LAD can be identified, both in terms of suitability for learning objectives, completeness of tools and materials, clarity of procedures, and relevance of activities to the achievement of student competencies. The results of the analysis can be the basis for reconstructing LAD on digestive system material to make it more contextual, directed, and able to facilitate active student involvement in practicum. Thus, the LAD reconstruction carried out will directly contribute to improving the quality of practicum.

MATERIALS AND METHODS

1. Time and Place of Research

This research was conducted from February to May 2025 at the Physiology Laboratory, Department of Biology Education, Universitas Pendidikan Indonesia (UPI).

2. Research Method

This study employed a descriptive qualitative research method aimed at analyzing and improving the design of laboratory activities (LADs) related to the digestive system practicum (Ridwan et al., 2024). The research focused on reviewing existing LADs sourced from widely shared teaching module repositories, which had been circulated repeatedly among educators. The analysis included evaluating both structural and pedagogical components of the LADs, especially their alignment with the knowledge construction framework of the Vee diagram developed by Novak & Gowin (2006).

Data collection instruments included: a table for documenting the implementation results of practical procedures, an identification table for components of the Vee diagram and an assessment rubric adapted from the Vee diagram evaluation framework.

3. Research Procedure

The research was carried out using the ANCOR model developed by Dr. Bambang Supriatno, M.Si. (Supriatno, 2013). ANCOR stands for Analysis, Testing, Reconstruction. The research procedure consisted of the following stages:

1. Analysis Stage

   LADs related to the digestive system were collected from several online sources. An in-depth analysis was conducted using a predetermined instrument to assess the LADs in terms of: feasibility of the title, clarity and relevance of objectives, accuracy of procedural steps and Alignment with the elements of the Vee diagram (focus questions, observed objects/events, theoretical foundations, principles/concepts, data processing, and knowledge claims).
2. Testing Stage

   The practicum activities described in the original LADs were implemented in the Physiology Laboratory of the Biology Department, UPI, without modifying the content. This was done to observe actual practice and identify both strengths and weaknesses in the LAD design.
3. Reconstruction Stage

   Based on the results from the previous analysis and testing, improvements were made to the LADs. This reconstruction focused on enhancing the scientific accuracy, procedural clarity, and the integration of meaningful knowledge construction as per the Vee diagram framework.
4. Final Testing Stage

   The reconstructed LADs were retested to ensure the feasibility and effectiveness of the improved procedures. Observations were recorded to verify that the revised designs could be implemented successfully and support better learning outcomes.

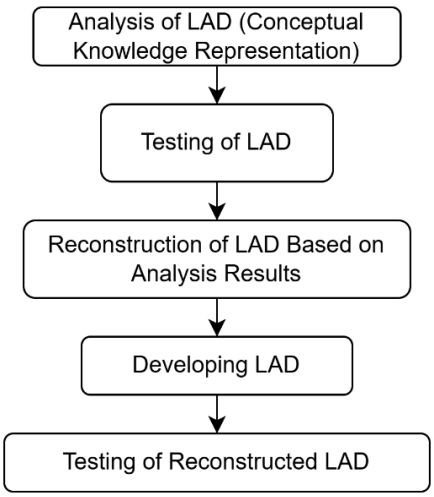


Figure 1. ANCOR work steps (Supriatno, 2013)

RESULTS AND DISCUSSION

Analysing LAD using Vee Diagrams

The original purpose of developing the Vee heuristic or Vee Diagram by Gowin and Novak was to help students understand the structure of knowledge and the scientific thinking process in learning. This diagram is designed to facilitate conceptual understanding by linking key concepts and principles within a topic, as well as explaining the process of scientific enquiry in a systematic way (Novak & Gowin, 2006). In this diagram, the left side depicts conceptual aspects in the form of theories, principles, and concepts, while the right side depicts methodological aspects in the form of data, observations, and experimental results. With this visualisation, students can understand how the theoretical knowledge they learn is connected to their practical experiences (Restudila et al., 2025). Vee diagrams also serve to encourage reflection on learning, allowing students to reflect on their understanding, question the concepts learnt, and relate them to the evidence found. For more details, please see Figure 2.

