

The Effectiveness of an Interactive Flipbook on Nutrition Knowledge in Mandailing Culinary on Students Ability to Plan a Balanced Menu

Using Local Foods Ingredients

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Abstract

This study examines the effects of an interactive flipbook on nutrition knowledge in Mandailing cooking schools and how it affects students' capacity to plan a balanced dinner utilizing local food ingredients. A quantitative quasi-experimental approach was used, with 101 nutrition students divided into two groups: an experimental group (49 students) using the flipbook and a control group (52 students) using the e-book. Pre- and post-tests were used to evaluate the students' baseline and post-intervention knowledge and abilities. Both groups saw a 3-point increase in average scores, but there was a significant difference (Asymp. Sig value of $0.001 < 0.05$) in post-test results, indicating that the flipbook had a greater impact on learning outcomes than the e-book. Furthermore, 60.5% of the students indicated the flipbook was very engaging and interesting, especially when it came to creating a balanced menu utilizing local Mandailing food, while 39.5% thought it was good. Most students appreciated the inclusion of specific nutritional content, which helped them understand local foods and calculate dietary values for balanced menu planning. These findings indicate that the interactive flipbook is useful for increasing participation and nutrition knowledge in Mandailing culinary education.

Keywords: *Flipbook, Nutrition Knowledge, Balanced Menu, Local Food Ingredients, Mandailing Culinary.*

Introduction

Technology has transformed the world of education. The significance of technology in schools should not be underestimated. In fact, with the introduction of computers in education, it has become easier for educators to convey knowledge and students to learn it (Raja & Nagasubramani, 2018). As we go into the current digital era, education should keep up with technological advancements and innovations. One way that technology may help is by creating new learning spaces that support various learning activities (Marta, 2019). Traditional educational instruction struggles to offer an instantaneous learning environment, quicker evaluations, and more participation. Conversely, technology and digital learning resources fill this gap. Traditional learning approaches just cannot match some of the efficiencies that these digital technologies offer (Haleem et al., 2022).

An example of one of these digital tools is the interactive flipbook, a digital resource that combines textual, visual, and auditory content to better engage students. Flipbook is a specialized software that makes it simple to generate digital books, catalogs, brochures, and presentations (Hardiansyah & Mulyadi, 2022). This application allows educators to provide electronic

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Instructional materials in a more engaging manner by adding interactive components including images, videos, animations, and text. Flipbooks' interactive features, such as moving animations and audio-visual content, make the learning experience more dynamic and engaging (Wibowo & Pratiwi, 2018). In this study, flipbooks as digital technology is used as an aid to digitize printed books into electronic books so that it can be accessed more easily and flexibly by students.

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Rapid technological developments have influenced the appetite of Indonesian teenagers. Food can be easily accessed with a variety of flavors to suit your taste. Fast food is often chosen by teenagers because it is served quickly, saves time, can be enjoyed anytime and anywhere, is affordable, and suits the tastes of teenagers. Fast food is available with a variety of dishes ranging from snacks to main dishes.

Traditional Indonesian food is starting to experience a shift in popularity, including Mandailing cuisine, especially among the younger generation, due to the entry of more modern contemporary foods that follow technological developments. Choosing food without considering nutritional content can have a negative impact on health, especially for teenagers who are still growing. Understanding how to plan a balanced menu is essential so that teenagers are able to choose food according to their needs. Digital innovation is needed to increase knowledge about Mandailing cuisine and understanding how to plan a balanced menu using local food (Mititelu et al., 2023).

Food serves as a link between culture and nature (Ankerstein & Pereira, 2013). Indonesian forests offer enormous potential to help the community's food supply (Komarayanti et al., 2018). One of the most well-known cuisines in North Sumatra is Mandailing cuisine, which is highly favored by residents of Medan (R. Rahmawati & Mulyadi, 2021). Meanwhile, North Sumatra famous Mandailing cuisine is facing challenges in the present period because of changing culinary trends and advancements in digital technologies (Emilia et al., 2024) despite the variety of food menus and local ingredients they have Mandailing culinary customs is a great way to teach students about the advantages of balanced diets that include foods that are readily available in the area. These traditions are rich in cultural heritage and nutritional worth. Comprehending nutritional value and creating well-balanced diets are essential abilities for nutrition students, particularly in areas where regional food plays a big part in daily life. Getting the right nutrition is essential to maintaining good health, being physically fit, and living a healthy life. This is the major objective of nutrition plans (Barzegari et al., 2011).

