

Effectiveness of Pop-up Demonstration and Card Game Methods on Students Balanced Nutrition Knowledge at SMPN 44 Semarang

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ABSTRACT

Background: Nutritional problems among junior high school adolescents in Indonesia remain high due to a lack of knowledge about balanced nutrition, which is caused by suboptimal counseling due to the use of less interactive methods. Modifications to more interactive methods, such as pop-up demonstrations and card games, are needed.

Objectives: To determine the difference in effectiveness between the pop-up demonstration and card game methods in improving students knowledge about balanced nutrition at SMP Negeri 44 Semarang.

Methods: A quantitative method with a true-experimental design of two-group pretest-posttest without control and a proportional stratified random sampling technique. The sample consisted of 64 ninth-grade students, with each group consisting of 32 students. Data analysis used the Wilcoxon test to determine the difference in knowledge before and after the counseling of each method, as well as the Mann-Whitney test to determine the difference in effectiveness of the two methods. The instruments needed for this study are a balanced nutrition tumpeng pop-up, game cards, and a 30-question pretest-posttest questionnaire.

Results: Before the pop-up demonstration method, only 5 (15.6%) of the sample were in the good category, which increased to 20 (62.5%) after the pop-up demonstration method. There was a difference in student knowledge before and after the pop-up demonstration method ($p < 0.001$). Before the card game method, only 7 (21.9%) of the sample were in the good category, which increased to 20 (62.5%) after the card game method. There was a difference in student knowledge before and after the card game method ($p < 0.001$). There was no difference in effectiveness between the pop-up demonstration and card game methods (significance $0.478 > 0.05$). Based on the mean rank, the pop-up demonstration method was more effective.

Conclusion: The pop-up demonstration method and the card game were equally effective in increasing student knowledge.

Keywords: Balanced Nutrition, Card Game, Knowledge, Pop-Up Demonstration, Quality Education

INTRODUCTION

The prevalence of nutritional problems among adolescents aged 13–15 years in Indonesia remains a significant public health concern. According to the Ministry of Health of the Republic of Indonesia (2023), 6.6% of adolescents are classified as very short and 17.5% as stunted based on height-for-age indicators, while 1.9% are categorized as very thin, 5.7% as thin, 12.1% as overweight, and 4.1% as obese based on body mass index-for-age indicators (Ministry of Health of the

Republic of Indonesia, 2023). This is caused by the lack of knowledge of junior high school students regarding balanced nutrition (Aulia, 2021). A study conducted among junior high school students in Indonesia showed that there were 11 students with insufficient energy intake, where 8 students were categorized as having poor nutritional knowledge and 3 students were categorized as having good nutritional knowledge (Aulia, 2021). One factor that causes the lack of knowledge of balanced nutrition is

the less-than-optimal provision of balanced nutrition counseling to junior high school students (Fitriani et al., 2020). The suboptimal delivery of balanced nutrition education is due to the use of methods that are less engaging and less student-centered. To address this, modifications to methods are needed that are engaging, interactive, and involve students, such as pop-up demonstrations and card games (Yulianti et al., 2024).

The pop-up demonstration method of balanced nutrition counseling is a counseling method that demonstrates what balanced nutrition is using pop-up media accompanied by explanations displayed on the pop-up so that it can be understood by counseling participants. The advantage of the pop-up demonstration method is that it can make counseling clearer and more realistic, making it easier to understand and more engaging. Counseling participants will be more focused with this method because they can observe, adjust theory to reality, and can directly practice it themselves (Masturo, Kholisotin, and Agustin, 2020). In addition to its advantages, the pop-up demonstration method also has disadvantages, namely, it requires more thorough preparation, requires adequate and quite expensive equipment, and requires special abilities and skills (Wulandari and Pudjawan, 2019). Besides the pop-up demonstration method, there is another interesting method for junior high school students: the card game method. This method uses cards and then creates a game with the aim of making it more engaging and engaging for participants, thus increasing their interest in participating in the training (Prasetyaningtyas, 2020). A study showed that card game media has a weakness, namely that it requires teacher creativity in delivering the game. So, to overcome this, the cards used and the way to play them should be made as interesting as possible so that students are more interested in paying attention to the material being presented (Suhartining, Fauzia, and Hajar, 2022).