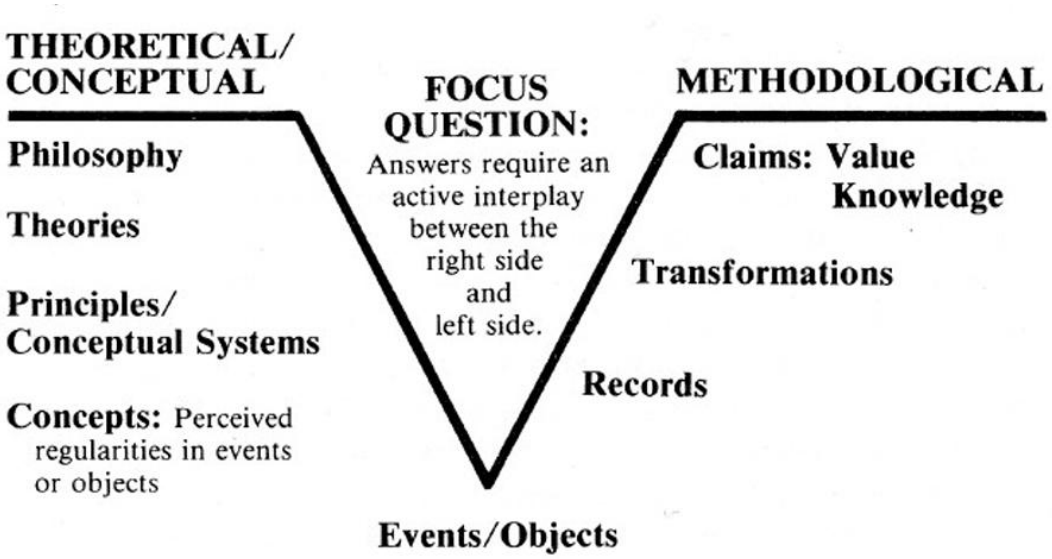


Figure 2. Vee diagram (Novak & Gowin, 2006)

Although the Vee heuristic or Vee Diagram was originally developed as a tool to help students understand the structure of scientific knowledge and thought processes, its use later evolved into an effective tool for analysing LAD. In the context of analysing LAD, Vee Diagrams are used to evaluate the core components of LAD, such as the clarity of the focus question, the relevance of concepts and theories, the logic of experimental procedures, and the quality of analyses and conclusions have been effectively facilitated in the learning process. Thus, the Vee Diagram is not only a tool to facilitate student understanding but also an analytical instrument for educators to ensure that the LAD is designed coherently and consistently.

The following describes in table 1 the scores that reflect the results of the analysis of the knowledge construction process based on Novak & Gowin's approach. This table serves to reveal patterns in the way learners construct and understand knowledge, while providing insights useful for developing strategies for improving and enhancing the quality of LADs, as presented in Table 1.

Table 1. LAD analysis is conducted based on the vee diagram rubric

Aspect	Score	Description
Focus Question	0	No focus question identified.
	1	Focus question identified but does not guide the acquisition of events/concepts.
	2	Focus question identified; guides the acquisition of events/concepts; there are incorrect events that lead to incorrect data.
	3	Focus question identified and can be used to generate appropriate events and data.

Aspect	Score	Description
Object/Event	0	No object/event identified.
	1	Main event identified but not consistent with the focus question.
	2	Main event identified and consistent with the focus question.
	3	Main event identified; consistent with the focus question; can be used to record data.
Theory/Principle/Concept	0	No concept identified.
	1	Concept identified but without principles and theory.
	2	Concept identified and one of the principles (conceptual/procedural) or relevant theory identified.
	3	Concept and principles (conceptual and procedural) identified; or concept, one principle, and relevant theory identified.
	4	Concept, principles (conceptual and procedural), and relevant theory identified.
Record/Transformation	0	No record/transformation identified.
	1	Record identified but not consistent with the focus question/event.
	2	One of (record/transformation) identified and consistent with the focus question/event.
	3	Record/transformation identified; record matches the event; transformation is not consistent with the focus question.
	4	Record and transformation identified; record matches the event; transformation consistent with the focus question; and lab activities match the students' level.
Knowledge Claim	0	No knowledge claim identified.
	1	Knowledge claim is not related to concepts, principles, and theories.
	2	Knowledge claim includes concepts that can be used for generalization but is not consistent with record and transformation.
	3	Knowledge claim includes concepts that can be used for generalization and is consistent with record and transformation.
	4	Knowledge claim includes concepts that can be used for generalization; consistent with record and transformation; can be used to create a new focus question.

