THE EFFECT OF NUTRITION EDUCATION WITH PUZZLE GAMES ON KNOWLEDGE AND ATTITUDES ABOUT VEGETABLES AND FRUIT AT PUBLIC ELEMENTARY SCHOOL KERTAJAYA 1 SURABAYA

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Abstract. Background, One of the causes of insufficient vegetable and fruit consumption is the lack of knowledge and attitude. The lower the knowledge and attitude of school children, the more it affects the lack of vegetable and fruit consumption. According to the Riskesdas report (2018), as many as 93.4% of Indonesians aged ≥5 years fall into the category of low consumption of vegetables and fruits. Objective, to determine the influence before and after being educated through puzzle media about vegetables and fruits on school children at Public Elementary School Kertajaya 1 Surabaya. Methods, Quasi Experimental with One Group Pretest-Post-test Design approach. The sample consists of 57 individuals. The collected data are pre-test and post-test questionnaires on knowledge and attitudes. Statistical tests used the Wilcoxon Signed Rank Test. Results, The research findings show a difference before and after being educated in nutrition through puzzle media regarding knowledge and attitudes about vegetables and fruits with a p value of 0.000 ($p<0.05$). The average knowledge and attitude scores of students increased after education by 19.22 and 18.93, respectively. Conclusion, There is an influence of education through puzzle media on knowledge and attitudes after being educated about vegetables and fruits among students in grades 3, 4, and 5 at Public Elementary School Kertajaya 1 Surabaya. Suggestions, Puzzle media should be considered for future educational use to enhance students' knowledge and attitudes.

Keywords: Vegetables and Fruits, Nutrition Education, Puzzle Media, Knowledge, Attitude

1 BACKGROUND

Elementary school children refer to individuals who are in the age range of 6 to 12 years old, scientifically referred to as the period of intellectual development (Rosaria and Novika, 2018). This age group undergoes various changes in growth and development that impact how their characteristics and personalities evolve (Diyanti et al, 2015). Just as school-age children will grow faster, increase in height, and have greater nutritional needs compared to children below this age (Istiany, 2013).

Over time, children's knowledge will grow rapidly, and their skills will become diverse (Heng, 2018) (Wolff et al., 2020) (Masykuroh et al, 2022).The insufficient consumption of fruits and vegetables in school children's meals must be taken into consideration, as it can lead to inadequate micronutrient intake (Kemenkes RI, 2017) (Mitsopoulou et al., 2020) (Molina‐López et al., 2021). This event signifies that improving nutrition understanding among elementary school children is positively associated with their habits of consuming vegetables and fruits (IHBOUR et al, 2022) (Mohammad and Madanijah, 2015) (Ober et al, 2021).

Based on the Riskesdas report (2018), the majority of Indonesia's population aged at least 5 years or older, 95.5%, is classified as deficient in fruit and vegetable consumption. Results from the Riskesdas (2018) data also show that in East Java

Province, the proportion of the population aged ≥5 years who were deficient in fruit and vegetable consumption was 95.3% in 2013, but this figure decreased to 93.4%. In children aged ≥5 years in Surabaya District who consumed fruits and vegetables from the proportion of eating 1-2 servings per day 62.44%, 3-4 servings per day 20.66% and 5 or more servings per day 4.66%. The high prevalence of children ≥5 years old who consume less fruits and vegetables indicates a problem that needs more serious attention.

One of the causes of the lack of consumption of vegetables and fruits is lack of knowledge and attitudes, the lower the knowledge and attitudes of school children, the less the consumption of vegetables and fruits (Vittrup & McClure, 2018) (Mahmudiono et al., 2020) (Surijati et al, 2021). Efforts that can be made are by providing nutrition education (Citra et al, 2018). The nutrition education approach is a tool that aims to explore the potential of individuals to improve or maintain optimal nutritional status(Abu-Baker et al., 2021) (Salam et al., 2020) (Notoadmojo, 2014). The use of puzzles in education has significant benefits in increasing interest in learning, sharpening memory, developing cognitive abilities, training psychomotor skills, and training critical thinking in solving problems (Rosliyana, 2020) (Gorev et al., 2018) (Nazeer et al., 2018). Therefore, this media is commonly used as an effective tool in improving the understanding and attitude of students at the primary school level towards the subject matter studied (Silmi and Kusmari, 2017).