Based on a preliminary study by researchers at SMP Negeri 44 Semarang When April 28, 2025, on 17 students, it was found that 10 students (58.8%) had sufficient knowledge (questionnaire score 60-75%) and 7 other students (41.2%) had good knowledge (questionnaire score >75%). This grouping is based on Arikunto (2016), who stated that results <60% are considered inadequate, 60-75% are considered adequate, and >75% are considered good. SMP Negeri 44 Semarang was selected as the research site for several scientific reasons. Adolescents aged 13–15 years at this school are in a critical growth and development stage, making them an appropriate target for nutrition education interventions. The school also shows good cooperation and support for health-related educational activities, ensuring the feasibility of implementing the research. Moreover, the school's student population represents a diverse urban

adolescent group, making the findings more generalizable to similar educational contexts. Besides that, based on an interview with one of the teachers at SMP Negeri 44 Semarang, it was found that the students only received counseling about balanced nutrition from the community health center once, namely during the School Environment Introduction Period (MPLS). This could be one of the factors that make students knowledge of balanced nutrition less than optimal. Therefore, due to the low level of nutrition knowledge among students and the need for more effective learning media, this study aims to evaluate the effectiveness of pop-up demonstration and card game methods in improving students knowledge of balanced nutrition at SMPN 44 Semarang. This study aimed to determine the increase in students knowledge of balanced nutrition at SMP Negeri 44 Semarang before and after counseling using pop-up enhancement and card games, and to compare the effectiveness of the two methods. It is hoped that after the counseling, students knowledge of balanced nutrition will increase and can be applied in their daily lives to maintain nutritional status and prevent nutritional problems. This study offers novelty by directly comparing the effectiveness of two interactive nutrition education methods demonstration and a card game, in improving adolescents' knowledge of balanced nutrition. While previous research has used similar media separately, comparative studies involving both methods in the same population are still limited. Moreover, this study integrates learning materials based on the Indonesian Balanced Nutrition Guidelines (*Pedoman Gizi Seimbang*) and adapts the intervention to the junior high school context, providing culturally relevant and engaging strategies to enhance nutrition education among adolescents.

METHODS

This type of research is a quantitative research method, true experimental using a two-group pretest-posttest design without control. In this study, balanced nutrition counseling using the pop-up demonstration method and the card game method were included as independent variables, while junior high school students knowledge was included as the dependent variable. The study was conducted at SMP Negeri 44 Semarang. The inclusion criteria for this study were active ninth-grade students of SMP Negeri 44 Semarang; students who were willing to be respondents; students who participated in all stages of the study; and students who were able to read and understand the test instructions well. The exclusion criteria for this study were students who were absent from any stage of the study; students who were sick or had learning disabilities, students who refused or withdrew from the study, and students who did not complete the test seriously. The

pretest was conducted one day before the treatment to determine students' initial knowledge. The treatment was carried out one day in two different groups: the pop-up demonstration group and the card game group. The posttest was conducted seven days after the treatment to measure knowledge retention. The intervention was conducted once a day because the counseling was designed to provide direct information and understanding through demonstrations and card games. A post-test was administered one week after the intervention to assess participants' knowledge retention. The results reflected not only short-term memory but also participants' ability to retain information over time.

The population in this study was class IX students of SMP Negeri 44 Semarang, which consisted of four classes, namely class IX A, IX B, IX C, and IX D, with a total of 128 students (32 students in each class). The selection of ninth-grade students was made because at this level, students have more mature cognitive abilities to understand the concept of balanced nutrition analytically. Furthermore, ninth-grade students have more stable academic readiness and learning discipline, allowing for more controlled intervention implementation and a lower risk of losing respondents. Selecting a single grade level also aimed to maintain homogeneity of participant characteristics, ensuring more consistent and valid knowledge measurement results without being influenced by the still high developmental variation in seventh and eighth grades. A sample of 64 students was obtained from calculations using the Slovin Formula, so that 16 students were taken from each class. The sampling technique used was proportional stratified random sampling. The instruments used were a balanced nutrition tumpeng pop-up, game cards, and a knowledge questionnaire. The balanced nutrition tumpeng pop-up and game cards presented information about balanced