Using the vee diagram rubric on Table 1, an in-depth analysis of the LADs found was conducted. The results of the LAD analysis of the digestive system, specifically the food substance test, are as follows.

Table 2. LAD analysis results based on Vee Diagram

No.	Aspect	Score	Percent
1	Focus Question	0	0 %
2	Object/Event	1	5.55 %
3	Teory/Principle/Consept	2	11.11 %
4	Record/Transformation	1	5.55 %
5	Knowledge Claim	2	11.11 %
Total score		**6**	**33.33 %**

Table 2 presents the scores from the analysis of the Laboratory Activity Design (LAD) on the topic of food substance testing using the Vee Diagram framework. The score shown is an assessment of the extent to which the components in the LAD facilitate the construction of scientific knowledge. Of the five main aspects of the Vee Diagram Focus Question, Object/Event, Theory/Principle/Concept, Record/Transformation, and Knowledge Claim - the LAD only achieved a total score of 6 out of a maximum of 18, equivalent to 33.33%. This result shows that the LAD is still not optimal in supporting the formation of a strong relationship between practicum activities and students' conceptual understanding.

Based on an in-depth analysis of the LAD on the focus question aspect in table 2, a score of 0 was obtained. This shows that the LAD does not direct students to transform factual observations

into concepts through questions. Whereas according to Novak & Gowin, the existence of focus questions helps students to stay focused on the problem or phenomenon being studied, so that the thinking process becomes more systematic and focused. This question is crucial in the process of knowledge construction through information gathering (left side of Heuristic Vee) and knowledge organisation (right side of Heuristic Vee). The focus question in LAD also serves to direct learning, trigger critical thinking, connect new concepts with prior knowledge, guide information search, and facilitate evaluation of understanding (Anggraeni & Suratno, 2021).

In the Object/Event aspect, the score given to the LAD is 1 (5.55%). This shows that there is an identification of objects or events, but it is still limited in the explanation or description given. Object/Event is a very important element in the Vee heuristic, so it is placed in the centre of the diagram. Event objects refer to phenomena, events, or materials that are observed and become the main focus of a scientific investigation or practicum (Novak & Gowin, 2006). In the context of science learning, the event object becomes the centre point because this is where learners observe, collect data, and gain direct experience that becomes the basis of factual knowledge (Zainal Nurul Huda et al., 2020). This emphasis on event objects ensures that the learning process does not only revolve around theory, but also involves direct interaction with real phenomena. This is in accordance with Millar (2004) opinion that practicum has an important role in helping students understand scientific concepts through direct experience and interaction with real phenomena.

The occurrence of this object/event determines the direction of the practical activity. For example, in the LAD analysed, the object/event that appears is the colour change in the food substance samples that are tested with food test reagents. The colour change phenomenon that appears is less meaningful because it only shows that food substances such as rice contain carbohydrates, egg whites contain protein and butter contains fat. The knowledge that rice contains carbohydrates is already known by the students so why else do a food test. In this case, even if the expected phenomenon appears, students will not build new concepts other than rice contains carbohydrates, eggs contain protein and butter contains fat. Students will build a new concept if the food substance test practicum activity is connected to the digestive process.

The Theory/Principle/Concept aspect scored 2 (11.11%), which indicates an attempt to include theories or concepts relevant to the topic being analysed. The Theory/Principle/Concept aspect of the Vee heuristic is an important part located on the left side (conceptual part) of the diagram. This section includes theoretical knowledge that forms the basis for understanding and analysing the phenomena studied in a practical or research activity (Novak & Gowin, 2006). Theory is a set of statements or models that explain phenomena in a field of science. Meanwhile, principles are basic rules or scientific laws that apply generally in certain fields of science, while concepts are terms or keywords that describe basic ideas in science (Sabila, 2019; Surahman et al., 2020). In the Vee diagram, these three aspects are interrelated and serve as a conceptual foundation in understanding the observations of a practicum activity to help learners to connect between scientific theory and the direct experience they have in practicum so as to produce a deeper and structured understanding. Unfortunately in this LAD, the theories used are still limited in number or depth. This section should contain theories or principles that comprehensively explain the phenomenon being analysed, so that it can support a thorough understanding.