The usefulness of interactive flipbooks as educational tools has been demonstrated in recent studies, especially when it comes to improving student learning results. Over the last three years, research has demonstrated that flipbooks, with their interactive and multimedia capabilities, greatly increase student learning and engagement. Flipbooks, for instance, can be made more interesting by incorporating movies, quizzes, and other interactive aspects. This improves information retention and fosters a deeper grasp of difficult subjects. Researchers discovered that utilizing interactive flipbooks in the classroom promoted individualized learning, allowing students to progress at their own speed, in addition to raising student participation. Flipbooks are particularly helpful in varied learning situations where students may have varying learning needs because of their versatility (Manurung & Panggabean, 2020; Nafi'ah et al., 2019). Flipbooks' adaptability to a variety of devices further increases their efficacy as teaching tools by enabling learning to continue outside of the classroom.

The flipbook intends to see the effectiveness of students' abilities to design balanced menus based on local food resources by encouraging active learning in addition to imparting knowledge. The study aims to ascertain how the flipbook's interactive and multimedia components affect students' ability to use this knowledge in real-world meal-planning situations.

Literature Review

Flipbook

A flipbook is a digital or physical book that delivers text in a way that allows users to "flip" across pages, similar to the experience of reading a regular book but with the addition of interactive multimedia components. Unlike traditional books, digital flipbooks can feature videos, animations, quizzes, and hyperlinks, making them an effective educational tool. Recent study on digital flipbooks has been widely carried out (O. I. Rahmawati et al., 2023). Previous research did study on flipbook worksheets with the goal of enhancing students' practical independence (Kriswanti et al., 2022). Their findings demonstrated that the flipbook-based teaching resources were both legitimate and extremely effective, with students expressing significant acceptance and independence while using the products. The study received an overall practicality

score of 96.8% and an independence score of 97.8%, both of which were rated "very good." This educational material is easily accessible on smartphones, especially Android, making it convenient for both teachers and students. Android-based learning media offers interactive features and visual effects (Aryani* et al., 2023). This teaching material provides for flexible learning without space or time constraints (Odewumi et al., 2019).

The flipbook has multiple implications for this research. First, its interactive features, such as integrated videos and quizzes, create an engaging learning environment that caters to a variety of learning styles, which is critical for assisting students in understanding and applying complicated nutritional concepts like planning a balanced menu with local foods. Furthermore, the flipbook content is personalized to Mandailing culinary customs, making the material more culturally relevant and relatable, potentially increasing student motivation and retention of nutritional knowledge. Research repeatedly shows that interactive tools, such as flipbooks, increase student engagement and comprehension by allowing active contact with the text. This is especially useful in disciplines like nutrition, where visual aids and interactivity can help clarify complicated concepts. Finally, the flipbook is intended not only to teach theoretical knowledge, but also to facilitate its practical application, particularly in students' ability to plan balanced dinners, which is a significant educational result of this study.

Nutritional Knowledge

Nutritional knowledge is an individual's understanding of nutritional principles, such as the many nutrients, their roles, and how to balance them in a diet. It includes awareness of appropriate eating behaviors, the capacity to comprehend food labels, and understanding how dietary choices affect general health and well-being. Essentially, it provides the foundation for making informed food choices that can avoid malnutrition and lower the risk of diet-related disorders (Spronk et al., 2014). Nutritional knowledge can be obtained from nutrition programs. Nutrition education programs attempt to improve understanding and promote healthy eating habits in communities or specific populations (Heaney et al., 2011). Nutritional education, which includes understanding nutrients, their roles, and how to maintain a balanced diet, serves as the foundation for making informed dietary decisions. By incorporating these ideas into a culturally relevant flipbook, the study hopes to improve students' capacity to apply their knowledge realistically. The flipbook's interactive qualities make it an effective tool for conveying complicated nutritional ideas in an exciting and accessible manner. This approach is expected to improve students' theoretical understanding of nutrition as well as their practical ability to plan balanced meals with locally sourced ingredients, fostering healthier eating habits and potentially lowering the risk of diet-related disorders in this population.