nutrition, starting from the definition of balanced nutrition, balanced nutrition cone, balanced nutrition pillars, balanced nutrition messages, and My Plate Contents. The knowledge questionnaire consisted of 30 multiple-choice questions that were tested for validity and reliability before being administered to the sample. The knowledge questionnaire in this study covered aspects of the definition of balanced nutrition, the pillars of balanced nutrition, the message of balanced nutrition, the contents of my plate, and the balanced nutrition cone. The questionnaire was developed based on the Balanced Nutrition Guidelines and related literature, validated by experts, and then pilot-tested on a group with the same criteria as the sample to ensure clarity and reliability before being used in the study. The validity results show that all questions are valid because the sig value obtained is <0.05 and the reliability results obtained are a Cronbach's alpha coefficient value of $0.758 > 0.60$, meaning reliable. The questionnaire was scored with a score of 1 for correct answers and a score of 0 for incorrect answers. The scores are added up and calculated using the formula of the number of correct answers divided by the total number of questions multiplied by 100%. If the result is $<60\%$ it is considered inadequate, $60-75\%$ is considered adequate, and $>75\%$ is considered good (Arikunto, 2016). This research code of ethics was published by Poltekkes Kemenkes Semarang with number 976/EA/F.XXIII.38/2025. The code of ethics for this research is that the researcher obtains permission from the school, the researcher asks for approval from students through informed consent, student identities are not included in the report and are replaced with initials, student data is only used for research purposes, student participation is voluntary without coercion, and the research provides benefits to students in the form of increased knowledge.



Figure 1. Balanced Nutrition Tumpeng Pop-Up Overview



Figure 2. Game Card Overview

RESULTS AND DISCUSSION

Sample characteristics

The sample size in this study was 64 students, divided into two groups: a pop-up demonstration

group of 32 students and a card game group of 32 students. The sample size comprised ninth-grade students (A, B, C, and D) at SMP Negeri 44 Semarang. The distribution based on sample characteristics is as follows:

Table 1. Sample Characteristics

Characteristics	Pop-up Demonstration		Card Games		Total (%)
	n	(%)	n	(%)	
Age					
13 years old	1	3.1	2	6.3	4.7
14 years old	22	68.8	18	56.3	62.5
15 years old	9	28.1	12	37.5	32.8
Gender					
Male	18	56.3	20	62.5	59.3
Female	14	43.8	12	37.5	40.7

Based on Table 1. sample characteristics, the majority of samples in the pop-up demonstration group were 14 years old, namely 22 samples (68.8%), and the majority of samples in the card game group were 14 years old, namely 18 samples (56.3%), where this age is early adolescence. This is in accordance with the age category of school children by the Ministry of Education and Culture, which states that the age of junior high school students is around 13-15 years (Ministry of Education and Culture, 2018). At this age, early adolescents begin to be able to understand more complex concepts including knowledge about balanced nutrition using the pop-up demonstration method and the card game method as cognitive development according to Jean Piaget's theory (cited in Babullah, 2022) which states that the age of 11 to adulthood is at the formal operational stage where they have begun to think about certain events in a more abstract, idealistic, and logical way (Babullah, 2022). One of the limitations of this study is the unequal age distribution between the intervention groups. The sampling was conducted based on existing class groups, which caused the age composition in each group to follow the original classroom demographics rather than being evenly balanced. Although the majority of participants in both groups were 14 years old, this natural variation may influence individual learning readiness and response to the intervention. Future studies are recommended to use random assignment or stratified sampling to ensure a more balanced age distribution across groups. In addition to age, the characteristics of students that are seen are gender.

Based on the data obtained in Table 1. sample characteristics, the majority of samples in the pop-up demonstration group were male, with a total of 18 samples (56.3%), and the majority of samples in the card game group were male, with a total of 20 samples (62.5%). Nevertheless, this study aims to improve students knowledge of balanced nutrition using the pop-up demonstration method and the card game method regardless of gender. Although gender can influence cognitive development at school age, this study did not differentiate interventions based on gender. The focus of the study was to assess the effectiveness of the pop-up demonstration method and card game in improving knowledge of balanced nutrition among all students. This is a limitation, and it is recommended that future research consider gender-based analysis.