Based on preliminary studies conducted at Public Elementary School Kertajaya 1 Surabaya on grade 4 students as many as 20 people, it shows that the level of knowledge of vegetables and fruit is 15% in the good category, 25% in the enough category and 60% in the less category. Then the level of attitude to vegetables and fruit was 50% in the good category and 50% in the less category. Based on the background that has been discussed, researchers want to examine “The Effect of Nutrition Education with Puzzle Games on Knowledge and Attitudes about Vegetables and Fruits at Public Elementary School Kertajaya 1 Surabaya".

2 RESEARCH METHODS

The research employed a quasi-experimental design utilizing the One Group Pretest-Posttest approach. The study was conducted from December 2022 to March 2023 at Kertajaya 1 Public Elementary School in Surabaya. The research population consisted of all students in grades 3, 4, and 5 at Kertajaya 1 Public Elementary School, totaling 131 individuals. The sample size was determined using the Slovin formula, resulting in a total sample size of 57 students. The sampling technique used was Proportional Random Sampling, resulting in 14 students from grade 3, 19 students from grade 4, and 24 students from grade 5.

There are 2 stages in this research, the first stage is the planning phase, which includes obtaining research permission from the principal of Public Elementary School Kertajaya 1 Surabaya, developing knowledge and attitude questionnaires, creating

puzzle media covering characteristics, types, benefits, content, consumption recommendations, and the impacts of inadequate consumption of vegetables and fruits. Next, determining the research population and sample, as well as selecting and training 3 facilitators.

As for the second stage, the implementation phase involves conducting pre-tests for knowledge and attitudes, nutrition education using puzzle media in Phase I conducted during the first week for 30 minutes, followed by providing nutrition education using puzzle media in Phase II carried out during the second week for 30 minutes. This stage also includes conducting post-tests for knowledge and attitudes, data analysis, and report preparation.

Data collection was conducted directly through interviews using the knowledge and attitude questionnaire before and after nutrition education through puzzle media. After data collection, the knowledge level was assessed based on total score categories: less if the score was <56, enough if the score was 56 - 75, and good if the score was 76 – 100 (Arikunto, 2013). Meanwhile, attitude level assessment was based on total score categories: less if the score was ≤50, and good if the score was ≥50 (Sumaryo, 2013).

The data obtained were then processed and analyzed using the SPSS application on a computer. Univariate analysis was presented in the form of frequency distribution and percentage results for each studied variable. Meanwhile, bivariate analysis used the Wilcoxon signed-rank test. This test aimed to observe the differences before and after nutrition education using puzzle media regarding vegetables and fruits.

3 RESULT

Based on the data obtained in the study, the results obtained regarding the characteristics of respondents based on age and gender, the results of measuring knowledge and attitudes before and after being given education using puzzle media, as well as differences in the level of knowledge and attitudes before and after being given education using puzzle media.

Table 1. Frequency Distribution of Age among students in Grades 3, 4, and 5 at Public Elementary School Kertajaya 1 Surabaya in 2023

Age	N	Percentage (%)
8	1	2
9	19	33
10	14	25
11	23	40
Total	**57**	**100**

Source: Primary Data, 2023

Based on table 1, shows that the majority of respondents aged 11 years were 23 students (40%), while the smallest respondent was 8 years old as many as 1 student (2%).

Table 2. Frequency Distribution of Gender among Students in Grades 3, 4, and 5 at Public Elementary School Kertajaya 1 Surabaya in 2023

Gender	n	Percentage (%)
Male	28	49,1
Female	29	50,9
Total	**57**	**100**

Source: Primary Data, 2023

Based on table 2, shows that the number of male respondents is 28 students (49,1%), while female respondents amount to 29 students (50,9%).

Table 3. The Results of Measuring Knowledge Before and After being given Education through Puzzle Media about Vegetables and Fruits for Students in Grades 3, 4, and 5 at Public Elementary School Kertajaya 1 Surabaya

Knowledge	Before		After	
	n	%	n	%
Less	17	29,8	1	2
Enough	25	43,9	9	16
Good	15	26,3	47	82
Total	**57**	**100**	**57**	**100**

Source: Primary Data, 2023

Based on table 3, shows that the results of measuring students' knowledge before getting education through puzzle media obtained results of 15 students (26,3%) have a good category knowledge level, while 25 students (43,9%) have a enough category knowledge level. The results of measuring knowledge after providing education through puzzle media obtained results of 47 students (82%) had a good level of knowledge category, while 9 students (16%) had enough level of knowledge category.