Mandailing Culinary

Mandailing cuisine refers to the traditional food and cooking traditions of the Mandailing people, an ethnic group from North Sumatra in Indonesia. Mandailing cuisine is distinguished by its rich and varied flavors, which frequently incorporate local spices, herbs, and regional delicacies. Key meals include "gulai" (a curry), "rendang" (slow-cooked pork in coconut milk and spices), and various "ikan mas" (carp) preparations. These foods showcase Mandailing culture and tradition while also playing an important role in the Mandailing people's social and ceremonial lives (Emilia et al., 2024). Mandailing culinary traditions provide a culturally meaningful framework for teaching nutrition to the students, according to the study. The study's flipbook, which focuses on local foods and traditional recipes, helps students connect nutritional knowledge to their daily eating habits, making educational content more approachable and practical. This technique also promotes the preservation and appreciation of Mandailing's culinary heritage among the younger generation.

Balanced Menu

Nutritious food contains all of the essential elements in sufficient quantities to meet the body's requirements. Vegetables and fruits provide diverse vitamins, minerals, and dietary fiber (Herlianty et al., 2024). As a result, eating vegetables and fruits is a crucial aspect of obtaining healthy nutrition (Cahyadi & Sulistyanningtyas, 2023). A balanced menu is crucial because it ensures an individual receives the required

nutrients to support general health and well-being. Skills in preparing a balanced meal menu are essential for nutrition education students because they equip them with the practical ability to apply theoretical knowledge in real-world settings. In the context of this research on Mandailing culinary and local food ingredients, promoting a balanced menu that incorporates local foods not only enhances nutritional intake but also preserves cultural heritage and introduces unique dietary practices to the broader community.

Local Food Ingredients

Mandailing culinary, rooted in the rich cultural heritage of the Mandailing people of North Sumatra, Indonesia, is known for its use of unique local food ingredients that reflect the region's biodiversity and agricultural practices. These ingredients, such as "andaliman" (a local spice similar to Sichuan pepper), "asam cikala" (fruit of the torch ginger), and various types of local fish and vegetables, are integral to the traditional dishes of the Mandailing community. By incorporating these local ingredients into the teaching of nutritional knowledge, the research not only educates students about balanced diets but also promotes the use of indigenous foods. This approach can play a significant role in introducing Mandailing culinary traditions and local food ingredients to the world, showcasing the richness of Indonesian cuisine beyond the more globally recognized dishes.

Highlighting Mandailing culinary practices in educational tools like flipbooks can draw international attention to these unique ingredients and the cultural significance behind them. As a result, it encourages a broader appreciation and understanding of regional cuisines, potentially leading to a greater demand for these ingredients globally. This, in turn, can support local economies, preserve cultural heritage, and contribute to the global food diversity narrative. By linking nutritional education with cultural heritage, the research not only benefits students but also positions Mandailing culinary traditions and their local ingredients as valuable contributions to the world's culinary tapestry.

Material and Method

This section will discuss the materials and methods used in this study in more detail, as follows.

Data Collection

In this research, the process of data collection phase carried out was:

Meeting 1: Introduction and pre-test.

Meeting 2-5: Intervention period (use of flipbook).

Meeting 6: Post-test and questionnaire distribution.

Meeting 7: Data analysis and interpretation.

Meanwhile, the data collection used is pre-test, post-test and questionnaire as research instruments.

The objectives of each instrument are:

Pre-Test: Assess initial nutrition knowledge and menu planning skills.

Post-Test: Evaluate knowledge and skills after the intervention.

Questionnaire: Gather data on students' perceptions of the flipbook.

Meanwhile, participants in this study were nutrition students from the 2022 intake who had learned to create a balanced menu design in the previous semester.

Research Design

The research design for this study is quantitative quasi-experimental. This method entails selecting two groups of participants from the same population of nutrition students, one as the experimental group and the other as the control group. The experimental group will use the interactive flipbook as a learning aid, while the control group will stick with standard teaching approaches (PDF file). Both groups will take a pre-test to determine their baseline knowledge and abilities. Following the intervention, a post-test will be given to assess any changes in students' performance. The difference in pre-test and post-test results between the two groups will be compared to establish the flipbook's effectiveness. Despite the lack of random assignments, this design allows for the assessment of the educational intervention's impact while accounting for potential disparities between groups. The number of participants in this study was 101 participants who would be divided into two groups (experimental and control group) which can be seen in Table 1.

Learning Material

In this study, the primary learning material used will be an interactive flipbook focused on Mandailing culinary nutrition and the planning of a balanced menu using local food ingredients, and another learning media is the same books that will be inform of PDF file.