Pretest and posttest distribution of students knowledge of balanced nutrition

The sample's knowledge level was classified into three categories: not enough, enough, and good. Based on the data obtained, the majority of the sample's knowledge before receiving balanced nutrition counseling using the pop-up demonstration and card game methods fell into the adequate category. Meanwhile, after receiving balanced nutrition counseling using the pop-up demonstration and card game methods, the majority of the sample's knowledge fell into the good category. The frequency distribution of pretest and posttest results for students knowledge of balanced nutrition in the pop-up demonstration and card game groups is shown in Table 2, based on the Wilcoxon test:

Table 2. Distribution of the Pretest and Posttest

	n (%)	IK95%
Pretest pop-up demonstration		
Not enough	5 (15.6)	13.6-17.6
Enough	22 (68.8)	67.3-70.3
Good	5 (15.6)	13.6-17.6
Posttest pop-up demonstration		
Not enough	4 (12.5)	10.7-14.3

	n (%)	IK95%
Enough	8 (25.0)	22.8-27.2
Good	20 (62.5)	60.7-64.3
Pretest card games		
Not enough	4 (12.5)	10.7-14.3
Enough	21 (65.6)	63.9-67.3
Good	7 (21.9)	19.7-24.1
Posttest card games		
Not enough	2 (6.3)	4.9-7.7
Enough	10 (31.3)	29-33.6
Good	20 (62.5)	60.7-64.3
Note: IK95%=Confidence Interval 95%, which is the range of statistical values that have 95% confidence to contain the true value of the population parameter being estimated.		

Based on the research data in table 2. distribution of the pretest and posttest, it is known that the majority of the sample's knowledge level before being given the pop-up demonstration method counseling is included in the sufficient category, namely 22 samples (68.8%) and the majority of the sample's knowledge level after being given the pop-up demonstration method is included in the good category, namely 20 samples (62.5%). Before being given the pop-up demonstration method counseling, only 5 samples (15.6%) were included in the good category, then increased to 20 (62.5%) after being given the pop-up demonstration method counseling. Based on this data, it can be concluded that there is an increase in knowledge between before and after counseling with the pop-up demonstration method. The results of this study are in line with research conducted by Masturo, Kholisotin and Agustin, 2020, which shows that the majority of respondents knowledge level before the demonstration method counseling is in the sufficient category, with a total of 24 samples, and after the demonstration method counseling, the majority of respondents' knowledge level is in the good category, with a total of 38 samples. Before being given counseling using the demonstration method, only 12 respondents were included in the good category; then, this increased to 38 samples after being given counseling using the demonstration method.

Based on the research data in table 2. distribution of the pretest and posttest, it is known that the majority of the sample's knowledge level before being given counseling on the card game method is included in the sufficient category, namely 21 samples (65.6%), and the majority of the sample's knowledge level after being given the card game method is included in the good category, namely 20 samples (62.5%). Before being given counseling on the card game method, only 7 samples (21.9%) were included in the good category, then increased to 20 (62.5%) after being given counseling on the card game method. Based on these data, it can be concluded that there is an increase in knowledge between before and after counseling with the card

game method. The results of this study are in line with research conducted by Sari, Purnamasari and Rahmah, 2025 which shows that there was an increase in knowledge score from 16 to 20 after being given nutrition education with 'Gemar Bingo Card' with a p-value <0.001.

Knowledge of balanced nutrition is knowledge about food and nutrients, sources of nutrients contained in food, safe food for consumption, and how to process food properly. A person's level of nutritional knowledge will influence attitudes and behavior, especially in food selection, which ultimately impacts a person's nutritional status and eating habits. Inadequate knowledge of balanced nutrition, a lack of understanding of good eating habits, and the contribution of nutrients from food can lead to problems with intelligence and productivity (Intantiyana, Widajanti and Rahfiludin, 2018). Inadequate nutritional knowledge can be caused by a lack of exposure to information. In this study, the majority of the sample had a sufficient level of knowledge before receiving counseling, and the majority had a good level of knowledge after receiving counseling using either the pop-up demonstration method or the card game method. This is in line with research by (Latif, Haniarti and Muin, 2018), which shows that providing appropriate information, such as using appropriate counseling methods, can improve students' knowledge.

