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FOOD EDUCATION ON SCHOOL CHILDREN'S SNACKS USING CREATIVE LEARNING MEDIA (E-BOOKLET) TO IMPROVE STUDENTS' KNOWLEDGE AT SMA NEGERI 5 PALU

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Abstract

School Children's Snacks (PJAS) serve as one of the daily food sources for students; however, many issues regarding hygiene and food safety are still frequently found. The 2023 BPOM inspection revealed that 126 samples (55.75%) did not meet biological standards due to contamination by Escherichia coli. In addition, three samples of noodles and tofu (1.95%) were found not to meet chemical standards because they contained formalin. This situation is exacerbated by the lack of supervision from parents and teachers, as well as students' limited knowledge about food safety. To address these problems, a community service program was conducted at SMA Negeri 5 Palu on August 25, 2025. The activity began with coordination between the principal and teachers regarding the use of an e-booklet as an educational medium for PJAS. A pre-test was carried out to assess students' baseline knowledge, followed by counseling sessions delivered through short lectures, e-booklets, and videos. A post-test was then administered to measure knowledge improvement. To further motivate students, educational games with prizes were organized, and the PJAS e-booklet was handed over to the school for continuous use. Analysis of the pre- and post-test results showed a significant increase, both in understanding PJAS selection and awareness of harmful substances. Thus, this educational activity effectively enhanced students' knowledge of safe PJAS consumption and helped reduce the risk of foodborne illness.

Keywords: Education, e-booklet, snacks, school, PJAS

1. Introduction

Food is a basic human need, especially for school children, which must be fulfilled daily. One of the main sources of food for school children is School Children's Snack Foods (PJAS). PJAS refers to food or beverages sold within the school environment and consumed daily by students (Nasriyah, Kulsum & Tristanti, 2021). These foods and beverages can be consumed directly, either produced by vendors or by others, without requiring further processing.

The snacks sold at schools often have bright colors, savory tastes, chewy textures, and affordable prices. These characteristics attract students to buy and consume them without considering the potential health hazards (Hasriani et al., 2024). Vendors often neglect hygiene and food quality aspects. Unsafe snacks can cause foodborne illnesses. Therefore, the roles of parents, schools, and snack vendors are crucial in ensuring that school snacks are free from biological, chemical, and physical contaminants that may cause health problems.

In 2023, the Food and Drug Supervisory Agency (BPOM) conducted tests on 1,332 samples of School Children's Snack Foods. The results showed that 126 samples (55.75%) did not meet biological safety standards due to contamination with Escherichia coli. Meanwhile, of the 154 noodle and tofu samples tested, 151 samples (98.05%) met the chemical standards, while 3 samples (1.95%) did not, as they contained formalin (BPOM, 2024). Many PJAS vendors pay little attention to hygiene and food safety. This negligence may lead to E. coli contamination. In addition, some vendors use harmful chemicals to reduce production costs and extend shelf life. By lowering production costs, they can offer cheaper prices and thus increase sales (Hasriani et al., 2024). These practices make school snacks unsafe for consumption.

According to the 2023 report from the Palu Food and Drug Supervisory Center (Balai POM Palu), Palu City had the highest frequency of food poisoning cases, totaling 28 incidents (40%), with one case (20%) classified as an Extraordinary Event (KLB-KP). The microbiological agents responsible for these incidents were molds, yeasts, and Staphylococcus aureus. The most common locations of such outbreaks were schools, Islamic boarding schools, and offices/factories (Balai POM Palu, 2024). Consumers' lack of awareness also contributes to the vulnerability of PJAS food safety. This issue is critical because the continuous consumption of unsafe PJAS can negatively impact the health of school children (Pakpahan, Mardhiyah & Putri, 2022). This aligns with the 2023 Indonesian Health Survey (SKI), which found that the main reasons for consuming risky foods and beverages were good taste (96.2%), easy accessibility (91.3%), low price (79.3%), and lack of knowledge about the dangers and risks (43.3%) (BKPK Ministry of Health, 2024).