E-Book

Mandailing culinary are one of the foods that are often consumed, found and sought after by the people of North Sumatra. However, information about the nutritional content of this special food has never been researched and made into a book. This is what prompted the Author to research and compile a book containing descriptions of food, recipes, and the nutritional content of Mandailing culinary (Emilia et al., 2024). Here's a detailed explanation of the PDF file books as a learning material:

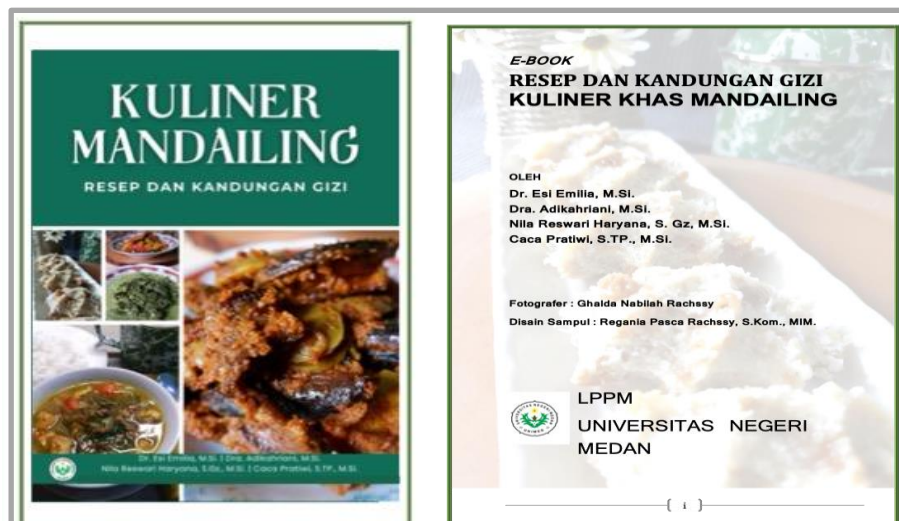


Figure 1. Book Cover

Figure 1 above shows the cover page of the books in PDF file format. This Mandailing culinary book with recipes and nutritional content consists of 9 chapters containing an analysis of the nutritional content of typical Mandailing cuisine, a list of household sizes and nutritional adequacy figures, the application of a balanced menu in Mandailing cuisine, typical Mandailing side dishes, typical Mandailing vegetables, typical Mandailing chili sauce, typical Mandailing plate dishes, typical Mandailing cakes with a total of 23 recipes and a final chapter on a summary of the nutritional content of typical Mandailing food.

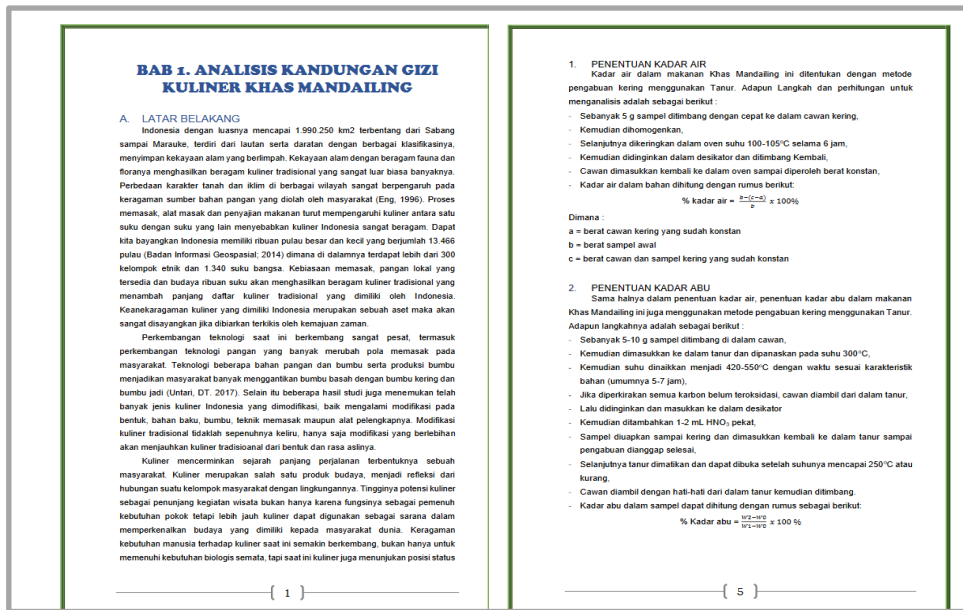


Figure 2. Chapter 1. Analysis Of the Nutritional Content of Mandailing Cuisine

Figure 2 above shows Chapter 1 of the book which explains about Analysis of the nutritional content of Mandailing cuisine. The analysis carried out includes Water Content, Mineral Content using the Dry Ashing method (furnace), Protein Content using the Kjeldahl method, and Fat Content using the Soxhlet Method, Carbohydrate Content using different methods.