Differences in students knowledge of balanced nutrition before and after the balanced nutrition counseling

The Wilcoxon test was used to determine differences in students knowledge of balanced nutrition before and after the counseling. A significant value of $0.000 < 0.05$ indicates a difference in students knowledge of balanced nutrition before and after the balanced nutrition counseling. The results of the Wilcoxon test analysis are shown in the table 3:

Table 3. Results of the Wilcoxon Test

	n	%	Sig. value
Knowledge after-knowledge before (pop-up demonstration group)	1 ^a	3.1	<0.001
	17 ^b	53.1	
	14 ^c	43.8	
Knowledge after-knowledge before (card games group)	1 ^a	3.1	0.001
	14 ^b	43.8	
	17 ^c	53.1	

- a. Knowledge after<knowledge before
- b. Knowledge after>knowledge before
- c. Knowledge after=knowledge before

Based at table 3, the results of the Wilcoxon test at a level of 5% or 0.05 and a confidence level of 95%, show the results that students knowledge of balanced nutrition between before and after counseling using the pop-up demonstration method obtained a sig. $0.000 < 0.05$, which means there is a difference in students knowledge of balanced nutrition between before and after counseling using the pop-up demonstration method. There is 1 sample with knowledge before better than after counseling, 17 samples with knowledge after counseling improved to be better, and 14 samples with knowledge before and after counseling remained the same. This confirms that the pop-up demonstration method is effective in improving students knowledge of balanced nutrition. These results are in line with the research of Tasya and Sunarti (2020), which shows that there is an effect of pop-up books on balanced nutrition on the knowledge of students in the experimental group before and after treatment, with a significant effect. $0.000 < 0.05$, where 0 students with knowledge after health education are lower than before health education, 22 students with knowledge better than before health education, and 20 students with knowledge unchanged from before health education (Tasya and Sunarti, 2020).

This increase in knowledge is supported by the characteristics of the pop-up demonstration method, which involves visual aids designed to be as attractive and interactive as possible, making it easier for students to understand the material presented in the pop-up. From a theoretical perspective, visual media can provide a different and more engaging atmosphere because there is tangible evidence that can be seen, so it can provide positive changes, namely, increasing understanding and strengthening memory regarding the material presented (Hulu et al., 2022). Thus, it can be concluded that balanced nutrition counseling using the pop-up demonstration method is effective in increasing students knowledge about balanced nutrition, which is expected to be the foundation for forming attitudes and behaviors to implement balanced nutrition in everyday life.

Based on table 3, the results of the Wilcoxon test with a level of 5% or 0.05 and a confidence level of 95%, show the results that students knowledge of balanced nutrition between before and after

counseling using the card game method obtained $p=0.001$, which means there is a difference in students knowledge of balanced nutrition between before and after counseling using the card game method. There is 1 sample with knowledge before better than after counseling, 14 samples with knowledge after counseling improved to be better, and 17 samples with knowledge before and after counseling remained the same. Although those who experienced an increase were fewer than those who remained the same, card games were still effective in improving students knowledge of balanced nutrition because after being tested with the Wilcoxon test, a sig. $0.001 < 0.05$ was obtained, which means there was a difference between knowledge before and after counseling using the card game method. This is in line with the research of (Damayanti and Rahma, 2025). There is a significant difference between the results of the pretest and posttest with a sig. $0.000 < 0.05$, where there was an increase in knowledge from 75% in the pretest to 95% in the posttest after education with the Nutricard game.

This increase in knowledge is supported by the characteristics of the card game method, which involves interactive and fun elements so that students can be more actively involved, not feel bored, and are motivated to participate in counseling. If viewed from the theory, effective counseling is counseling that is carried out interactively, provides inspiration, is fun, motivates to be actively involved, and provides opportunities for creativity and independence according to talents and interests (Alawiyah, 2017). The game method is a method that utilizes games designed to achieve counseling objectives so as to increase understanding of the material presented (Maulidina, Susilarningsih and Abidin, 2018). Thus, it can be concluded that balanced nutrition counseling using the card game method is effective in increasing students knowledge about balanced nutrition, which is expected to be the foundation in forming attitudes and behaviors to apply balanced nutrition in everyday life.