In the Record/Transformation aspect, the score given is 1 (5.55%). This shows that there is little effort to record and transform information. According to Novak & Gowin (2006) Record/Transformation on the Vee diagram is an important part located on the right side (methodological part) of the diagram. This section includes the process of recording and processing data obtained from practical activities. Data transformation is important in LAD because it serves to convert raw information into a more easily understood form, such as graphs, tables, or diagrams. Unfortunately, based on the results of the analysis conducted on the LAD, it still shows a low score. The observation table is still very simple and does not facilitate students to record as much information as possible from the observed object/event.

The Knowledge Claim aspect received a score of 2 (11.11%), which indicates that there is a knowledge claim obtained, but the claim is still not strong or not supported by adequate evidence.

According to Novak & Gowin (2006) Knowledge Claim is a statement that describes the conclusions or results obtained from data analysis and transformation. This statement answers the question 'What do we know from this activity?' and is usually formulated based on the evidence collected. Knowledge claims can be in the form of new findings, relationships between variables, or explanations of observed phenomena. Unfortunately, in the analysed LAD this is not optimal. The questions made in the LAD do not specifically direct students to make knowledge claims based on the analysis of the observed object/event.

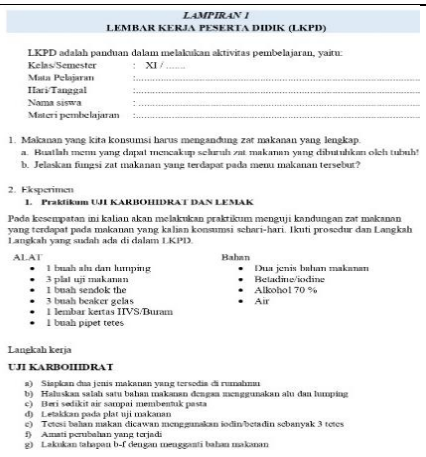
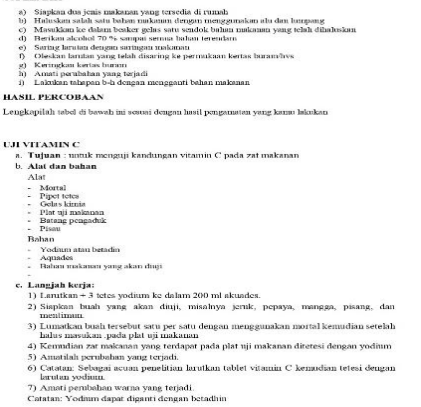
The next aspect after students make a knowledge claim is the value claim. Value claim describes the value or meaning of the knowledge gained, both in scientific, social, ethical, and practical terms (Novak & Gowin, 2006). Value claim helps learners understand the relevance and application of the knowledge they acquire, both in everyday life and in the development of science. This was also not found in the analysed LADs. Whereas this aspect is very important for learners to provide the usefulness of the knowledge they gain from practicum activities.

The findings from the analyses above imply that the LAD needs to be improved to encourage meaningful scientific knowledge construction. Strengthening key elements such as the formulation of focus questions, the elaboration of relevant concepts, and the design of data transformation activities that support conclusion making will be very helpful in bridging the gap.

Trial Results (*Practical Analysis*)

After analysing the constructivity elements of the LAD based on the Vee diagram, the LAD was tested in the physiology laboratory of the University of Biology Education without making modifications to the LAD that had been analysed. The purpose of conducting LAD trials is to determine the implementation of work procedures, suitability of tools and materials, advantages and disadvantages of LAD and whether or not the expected phenomena appear. The LAD display that was tested can be seen in Table 3.

Table 3. LAD analysis results based on Vee Diagram

No.	LAD's Display	Contents
1		This section contains student identities, initial questions, tools and materials, and steps for conducting the carbohydrate test.
2		This section contains the steps for testing fat and vitamin C.

No.	LAD's Display	Contents
3	d. Tabel Pengamatan No | Bahan Makanan | Warna awal | Warna akhir 1 2 3 4 5 6 7 8	This section contains a table of observation results.

After the LAD trial, several obstacles were found in the process of practicum implementation. The obstacles encountered include some materials not mentioned such as label paper, specifications of tools not mentioned such as the size of glass beakers, safety lab equipment not mentioned in the list of tools and materials, the amount of water and alcohol not mentioned. The non-specificity of the size and number of tools and materials will certainly make practitioners confused in carrying out the practicum. For example, label paper is not mentioned in the tools and materials but suddenly appears in the work procedure, making practitioners overwhelmed because they did not prepare label paper.