Flipbook

Here's a detailed explanation of the flipbook as a learning material:

Interactive Flipbook Content

- **Nutrition Knowledge:** The flipbook will cover key concepts related to nutrition, particularly focusing on the traditional Mandailing culinary practices. This includes information on the nutritional value of various local ingredients, the importance of balanced nutrition, and how to combine different foods to create a nutritious meal.
- **Mandailing Culinary Practices:** The material will introduce students to the cultural and historical significance of Mandailing cuisine. It will detail traditional cooking methods, common ingredients, and the nutritional benefits of traditional dishes.
- **Balanced Menu Planning:** The flipbook will guide students through the process of planning a balanced menu, emphasizing the use of local food ingredients. It will provide practical examples, meal planning templates, and tips on ensuring that meals meet nutritional standards.

Interactive Elements

- **Visual and Multimedia Content:** The flipbook will include images, videos, and diagrams to visually represent the nutritional content of foods, cooking techniques, and balanced meal examples. These elements are designed to engage students and enhance their understanding of the material.
- **Interactive Activities:** To reinforce learning, the flipbook will contain interactive quizzes, drag-and-drop exercises, and scenario-based questions that allow students to apply their knowledge in a practical

context. For example, students might be asked to select appropriate ingredients for a balanced meal or identify the nutritional benefits of specific Mandailing dishes

- *Real-Time Feedback:* The flipbook will provide immediate feedback on the interactive activities, helping students to correct misunderstandings and deepen their understanding of the content.

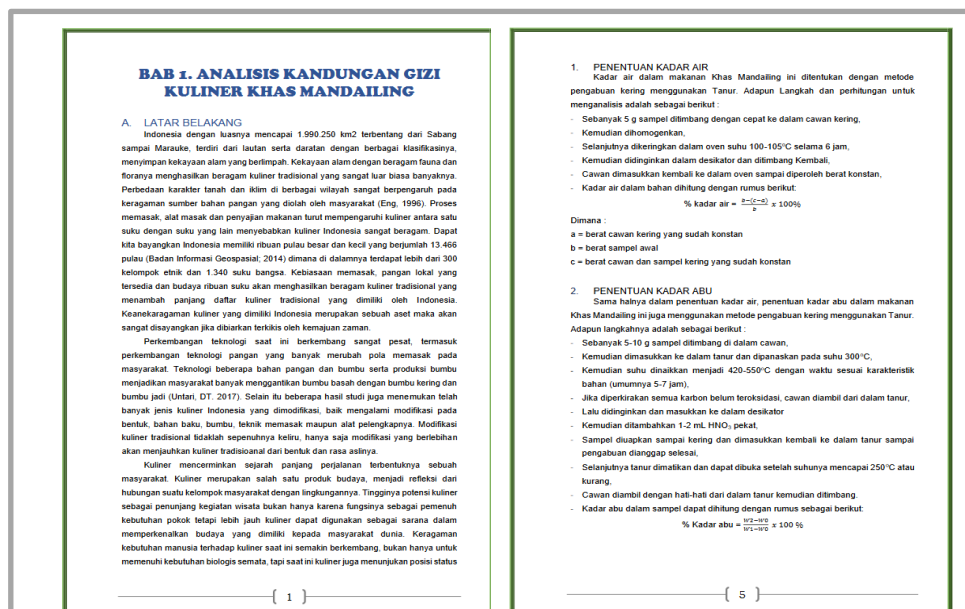
Learning Objectives

- *Increase Knowledge of Local Nutrition:* The flipbook aims to deepen students' understanding of nutrition, particularly within the context of local Mandailing cuisine.
- *Enhance Practical Skills in Menu Planning:* By engaging with the interactive content, students will develop practical skills in planning balanced menus that incorporate local ingredients.
- *Promote Cultural Appreciation:* The material will also emphasize the cultural importance of Mandailing culinary practices, encouraging students to appreciate and preserve local food traditions.

Usability and Accessibility

- *User-Friendly Design:* The flipbook will be designed with user-friendly navigation, ensuring that students can easily access and engage with the material.
- *Accessible on Multiple Devices:* The material will be accessible on various devices, such as tablets, laptops, and smartphones, to accommodate different learning environments.