A solution to the limited knowledge of students about food safety is through School Children's Snack Food Education (PJAS). Knowledge and technology transfer from universities through creative education using e-booklets can enhance students' understanding of which snacks are safe for consumption and reduce the risk of food poisoning and other health problems. One effective way to engage audiences in the digital era is by using digital-based media such as e-booklets. The use of e-booklets in PJAS education can stimulate students' curiosity with concise material and attractive visuals (Setiawan & Akrom, 2020). The choice of e-booklets as an educational medium is due to their accessibility (via laptops or mobile phones) and wide distribution through social media and websites. The main goal of PJAS safety intervention is to ensure the safety of food consumed by students (elementary, junior high, and senior high school levels). In 2023, the Palu Food and Drug Supervisory Center (Balai POM Palu) intervened in 15 schools in Palu City, consisting of 9 elementary schools and 6 junior high schools (Balai POM Palu, 2024). However, no interventions had been carried out in senior high schools, including SMA Negeri 5 Palu, which is located on Jl. R.E. Martadinata, Tondo Subdistrict, Mantikulore District, Palu City. SMA Negeri 5 Palu has 885 active students and 64 teachers.

Due to the lack of parental and teacher supervision regarding students' snack consumption, it is essential to introduce students to PJAS that do not meet safety standards. This community service activity aims to educate students at SMA Negeri 5 Palu about PJAS safety. The program reflects the Faculty of Public Health, Tadulako University's commitment to improving public health by emphasizing preventive efforts to minimize food poisoning cases among school children. Based on this background, the researchers were interested in conducting a study entitled "Food Education on School Children's Snacks Using Creative Learning Media (E-Booklet) to Improve Students' Knowledge at SMA Negeri 5 Palu."

2. Methods

We combined satellite remote sensing with material performance modeling for January 2021-December 2024. Rainfall data from GPM (0.1-degree resolution, daily), SST and chlorophyll- a from MODIS Aqua (4-km resolution, daily) (Hidayah et al., 2024). Data accessed through NASA Earthdata, processed with cloud masking, gap interpolation, and spatial averaging over West Java waters (5-8°S, 105-109°E).

This community service program was carried out through several systematic stages designed to improve students' knowledge and awareness regarding School Children's Snack Foods (PJAS). The implementation steps were as follows:

1. Coordination and Consensus Building. An initial coordination meeting was held with the principal and teachers of SMA Negeri 5 Palu to establish a shared understanding of the objectives, content, and use of the School Children's Snack Food (PJAS) E-Booklet as an educational medium.

2. Pre-Intervention Assessment (Pre-Test). A pre-test was administered prior to the educational intervention to assess participants' baseline knowledge and awareness of PJAS safety within the school environment.
3. Educational Intervention. The knowledge dissemination session consisted of a short interactive lecture delivered by the academic team, followed by an educational game related to PJAS. The session aimed to increase students' understanding of safe snack consumption through participatory and engaging learning methods.
4. Post-Intervention Assessment (Post-Test). A post-test was conducted after the educational session to measure the improvement in students' knowledge and comprehension regarding PJAS safety, compared to the pre-test results.
5. Appreciation and Engagement. Activity Prizes were awarded to students who performed well in the educational game titled "Let's Choose Healthy Snacks" as a form of motivation and appreciation for their active participation. The activity was facilitated by student volunteers involved in the community service program.
6. Distribution of Educational Materials. The PJAS E-Booklet for School Introduction was distributed to students, teachers, and the school administration as a sustainable learning resource to support continued education on snack food safety.

The primary target group of this activity consisted of 50 students from grades X, XI, and XII at SMA Negeri 5 Palu. The school principal and teachers were also involved as secondary participants to reinforce knowledge transfer and behavioral change among students regarding PJAS safety. Furthermore, they are expected to continuously emphasize the importance of choosing safe snacks and to integrate PJAS-related materials into the school's learning activities.