Furthermore, in the work procedure section, the obstacles faced include the lack of specifications for food types. The work procedure did not explain that the food tested must contain carbohydrates (e.g. rice, potatoes, bread), there was no negative control for materials that did not contain carbohydrates. There is also a lack of observation instructions such as no mention of the expected colour change as an indicator of the presence of carbohydrates (for example, blue-black colour if positive for amylum) as well as other food substances.

The advantage of this LAD is that in the carbohydrate food substance test, the expected phenomenon is a blue colour change in bread and rice samples. This phenomenon is less meaningful for students because before doing the food substance test, students already know that rice and bread contain carbohydrates. A good practicum phenomenon is when it can facilitate students to build concepts (Restudila et al., 2025; Winangun, 2021). Furthermore, the phenomenon that appears has nothing to do with the digestive process that occurs in the body.

However, in the test of fat and vitamin C food substances, the expected phenomena did not appear. This is due to the lack of clarity of the work procedure stated in the LAD. This condition is unfortunate because the expected phenomenon does not appear. Whereas based on the Vee digram, object/event or phenomenon is the starting point for students to build knowledge (Novak & Gowin, 2006).

Furthermore, the focus question in this LAD also has nothing to do with the phenomenon that appears. A good focus question is when the student can answer based on the observed phenomenon (Nurhayati et al., 2020). The existence of this focus question is a very important part in the process of building student knowledge. If the question is not connected to the facts that appear in the observation, the factual to conceptual transformation process does not occur.

Reconstruction Results

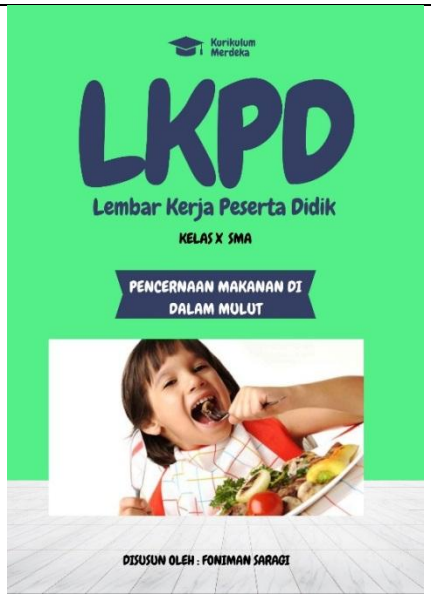
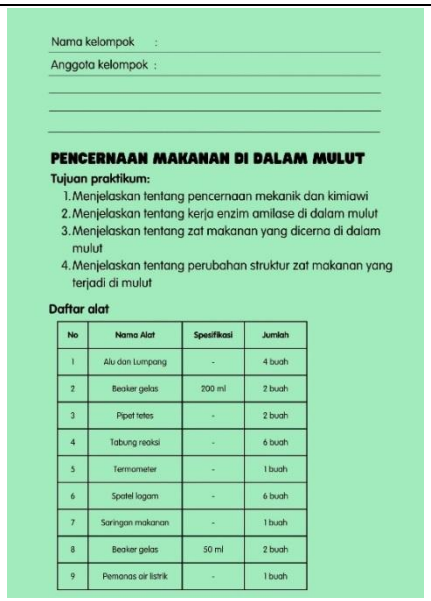
Based on the analysis of the LAD and the LAD trials that have been carried out, various findings were obtained related to the strengths and weaknesses of the LAD used. The analysis revealed several aspects that were less effective, such as the non-specificity of tools and materials, unclear work procedures, phenomena that appear but are less meaningful, phenomena that do not appear and focus questions that are not related to the observational facts that appear. To overcome these obstacles, LAD reconstruction was carried out by adjusting tools and materials, work procedures and making focus questions related to observational facts. This reconstruction is designed so that the new LAD is able to accommodate the students' knowledge construction process specifically in the digestive system material.

The title of the reconstructed LAD is food digestion in the mouth. The food substances used are rice as a carbohydrate source and egg white as a protein source. The focus of this LAD is to understand to students that in the process of digestion occurs in two mechanisms, namely mechanical and chemical. Mechanical digestion aims to refine the structure of food and chemical

digestion aims to change the chemical structure of food substances (Herawati et al., 2024). Based on the observation facts that occur, students are expected to be able to explain the work of the enzyme amylase (chemical digestion) in the mouth and teeth (mechanical digestion). In addition, students are also expected to be able to build knowledge about food substances such as proteins that do not undergo chemical digestion in the mouth because there is no pepsin enzyme in the mouth.