Table 4. The Results of Measuring Attitude Before and After being given Education through Puzzle Media about Vegetables and Fruits for Students in Grades 3, 4, and 5 at Public Elementary School Kertajaya 1 Surabaya

Knowledge	Before		After	
	n	%	n	%
Less	30	52,6	0	0
Good	27	47,4	57	100
Total	**57**	**100**	**57**	**100**

Source: Primary Data, 2023

Based on table 4, shows that the results of measuring students' attitudes before getting education through puzzle media obtained results of 27 students (47,4%) have a good category attitude level, while 30 students (52,6%) have a less category attitude level. The results of measuring attitudes after providing education obtained results of 57 students (100%) have a good category attitude level.

Table 5. Differences in Knowledge levels Before and After being given Education through Puzzle Media about Vegetables and Fruits for Students in Grades 3, 4, and 5 at Public Elementary School Kertajaya 1 Surabaya

Attitude score	n	Minimum	Maximum	Average	p-value
Before	57	40	95	67,11	0,000
After	57	35	100	86,33	

Source : Primary Data, 2023

Based on table 5, shows the average value of knowledge of 57 students before they were given education through puzzle media was 67,11. Meanwhile, after being given education through puzzle media, the average value of student knowledge has increased to 86,33. Statistical tests were carried out using the Wilcoxon test, obtained a value of p = 0.000, which means p <0.05. This shows that there are differences before and after being given nutrition education using puzzle media related to knowledge about vegetables and fruits in grades 3, 4, and 5 at Public Elementary School Kertajaya 1 Surabaya.

Table 6. Differences in Attitude levels Before and After being given Education through Puzzle Media about Vegetables and Fruits for Students in Grades 3, 4, and 5 at Public Elementary School Kertajaya 1 Surabaya

Attitude score	n	Minimum	Maximum	Average	p-value
Before	57	24	72	47,75	0,000
After	57	53	79	66,68	

Source: Primary Data, 2023

Based on table 6, shows the average attitude value of 57 students before they were given education through puzzle media was 47,75. Meanwhile, after being given education through puzzle media, the average value of student attitudes has increased to 66,68. Statistical tests were carried out using the Wilcoxon test, obtained a value of p = 0.000, which means p <0.05. This shows that there are differences before and after being given nutrition education using puzzle media related to attitudes about vegetables and fruits in grades 3, 4, and 5 at Public Elementary School Kertajaya 1 Surabaya.

4 DISCUSSION

Respondents involved in the study were students aged 8-11 years. This age is the time when children have gained basic knowledge in determining success so that they are able to carry out communication and cooperate well in improving their knowledge and attitudes (Agusniatih and Manopah, 2019). In addition, the respondents involved in the study consisted of male and female students. The existence of this gender, both men and women, plays an important role in carrying out the research process to improve knowledge and attitudes evenly.

The results of knowledge measurement have increased after being given education using puzzle media about vegetables and fruits. This finding is in accordance with the research of Sharps, Thomas, and Blissett (2020). The use of visual media that shows pictures of healthy foods such as vegetables and fruits, has been proven effective as an effort to increase knowledge related to vegetable and fruit consumption (Sharps et al, 2020). This increase in knowledge occurs because the learning process requires the help of tools if there is no media, then learning is less effective so that many students feel bored and uncomfortable which can make learning will tend to produce one-way and monotonous interactions (Salsabila et al, 2020).

The results of attitude measurements have increased after being given education using puzzle media about vegetables and fruits. This finding is in accordance with the research of Kim et al (2019), elementary school children need nutrition education because nutrition education provided to children has been shown to change their knowledge and attitudes regarding food consumed. Students' attitudes have increased because nutrition education effectively increases children's understanding of vegetables

and fruits, where this knowledge can affect attitudes and practices of balanced nutrition, especially vegetables and fruits in daily life (Ladiba et al, 2021).