3. Result

The community service activity entitled "Food Education on School Children's Snacks (PJAS) Using Creative Learning Media to Improve Students' Knowledge at SMA Negeri 5 Palu" has been successfully carried out. The activity took place on Monday, August 25, 2025, starting at 08.00 a.m. until completion. The event began with an opening speech delivered by the Principal of SMA Negeri 5 Palu, Drs. Salim, M.M. Prior to the implementation, the organizing team had conducted a coordination meeting with the school management to obtain formal permission for the execution of the activity.

Figure 1. Introduction of the Community Service Team, Faculty of Public Health, Tadulako University

The educational session began with an introduction of the community service team and students from the Faculty of Public Health, Tadulako University (FKM UNTAD) to the participating students and accompanying teachers. This was followed by a pre-test designed to

assess participants' baseline knowledge of the topics to be delivered. The pre- and post-test forms consisted of "true or false" statements and image-matching exercises to evaluate comprehension and visual recognition related to the material. The educational materials presented during the session included the following topics:

1. The Urgency of School Snack Food Safety in Indonesia
2. Types of Food Additives and Food Contaminants
3. Health Impacts of Consuming Unsafe School Snacks (PJAS)
4. Stakeholders Responsible for PJAS Safety
5. The Role of Schools in Implementing PJAS Safety Practices
6. The Role of Food Vendors in Ensuring PJAS Safety
7. Key Principles of Food Safety According to the Food and Drug Supervisory Agency (BPOM)

The material was delivered interactively using a combination of lectures, visual media, and discussions to encourage active student participation and ensure better understanding of the topic.

In addition to the PowerPoint presentation, a video illustrating examples of healthy snacks for children was also used to enhance students' understanding and engagement. The educational session was attended by 50 students and 4 teachers from SMA Negeri 5 Palu, conducted offline in the classroom. The number of participants was intentionally limited to ensure that the session could be carried out effectively and interactively. To build participants' confidence and encourage active involvement, a question-and-answer and quiz session was held after the delivery of the main material. During this session, the quiz was facilitated by students from the Faculty of Public Health, Tadulako University (FKM UNTAD). Participants were asked several questions related to the topics that had been presented. Those who provided correct answers received door prizes that had been prepared beforehand as a form of appreciation for their active participation. This interactive learning approach not only reinforced students' understanding of safe and healthy snacks but also created a positive and enjoyable learning atmosphere that supported the achievement of the program's educational goals.

Figure 2. Presentation of PJAS Educational Material

Figure 3. Door Prize Distribution

At the end of the activity, a post-test was conducted to measure the extent to which the delivered material improved the participants' knowledge. The results of the pre- and post-test analysis involving 50 students are presented in Figure 4. The comparison between pre-test and post-test scores served as an indicator of the effectiveness of the educational intervention in enhancing students' understanding of School Children's Snack Food (PJAS) safety.

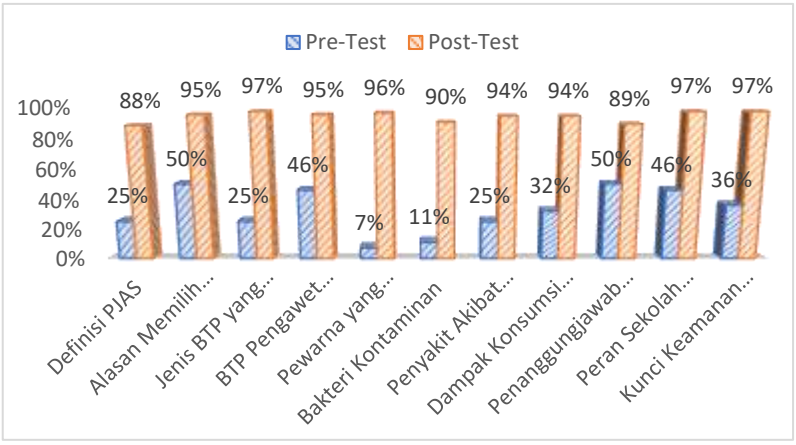

Figure 4. Pre-Test and Post-Test Score Comparison of Students Participating in the PJAS Education Program at School.