The carbohydrate food substance test in LAD uses the Benedict test while the protein test uses the ninhydrin test. The benedict test is used to test for the presence of glucose in food samples (Sinaga et al., 2020). Meanwhile, the ninhydrin test is used to test the presence of amino acids (Priatni et al., 2020). In the working procedure, each food sample (rice and egg white) will be mashed in a mortal and pestle with three types of treatment. The first treatment of food substances is added with distilled water and mashed. The second treatment is saliva/amylase enzyme (condition in the mouth) and mashed for one minute. The third treatment was saliva and mashed for 3 minutes. Each sample was then stained with benedict for rice and ninhydrin for egg white. From each experiment, students are expected to be able to build their own knowledge about the digestive process that occurs in the mouth. To make it clearer, the reconstructed LAD is shown in Table 4.

Table 4. LAD analysis results based on Vee Diagram

No.	LAD's Display	Contents
1		This section contains the cover and title of the practical work to be carried out by the students
2		This section contains the names of group members, the objectives of the practicum, and a list of required equipment.

No.	LAD's Display	Contents
3	**Daftar bahan**  **PENCERNAAN KARBOHIDRAT** **Ikutilah prosedur kerja berikut ini, kemudian jawab pertanyaan yang tertera selanjutnya.** 1. Sebelum melaksanakan praktikum gunakan safetylab (masker dan sarung tangan) terlebih dahulu. 2. Siapkan makanan yang akan diuji yaitu nasi putih 20 gram 3. Sediakan tiga buah alu dan lumpang dan berikan label 1,2 dan 3 4. Masukkan 10 gram nasi ke dalam alu dan lumpang nomor 1,2 dan 3 5. Haluskan nasi di alu dan lumpang nomor 1 dengan menambahkan sedikit air hingga terbentuk pasta 6. Untuk alu dan lumpang nomor 2, campurkan air liur 1 sendok dengan nasi kemudian haluskan selama 1 menit. 7. Untuk alu dan lumpang nomor 3, campurkan air liur 1 sendok dengan nasi kemudian haluskan selama 2 menit. 8. Lakukan penyaringan dengan menggunakan saringan terhadap pasta nasi 1,2 dan 3 9. Masukkan masing-masing ekstrak Nasi kurang lebih 3 ml ke dalam Tabung Reaksi dan beri label 1,2 dan 3	This section contains practical materials and practical steps for carbohydrate digestion experiment.
4	10. Tambahkan sekitar 2-3 tetes larutan Benedict ke dalam tabung reaksi yang berisi ekstrak nasi. 11. Panaskan tabung reaksi dalam air panas (sekitar 80°C - 90°C) selama 3-5 menit. Jangan langsung memanaskan dengan api terbuka (seperti menggunakan pemanas Bunsen) karena larutan bisa terdekomposisi atau terbakar. Amati perubahan warna larutan dalam tabung reaksi. ▪ Warna biru menunjukkan bahwa tidak ada atau hanya sedikit gula pereduksi dalam larutan. ▪ Warna hijau menandakan sedikit gula pereduksi. ▪ Warna kuning, oranye, atau merah bata menunjukkan semakin banyaknya gula pereduksi (misalnya glukosa), yang berarti pati dalam nasi telah dihidrolisis dengan baik. **TABEL HASIL PENGAMATAN**  **Jawablah pertanyaan berikut berdasarkan fakta yang kamu temukan dalam praktikum** • Apa tujuan penambahan air liur dan penggunaan alu dan lumpang pada praktikum tersebut? • Apakah ada perbedaan warna ketika dilakukan uji benedict pada larutan 1,2 dan 3? • Jika terjadi perubahan warna, mengapa terjadi perbedaan warna pada larutan 1,2 dan 3? • Proses apa yang terjadi yang mengakibatkan perbedaan warna tersebut? • setelah melakukan praktikum, apa yang seharusnya kamu lakukan ketika mengunyah makanan ? Apa tujuan dari tindakanmu?	This section contains a table of observation results and questions that must be answered based on the phenomena that occurred during the carbohydrate digestion experiment.
5	**PENCERNAAN PROTEIN** **Ikutilah prosedur kerja berikut ini, kemudian jawab pertanyaan yang tertera selanjutnya.** 1. Siapkan makanan yang akan diuji yaitu putih telur 20 gram 2. Sediakan 3 buah alu dan lumpang dan berikan label 1,2 dan 3 3. Masukkan 5 gram putih telur ke dalam masing-masing alu dan lumpang nomor 1,2 dan 3 4. Haluskan putih telur di alu dan lumpang nomor 1 dengan menambahkan sedikit air hingga terbentuk pasta 5. Untuk alu dan lumpang nomor 2, campurkan air liur 1 sendok dengan nasi kemudian haluskan selama 1 menit. 6. Untuk alu dan lumpang nomor 3, campurkan air liur 1 sendok dengan nasi kemudian haluskan selama 2 menit. 7. Lakukan penyaringan dengan menggunakan saringan terhadap pasta telur1,2 dan 3 8. Masukkan ekstrak putih telur kurang lebih 5 ml ke dalam Tabung Reaksi dan beri label 1,2 dan 3 9. Tambahkan sekitar 2-3 tetes larutan ninhydrin ke dalam tabung reaksi yang berisi cairan putih telur. 10. Panaskan selama 3-5 menit tabung reaksi yang berisi campuran sampel dan ninhidrin pada suhu sekitar 90°C hingga 100°C (dapat menggunakan pemanas air atau lampu alkohol). Jangan terlalu lama memanaskan agar tidak merusak sampel. 11. Perhatikan Perubahan Warna: Setelah pemanasan, perhatikan perubahan warna dalam tabung reaksi. a. Jika ada asam amino atau protein, akan terbentuk warna ungu atau biru. Ini terjadi karena reaksi antara ninhidrin dan gugus amino pada asam amino atau protein. b. Jika tidak ada asam amino atau protein yang terdeteksi, larutan tetap akan berwarna kekuningan atau tidak berubah.	This section contains the work procedures for the protein digestion practical.