The difference in effectiveness of the pop-up demonstration method and the card game method in increasing students knowledge of balanced nutrition at SMP Negeri 44 Semarang

The analysis used to determine the difference in effectiveness of the pop-up demonstration method and the card game method in increasing the knowledge of balanced nutrition of students at SMP Negeri 44 Semarang is the Mann-Whitney test. To

determine which is more effective between the pop-up demonstration method and the card game method in increasing the knowledge of balanced nutrition of junior high school students, it can be seen by looking at the output results of the mean rank section. If the value is greater, then that method has a higher ranking. In other words, it is more effective in increasing the knowledge of balanced nutrition among junior high school students.

Table 4. Mann-Whitney Test Results

	n	Mean Rank	Sig. value
Category changes			
Pop-up demonstration	32	33.95	0.478
Card games	32	31.05	
Total	64		

Mean rank is not a post-test score. It is a value used in non-parametric tests, especially Mann-Whitney U Test or Wilcoxon Signed Rank Test, when the data are not normally distributed.

Based on the results of bivariate analysis using the Mann-Whitney test with a level of 5% or 0.05 and a confidence level of 95% at table 4, Mann-Whitney test results, obtained a sig. value of 0.478, which means there is no difference in effectiveness between counseling using the pop-up demonstration method and card games. However, when viewed from the mean rank, the pop-up demonstration method shows higher effectiveness than the card game method because the mean rank value of the pop-up demonstration method is greater, namely 33.95, while the value of the card game method is 31.05. This difference in mean rank values indicates that the increase in knowledge of students in the group who received counseling with the pop-up demonstration method is higher than the group who received counseling with the card game method. Although the difference is not statistically significant, this trend should still be considered. The pop-up demonstration method can present information visually with attractive and interactive images and colors, so that it can help students better understand the balanced nutrition material, while the card game method creates a fun and interactive atmosphere so that students can understand the material while playing and not get bored, even though it is less in-depth in conveying information. The results of the study showed no difference in effectiveness between the compaction method and the card game in improving students knowledge. This lack of significance indicates that both methods have the same ability to facilitate understanding of the concept of balanced nutrition. This is likely due to the similar material presented and the interactive nature of both methods, which actively engaged students during the counseling process. The homogeneity of participant characteristics in grade IX also contributed to the equality of learning responses, resulting in relatively comparable increases in knowledge in both groups.

Thus, it can be concluded that both methods are equally effective in improving students knowledge of balanced nutrition. These results are in line with research by (Suharni et al., 2025), who stated there is a significant influence between knowledge before and after the balanced nutrition demonstration in adolescents in coastal and inland areas. In addition, based on research by (Afra, Sitoayu and Melani, 2021), the card game method can also improve students knowledge about balanced nutrition. These two methods can be an effective choice for providing balanced nutrition counseling to students so that students can understand the material presented and apply balanced nutrition in their daily lives.

The selection of counseling methods can be adjusted to the characteristics of the students or counseling participants. Furthermore, counseling methods can also be combined with each other, either method by method or method by media, to be more effective, such as the pop-up demonstration method with the card game method, the card game method with the lecture method, the lecture method and audiovisual media, and so on. This is in line with research conducted by (Hartanti, 2021), which showed differences in knowledge and attitude scores in subjects before and after an intervention in the form of nutrition education on stunting prevention through a lecture method combined with audiovisual media. Furthermore, there is also research by (Ifroh and Permana, 2021) which combined the game method with the demonstration method and obtained a p-value <0.001, meaning there was a difference in knowledge before and after the intervention, indicating that this combination of methods is effective in increasing knowledge. In addition, there is also research conducted by (Aria and Archer, 2018), which shows that educational videos and face-to-face education are equally effective in introducing and educating outpatients at St. Michael's Hospital in Toronto, Canada, who suffer

from at least one type of chronic disease about the function of the system.