This interactive flipbook serves as a comprehensive and engaging tool for teaching nutrition knowledge and menu planning, specifically tailored to the cultural context of Mandailing cuisine, and is expected to significantly enhance students' learning outcomes in this area.



C: figure 3. Flipbook

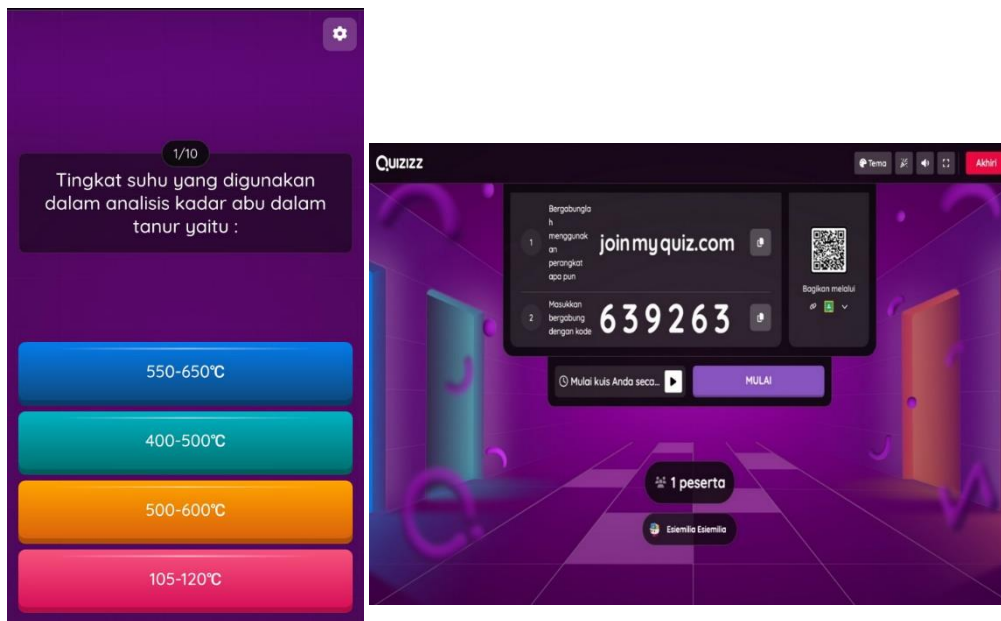


Figure 4. Implementation of Interactive Media on Flipbook (Quizizz)

Data Analysis

The data analysis in this study will focus on evaluating the effectiveness of the interactive flipbook on nutrition knowledge in Mandailing culinary by comparing the pre-test and post-test results of the experimental and control groups. Statistical methods, such as paired sample t-tests, will be employed to assess the significance of changes in students' knowledge and abilities to plan a balanced menu before and after the intervention. Additionally, a comparison between the two groups will be made using an independent samplet-test to control for any potential pre-existing differences. This analysis will help determine whether the use of the interactive flipbook has a statistically significant impact on students' nutrition knowledge and menu planning skills, providing insights into the efficacy of this educational tool

Results

The research participants were divided into two groups, namely the experimental group (using flipbook) consisting of 49 people and the control group (using e-book) consisting of 52 people, and the total of all participants are 101 nutrition students.

Tabel 1. Research Participants

Group	n	Description
Group 1	49 students	Experimental group
Group 2	52 students	Control group
Total	101 students	

Based on the results of statistical tests, the average pretest scores of e-book and flipbooks increased. Table 2 shows an increase of 3 points for both groups. The average scores obtained were not much different, indicating that respondents in the experimental and control groups had the same abilities on average.

Table 2. Descriptive Statistic

No	Descriptive statistic	Control Group (Ebook)		Experimental Group (Flipbook)	
		Pretest	Posttest	Pretest	Posttest
1	Mean	12,78	15,42	13,10	16,80
2	Median	13	16	13	17
3	Deviation	1,87	0,89	1,5	1,0
4	Minimum	8	13	11	15
5	Maximum	16	17	16	18

Based on the statistical test output, it is known that the Asymp.Sig value (2 tailed) is $0.001 < 0.05$, so it can be concluded that the Hypothesis is accepted, thus it can be said that there is a difference in student learning outcomes between classes that use E-books and classes that use Flipbooks.