Based on the research conducted, the average value of knowledge of 57 students before they were given education using puzzle media was 67.11. After being given education using puzzle media, it increased to 86.33. The results of the Wilcoxon test obtained a value of $p = 0.000$ which means $p < 0.05$. This shows that there are differences before and after being given nutrition education using puzzle media on the level of knowledge about vegetables and fruits where there is a significant increase in student knowledge before and after being given education using puzzle media about vegetables and fruits.

This finding is in accordance with the research of Wiena Arynda (2017), showing a difference in knowledge indicated by a p-value of 0.000 or $p < 0.05$, which means that there is a significant difference before and after counseling through puzzle game media. education is able to increase the level of individual knowledge. Implementation of increased health education programs, especially in the field of nutrition in elementary school children, can be used as a step to implement health interventions as a whole (De Villiers et al, 2016). The existence of differences in knowledge between before and after being given education through puzzle media shows that students become more understanding and feel happy so that they are able to feel joy while learning, which in turn can indirectly stimulate their brain development (Mariyaningsih and Hidayati, 2018)

Based on the research conducted, the average attitude value of 57 students before they were given education using puzzle media was 47.75. After being given education using puzzle media, it has increased, the average value is 66.68. The results of the Wilcoxon test obtained a value of $p = 0.000$ which means $p < 0.05$. This shows that there are differences before and after being given nutrition education using puzzle media on the level of attitude about vegetables and fruits where there is a significant increase in the attitude of students before and after being given education using puzzle media about vegetables and fruits.

This finding is in accordance with the research of Kharina Azmi (2021), explaining the effect of education using puzzle media on the attitudes of elementary school children regarding vegetables and fruits (p value = <0.05) (Kharina, 2021). Providing nutrition education through puzzle media on changes in student attitudes has a significant role in triggering an increase in positive attitudes and changes. This happens because puzzle media has a fun nature, is able to broaden horizons, and increase motivation and enthusiasm for learning.

5 CONCLUSION

Based on the above research, the average value after being given education for students in grades 3, 4, and 5 of Public Elementary School Kertajaya 1 Surabaya has

increased in knowledge by 19.22 while the average attitude value has increased by 18.93. The results showed that there was an effect of education using puzzle media on knowledge and attitudes about vegetables and fruits, meaning that there was a difference in the level of knowledge before and after being given nutrition education through puzzle media about vegetables and fruits in grades 3, 4, and 5 at Public Elementary School Kertajaya 1 Surabaya with a p value = 0.000 ($p < 0.05$).

6 REFERENCES

Abu-Baker, N. N., Eyadat, A. M., & Khamaiseh, A. M. (2021). The impact of nutrition education on knowledge, attitude, and practice regarding iron deficiency anemia among female adolescent students in Jordan. *Heliyon*, *7*(2).

Agusniatih, A., & Manopa, J. M. (2019). Keterampilan sosial anak usia dini: teori dan metode pengembangan. Edu Publisher.

Arikunto S (2013) Suatu Pendekatan Praktik. Jakarta: Rineka Cipata

Arynda W, Rosmida M Marbun (2017) Improving The Knowledge Of Primary School Children On Fourth Grade Stundents About Vegetables And Fruits And Attraction Of Puzzle Media In Sdn Mekarjaya I. Sanitas J Teknol Dan Seni Kesehat 08:114–122

Citra Palupi K, Sa'pang M, Swasmilaksmita PD (2018) Edukasi Gizi Seimbang Pada Anak Sekolah Dasar Di Kecamatan Cilincing Jakarta Utara. J Abdimas 5:49–53

De Villiers A, Steyn NP, Draper CE, Et Al (2016) Primary School Children's Nutrition Knowledge, Self-Efficacy, And Behavior, After A Three-Year Healthy Lifestyle Intervention (Healthkick).

Diyanti NK, Niluh P, Sagung LM (2015) Hubungan Karakteristik Dan kepribadian Anak Dengan Kejadian Bullying Pada Siswa Kelas Vdi SD"X" Di Kabupaten Badung. Fak Kedokt Univ Udayana Denpasar

Gorev, P. M., Telegina, N. V, Karavanova, L. Z., & Feshina, S. S. (2018). Puzzles as a didactic tool for development of mathematical abilities of junior schoolchildren in basic and additional mathematical education. *EURASIA Journal of Mathematics, Science and Technology Education*, *14*(10), em1602.

Heng, T. T. (2018). Different is not deficient: Contradicting stereotypes of Chinese international students in US higher education. *Studies in Higher Education*, *43*(1), 22–36.