The limitations of this study are that the knowledge measurement period was carried out on D+7 after the treatment so that it has the potential to cause recall bias because the sample may forget some of the material or get additional information outside the treatment and the absence of a control group so that it can cause difficulties in determining whether changes in knowledge are purely due to the treatment or due to other factors such as discussions with friends or internet access that can affect the measurement results. In addition, this study also has advantages, namely the use of a true experimental design that has a high level of validity because the group division is done randomly, so the results obtained are more reliable and this study compares two innovative balanced nutrition counseling methods, namely pop-up demonstrations and card games, which are appropriate to the characteristics of junior high school students because they are visual, interactive, and fun.

Based on the results of the research that has been conducted, the author provides the following suggestions: students of SMP Negeri 44 Semarang are expected to be able to apply knowledge about balanced nutrition in everyday life; the school is expected to utilize interactive and effective learning methods such as pop-up demonstration methods and card games in nutrition counseling activities and other learning; health workers are expected to provide balanced nutrition counseling with interesting and interactive methods, either through pop-up demonstrations, card games, or a combination with other educational media to increase the effectiveness of material delivery; and further researchers are expected to use this research as a reference and develop more diverse and innovative counseling methods in subsequent research.

CONCLUSION

Based on the results of the research that has been conducted, the following conclusions can be drawn: there is a difference in the knowledge of balanced nutrition of students of SMP Negeri 44 Semarang between before and after balanced nutrition counseling using the pop-up demonstration method. There was a difference in the knowledge of balanced nutrition of students of SMP Negeri 44 Semarang between before and after the balanced nutrition counseling using the card game method. There was no difference in the effectiveness of the pop-up demonstration method and the card game method in increasing students knowledge of balanced nutrition at SMP Negeri 44 Semarang. However, based on the mean rank value, the pop-up demonstration method was higher, so the pop-up demonstration method was more effective than the

card game method, although the difference was small.

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None

Author Contributions

VMN: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; resources; software; validation; visualization; roles/writing-original draft; PK: Conceptualization; methodology; supervision; validation; writing-review and editing; FAM: Conceptualization; methodology; supervision; validation; writing-review and editing.

REFERENCES

- Afra, G., Sitoayu, L. and Melani, V. (2021) 'The Effect of the Nutrition Card Game on Changes in Knowledges and Attitudes of Nutrition in Elementary School Students', *JGK*, 13, pp. 1–9. doi: 10.35473/jgk.v13i1.82.
- Alawiyah, F. (2017) 'National Standards for Primary and Secondary Education', *Aspirasi*, 8, pp. 81–92.
- Aria, R. and Archer, N. (2018) 'Using an Educational Video vs. In-person Education to Measure Patient Perceptions of an Online Self-Management Support System for Chronic Illness', *Computers in Human Behavior*, pp. 1–20. doi: 10.1016/j.chb.2018.01.041.
- Arikunto, S. (2016) *Research Procedures: A Practical Approach*. Jakarta: Rineka Cipta.
- Aulia, N. (2021) 'The Role of Nutrition Knowledge on Energy Intake, Nutritional Status, and Attitudes about Nutrition in Adolescents', *Scientific Journal of Nutrition and Health (JIGK)*, 02, pp. 31–35. doi: 10.46772/jigk.v2i02.454.
- Babullah, R. (2022) 'Jean Piaget's Theory of