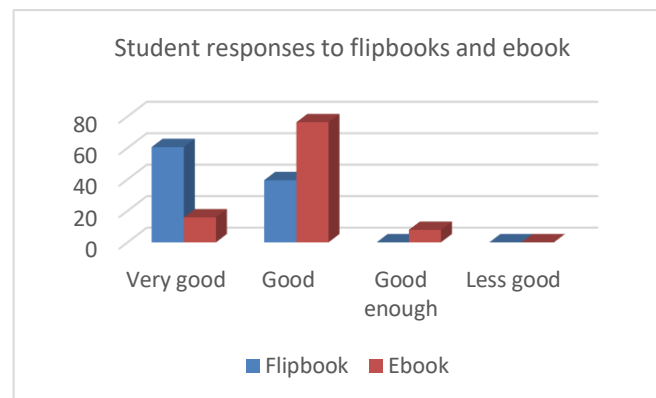

**Figure 5. Respondent Responses**

Figure 5 explains that the results of students' responses to the Mandailing Culinary flipbook showed that most respondents (60.5%) stated that the flipbook was very interactive and interesting to learn, especially in compiling a balanced menu using local cuisine, namely Mandailing cuisine. As many as 39.5% stated that the flipbook was good. The majority of students' responses to the Mandailing culinary ebook were in a good category (76%) and only 15.7% stated that the ebook was very good. Their responses stated that the Mandailing Culinary flipbook was very interesting to learn because it discussed local food complete with nutritional content information, making it easier to compile a balanced menu and calculate the nutritional content of the food (Figure 6).

1. Rendang Belut (Rondang Bolut)



Rondang bolut is the name of a typical Mandailing dish which means Eel Rendang. This dish is made from eel that is sold and then cooked using spices, chilies, coconut milk and the addition of ombu-ombu. The difference between Mandailing rendang and Minangkabau rendang lies in the addition of ombu-ombu. Ombu-ombu is coconut that is roasted until blackish brown. The process of making it is not much different from the process of making rendang in general, but the cooking process is not until dry. Especially for bolut sale, this type of smoked fish can be served with fried chili sauce, but is usually cooked with rendang together with small potatoes or jengkol the size of a coin or red beans. Rondang bolut has a distinctive taste and aroma and is one of the typical Mandailing dishes that can only be found in the Mandailing area, in Mandailing people's homes, or in Mandailing specialty restaurants because it is one of the favorite dishes of the Mandailing people.

Ingredients

• 500 grams of smoked eel	• Powdered spices
• 500 grams of jengkol or red beans	• 100 grams of ground red chili
• 1 stalk of lemongrass, bruised	• 50 grams of cayenne pepper
• 5 cm of galangal, bruised	• 2 cloves of shallot
• 1 turmeric leaf	• 2 cloves of garlic
• 3 bay leaves	• 3 cardeniums
• 1 lime leaf	• 3 cm of ginger
• 1/2 grated coconut (ombu-ombu)	• 2 cm of turmeric
• 1 old head, take the coconut milk	• 10 grams of ground coriander
• 2 cloves of shallot, sliced	
• Salt and Oil to taste	

How to make

1. Cut the smoked eel into several pieces, head and tail removed, wash thoroughly and set aside
2. Boil jengkol until cooked. Remove the skin then crush
3. Puree cayenne pepper, ginger, turmeric, shallots, garlic and cardeniums. Crush lemongrass and galangal
4. Saute grated coconut until brown, remove and puree using a grinder or mortar until smooth and the oil comes out. In some areas, add 1 tablespoon of coriander and puree with roasted coconut.
5. Heat oil in a frying pan, saute the sliced shallots until fragrant and golden yellow. Then add the red chilies and the spices that were pureed earlier, add lemongrass galangal, turmeric leaves, bay leaves and lime leaves, cook until cooked.
6. Add a little water and add the eel that has been cleaned earlier. Add salt to taste then cover and cook for approximately 15 minutes.
7. If the water has reduced then add coconut milk, stir until evenly distributed. Add jengkol and cook for about 20 to 30 minutes
8. Add ombu-ombu, stir until well blended, add salt and powdered broth to taste. Correct the taste and don't forget to stir, cook until the broth is reduced a little

Serving Size : 124 g

Nutritional Content per Serving Size

Energy (kcal) : 454.2


Protein (g) : 6.1

Fat (g) : 28.2

Water (g) : 68

Minerals (g) : 5.6

Carbohydrates (g) : 1.5



RENDANG BELUT

Based on the results of the analysis of nutrients in eel rendang, it is known that the dominant macronutrient in this dish is fat. This is because eel rendang is cooked with coconut sauteed with cooking oil and coconut milk which are also sources of vegetable fat. The mineral content of eel rendang is also quite high this is because eel bones contain minerals. Of the 124 g serving size, 5% contains protein because eel itself is one of the animal-based plant food ingredients.