Based on the analysis of the pre-test and post-test results, it was found that several questions were already correctly answered by most participants during the pre-test. For instance, in the question related to the reasons for choosing school snacks (PJAS), 25 students (50%) answered correctly before the intervention. After the delivery of educational materials through PowerPoint presentations, the e-booklet, and video demonstrations, the number of correct responses increased significantly to 45 students (95%). Students' knowledge also improved markedly in understanding the types of food colorants that can damage liver function. During the pre-test, only 4 students (7%) answered correctly, whereas after the educational intervention, there was a substantial improvement, with 48 students (96%)

providing correct answers. These results indicate that the use of creative learning media-such as e-booklets, visual presentations, and videos-was effective in enhancing students' comprehension of food safety and their ability to identify unsafe snack ingredients.

4. Discussion

The findings demonstrate that the combination of interactive learning approaches and digital educational media significantly contributed to improving students' engagement and knowledge retention. The e-booklet served as a concise yet comprehensive learning tool that students could easily access and understand, while the use of videos and visual aids helped illustrate real-life examples of safe and unsafe snacks commonly found in school environments. The integration of games and quizzes further reinforced the learning process by encouraging active participation, critical thinking, and peer discussion among students. This aligns with the concept of experiential learning, where students acquire and retain knowledge more effectively through direct involvement and interactive activities rather than passive listening.

The results of this program are consistent with previous studies indicating that health education interventions using digital and participatory media can effectively increase knowledge and promote positive behavioral change among adolescents. Similar findings were reported by Setiawan & Akrom (2020), who found that the use of e-booklets in food safety education enhanced students' awareness and motivation to choose healthy snacks. In the context of this community service program, the significant improvement in students' post-test scores suggests that the applied educational method—combining creative digital media (e-booklet and video) with interactive learning activities—is a promising strategy for promoting food safety education in schools. This approach not only improves students' cognitive understanding but also fosters a sense of responsibility toward maintaining their own health through better food choices.

The education on School Children's Snack Food (PJAS) was carried out to ensure that schools remain free from snacks containing microbiological agents such as Escherichia coli and hazardous chemicals including borax, formalin, methanil yellow, and rhodamine B. This initiative aimed to raise awareness within the school community about implementing food safety principles and practices in the school environment.

The use of e-booklets as a learning medium proved to be highly effective, as they can be accessed anytime and anywhere. The e-booklet provided comprehensive information on the four key principles of PJAS safety, namely: recognizing safe snacks, purchasing safe snacks, reading labels carefully, and maintaining cleanliness (Wulandari et al., 2022).

This finding indicates that the dissemination of PJAS information through PowerPoint presentations, e-booklets, and educational videos was highly effective in increasing students' knowledge and awareness. The use of video-based learning media also contributed to creating a more active classroom atmosphere and improving students' comprehension. With the help of an LCD projector, video-based media fostered an enjoyable learning environment that motivated students to participate actively in class, ultimately enhancing their learning outcomes (Sari, 2023).

Based on the data presented in Figure 4, it can be concluded that educational sessions utilizing visual and video media successfully increased students' understanding of the presented material. This result is consistent with the findings of Malau (2025), who stated that learning media play a crucial role in stimulating interest, motivation, and psychological engagement among students. The use of visual learning tools during the orientation phase helps convey messages effectively and facilitates meaningful learning experiences.

5. Conclusion

Following the implementation of the PJAS Education Program at SMA Negeri 5 Palu, the

results indicated a significant improvement in students' knowledge and understanding of safe and healthy school snacks. The delivery of educational information through video proved to be highly effective in enhancing students' comprehension and engagement throughout the session. It is recommended that similar community service programs (PkM) be conducted regularly for students, particularly focusing on healthy snack consumption. Continuous education on food safety can help prevent foodborne transmission and contamination that may cause illness among students. Sustained collaboration between schools, teachers, and health institutions is essential to ensure that food safety practices become an integral part of students' daily habits and the school's health promotion efforts.

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