No.	LAD's Display	Contents
6	**TABEL HASIL PENGAMATAN** No | Bahan makanan | Warna awal | Warna akhir 1 | Putih Telur + Air 2 | Putih Telur+ Air Liur dihaluskan selama 1 menit 3 | Putih Telur + Air Liur dihaluskan selama 2 menit **Jawablah pertanyaan berikut berdasarkan fakta yang kamu temukan dalam praktikum** • Apa tujuan penambahan air liur dan penggunaan alu dan lumpang pada praktikum tersebut? • Apakah ada perbedaan warna ketika dilakukan uji ninhidrin pada larutan 1,2 dan 3? • Jika terjadi perubahan warna, mengapa terjadi perbedaan warna pada larutan 1,2 dan 3? • Apakah perubahan warna yang terjadi ada hubungannya dengan kerja dari enzim amilase(air liur) • Proses apa yang terjadi yang mengakibatkan perbedaan warna tersebut? • setelah melakukan praktikum, apa yang seharusnya kamu lakukan ketika mengunyah makanan ? Apa tujuan dari tindakanmu?	This section contains a table of observation results and questions that must be answered based on the phenomena that occurred during the protein digestion experiment.

Based on table 4, we can see the reconstructed LAD. The improvement of this LAD can be seen in the clear objectives of the practicum, namely to understand mechanical and chemical digestion and the work of the enzyme amylase. After this practicum, students can also understand what food substances undergo chemical digestion in the mouth. In addition, students are also expected to be able to know the changes in the structure of food substances that occur in the mouth.

All of these practical objectives are expected to be achieved from the work procedures that must be carried out by students. The focus question made in the LAD also asks about the results of observations obtained by students. Through this focus question, it is expected that there will be a process of transforming factual knowledge into conceptual knowledge (Millar, 2004; Novak & Gowin, 2006). The knowledge gained through this process will be very meaningful for students.

CONCLUSION

Laboratory activity design (LAD) is a very important learning tool and determines the success of practicum activities. Practical activities will be considered successful if they are able to facilitate students in the knowledge construction process. The knowledge that students build from factual to conceptual knowledge will be meaningful to students. This LAD reconstruction is expected to provide meaningful learning ideas for students specifically on digestive system material.

ACKNOWLEDGEMENTS

The author would like to thank all the friends of the Innovative Adaptive Biology Practicum course at FPMIPA UPI who always provide input into the process of reconstructing this LAD. Gratitude is also expressed to the Laboran of the Laboratory of Physiology, Biology Education Study Program, Mrs Sri Rahayu Kartini, S.Si. who always provides the opportunity to carry out the reconstruction process in the Physiology lab.

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