Figure 6. Mandailing Culinary with Description and The Nutritional Content of The Food

Discussion

The purpose of this study was to assess the efficiency of an interactive flipbook on nutrition knowledge in Mandailing culinary and its impact on students' abilities to prepare a balanced dinner utilizing locally sourced foods. The study had 101 nutrition students divided into two groups: experimental (using the flipbook) and control (using an e-book). Statistical analysis found that both the experimental and control groups improved their average pretest scores by three points apiece.

The study's main finding is that the flipbook and e-book both helped students improve their knowledge, as indicated by the increase in scores. The statistical significance (Asymp.Sig value of 0.001) suggests that the improvement in scores between the two groups is statistically significant, implying that the type of learning material employed had an impact on the outcomes. While both learning aids boosted understanding, the flipbook was very helpful at increasing students' involvement and participation with the subject.

Students' feedback on the Mandailing Culinary flipbook adds to its efficacy. A large majority (60.5%) of respondents considered the flipbook to be quite participatory and engaging, especially when it came to creating a balanced menu incorporating Mandailing cuisine. Some responses from students stated that interactive flipbook of Mandailing cuisine displays complete material on how to calculate the nutritional content of Mandailing cuisine along with information on the nutritional content of the cuisine, making it easier for students to learn it. Interactive flipbook of Mandailing cuisine is a very interesting, informative and educational innovation to introduce typical Mandailing cuisine through technology. Interactive flipbook of Mandailing cuisine is easy to use, understand and has a very attractive appearance. Written in detail and interactively. Contains a description of the cuisine and an explanation of its nutritional content. Many students who are not familiar with Mandailing cuisine, by reading this Mandailing cuisine flipbook, their insight into Mandailing cuisine is opened. Adding to the collection of menus, especially local Mandailing cuisine for students who are learning to compile a balanced menu. Many students realize that local food, especially Mandailing cuisine, has a variety of nutritional content. This good comment emphasizes the flipbook's contribution to making the learning process more dynamic and relevant by incorporating local food and nutritional information. The interactive nature of the flipbook, along with specific nutritional material, appears to have made for a more compelling learning experience than the e-book. The readiness

of digital facilities and infrastructure is very important in supporting the smooth running of learning (Zaenah et al., 2024)

The results show that the Mandailing Culinary flipbook has various benefits:

Increased Engagement: The flipbook's interactive features most likely increased student engagement, making learning about local cuisine and nutrition more interesting and effective.

Increased knowledge: The flipbook's precise nutritional information aided in a better knowledge of how to create a balanced menu utilizing local resources.

Local Relevance: By focusing on Mandailing cuisine, the flipbook provided contextually relevant examples, which are expected to help students better understand the practical application of their nutritional information.

Supporting the findings of this study, previous studies have also shown that the use of flipbooks increases student engagement specifically on behavioral, emotional, and cognitive factors (B & Purwatiningsih, 2023). Previous research also shows that the use of flipbooks helps them in gaining knowledge and it is flexible to use that increases student independence in learning (Rahmadani & í, 2023). In addition, by using flipbooks, it also helps to make cultural topics more interactive (Putri et al., 2020). Active involvement of students is the main factor in developing student competencies, so interactive learning facilities are needed (Nugraheni et al., 2024). The interactive flipbook of Mandailing cuisine is one example of a learning facility that can increase active student involvement. However, it is important to note that, while the flipbook had an advantage in interactivity and engagement, the overall improvement in knowledge was comparable across the two groups. This implies that, while interactive tools such as the flipbook can improve learning experiences, regular e-books can also help improve basic nutritional knowledge.

Conclusion

In conclusion, the Mandailing Culinary flipbook was discovered to be an effective educational tool that improved students' capacity to create a balanced menu while also making learning more dynamic and fun. Future research could look into how different interactive aspects in educational resources affect learning results, and whether these impacts alter between subjects or student populations. Furthermore, studying long-term information retention and application in real-world circumstances may provide additional insights into the usefulness of interactive learning systems.

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