- Cognitive Development and Its Application in Learning', *Epistemic: Scientific Journal of Education*, 1, pp. 131–152. doi: 10.70287/epistemic.v1i2.10.
- Damayanti, A. and Rahma, A. (2025) 'The Effect of Nutricard Educational Games in Increasing Adolescent Awareness of Balanced Nutrition at UPT SMP Negeri 34 Gresik', *Journal of Nutrition and Health (JGK)*, 5, pp. 54–61. doi: 10.36086/jgk.v5i1.2893.
- Fitriani, R. et al. (2020) 'The Relationship between Knowledge of Balanced Nutrition, Body Image, Energy and Macronutrient Adequacy Levels with Nutritional Status in Students', *Gorontalo Journal Health and Science Community*, 4, pp. 29–38. doi: 10.35971/gojhes.v4i1.5041.
- Hartanti, D. (2021) 'The Effectiveness of Nutrition Education with Lecture and Audio Visual Methods on Knowledge and Attitudes about Stunting Prevention in Premarital Women of Childbearing Age', *Nutri-Sains: Journal of Nutrition, Food, and Its Applications*, 5, pp. 15–26. doi: 10.21580/ns.2021.5.1.6452.
- Hulu, D. et al. (2022) 'The Effect of Visual Media Use on Student Learning Outcomes', *Journal of Citizenship*, 6, pp. 2580–2586.
- Ifroh, R. and Permana, L. (2021) 'Combination of Game and Demonstration Methods in Improving Mothers' Knowledge about Stunting', *Scientific Journal of Public Health*, 13, pp. 1–6. doi: 10.52022/jikm.v13i1.124.
- Intantiyana, M., Widajanti, L. and Rahfiludin, M. (2018) 'The Relationship between Body Image, Physical Activity, and Knowledge of Balanced Nutrition with the Incidence of Obesity in Overnourished Female Adolescents at SMA Negeri 9 Semarang City', *Journal of Public Health*, 6, pp. 404–412. doi: 10.14710/jkm.v6i5.22064.
- Latif, R., Haniarti and Muin, H. (2018) 'The Influence of Poster and Leaflet Media on the Level of Knowledge and Attitude of Snack Food Consumption of Junior High School Students of Patampanua Pinrang', *Journal of Human and Health Sciences*, 1, pp. 272–279. doi: 10.31850/makes.v1i3.113.
- Masturo, Kholisotin and Agustin, Y. (2020) 'Effectiveness of Health Counseling on BSE with Group Discussion Method and Demonstration Method on WUS Behavior in performing BSE', *Citra Delima: Scientific Journal of STIKES Citra Delima Bangka Belitung*, 3, pp. 141–154. doi: 10.33862/citradelima.v3i2.86.
- Maulidina, M., Susilaningsih and Abidin, Z. (2018) 'Development of Game Based Learning Based on Scientific Approach for Fourth Grade Elementary School Students', *Jinotep*, 4, pp. 113–118.
- Ministry of Education and Culture (2018) *Ministry of Education and Culture Encourages Regional Governments to Implement Increasingly Accountable and Non-Discriminatory PPDB*.
- Ministry of Health of the Republic of Indonesia (2023) *Indonesian Health Survey (SKI) 2023: Executive Summary*. Jakarta: Health Development Policy Agency.
- Prasetyaningtyas, S. (2020) 'Application of the Quartet Card Game Method to Improve Learning Achievement and Learning Activeness in the Classification of Living Things Material for Class VII of SMP N 1 Semin', *Ideguru Journal*, 5, pp. 100–108. doi: 10.51169/ideguru.v5i1.118.
- Sari, V., Purnamasari, D. and Rahmah, H. (2025) 'The Effect of Balanced Nutrition Education with "Gemar Bingo Card" on Balanced Nutrition Knowledge and Junk Food Consumption Patterns in Overweight Adolescents', *Journal of Food and Nutrition Research*, 07, pp. 29–37.
- Suharni et al. (2025) 'Differences in the Influence of Demonstrations on Knowledge, Attitudes, and Balanced Nutritional Behavior of Coastal and Mainland Adolescents', *Husada Gemilang Health Journal*, 8, pp. 43–50. doi: 10.61129/jkhg.v8i1.113.
- Suhartining, Fauzia, W. and Hajar, R. (2022) 'Early Childhood Language Development and Children's Language Play Practices', *At-Thufuly: Journal of Early Childhood Education*, 2, pp. 98–103. doi: 10.37812/atthufuly.v2i2.584.
- Tasya, H. and Sunarti, S. (2020) 'The Influence of Pop Up Book Media on Knowledge and Attitudes about Balanced Nutrition in Fifth Grade Students at SDN 001 Samarinda Seberang', *Borneo Student Research*, 1, pp. 1268–1273.
- Wulandari, N. and Pudjawan, K. (2019) 'Implementation of Demonstration Method through Stringing Activities to Improve Fine Motor Development', *Scientific Journal of Teacher Professional Education*, 2, pp. 290–297. doi: 10.23887/jippg.v2i3.15716.
- Yulianti, N. et al. (2024) 'Healthy Living and Balanced Diet Counseling for Students', *Wahana Dedication: Journal of PKM Educational Sciences*, 7, pp. 259–266. doi: 10.31851/wdk.v7i2.16865.