IHBOUR, S., CHAOUI, B., ANARGHOU, H., CHAHBI, H., BOUTAHAR, K., CHIGR, F., & NAJIMI, M. (2022). Links Between Eating Habits, Cognitive Skills Associated with Learning to Read, and Academic Achievement in Moroccan School-Age Children. *Current Research in Nutrition & Food Science*, *10*(1).

Istiany, Ari, Rusilanti (2013) Gizi Terapan. PT Remaja Rosdakarya, Bandung

Kemenkes RI (2017) Pedoman Gizi Seimbang. Direktorat Bina Gizi Masyarakat

Kementerian Kesehatan RI. (2018) Hasil Riset Kesehatan Dasar (Riskesdas) 2018. Jakarta: Badan Penelitian Dan Pengembangan Kesehatan Kementerian RI

Kharina A (2021) Pengaruh Media Edukasi 3D Puzzle Terhadap Perubahan Pengetahuan, Sikap, Dan Tinda-Kan Konsumsi Gizi Seimbang Pada Siswa Kelas V Sekolah Dasar Di Lingkungan Sekitar Binong Kabupaten Tangerang

Kim J, Kim G, Park J, Et Al (2019) Effectiveness Of Teacher-Led Nutritional Lessons In Altering Dietary Habits And Nutritional Status In Preschool Children: Adoption Of A NASA Mission X-Based Program.

Ladiba, A., Zulfaa, A., Djasmin, A., Mevya, A., Safitri, A., & Purwanti, R. (2021). Pengaruh edukasi gizi terhadap peningkatan pengetahuan dan asupa sayur buah pada siswa sekolah dasar dengan status gizi lebih. *Darussalam Nutrition Journal*, *5*(2), 110-120.

Mahmudiono, T., Nindya, T. S., Rachmah, Q., Segalita, C., & Wiradnyani, L. A. A. (2020). Nutrition education intervention increases fish consumption among school children in Indonesia: results from behavioral based randomized control trial. *International Journal of Environmental Research and Public Health*, *17*(19), 6970.

Mariyaningsih, N., & Hidayati, M. (2018). *Bukan Kelas Biasa: Teori dan Praktik Berbagai Model dan Metode Pembelajaran menerapkan inovasi pembelajaran di kelas-kelas inspiratif*. CV Kekata Group.

Masykuroh, K., Chandra Dewi, S., Kons, M. P., Heriyani, E., Kons, M. P., & Widiastuti, H. T. (2022). Modul psikologi perkembangan. Feniks Muda Sejahtera.

Mitsopoulou, A.-V., Magriplis, E., Dimakopoulos, I., Karageorgou, D., Bakogianni, I., Micha, R., Michas, G., Chourdakis, M., Ntouroupi, T., & Tsaniklidou, S.-M. (2020). Micronutrient intakes and their food sources among Greek children and adolescents. *Public Health Nutrition*, *23*(13), 2314–2326.

Mohammad A, Madanijah S (2015) Konsumsi Buah Dan Sayur Anak Usia Sekolah Dasar Di Bogor (. 10:71–76

Molina‐López, J., Leiva‐García, B., Planells, E., & Planells, P. (2021). Food selectivity, nutritional inadequacies, and mealtime behavioral problems in children with autism spectrum disorder compared to neurotypical children. *International Journal of Eating Disorders*, *54*(12), 2155–2166.

Nazeer, M., Sultana, R., Ahmed, M. M., Asad, M. R., Sami, W., Hattiwale, H. R., & Sreekanth, T. (2018). Crossword puzzles as an active learning mode for student directed learning in anatomy teaching: Medical undergraduate perceptions. *International Journal of Medical Research & Health Sciences*, *7*(10), 12–19.

Notoadmojo S (2014) Promosi Kesehatan Dan Perilaku Kesehatan. Jakarta: Rineka Cipta

Ober, P., Sobek, C., Stein, N., Spielau, U., Abel, S., Kiess, W., ... & Vogel, M. (2021). And yet again: Having breakfast is positively associated with lower bmi and healthier general eating behavior in schoolchildren. *Nutrients*, *13*(4), 1351.

Rosaria, D., & Novika, H. (2018). Bimbingan Belajar Bahasa Inggris Bagi Anak Usia Sekolah Dasar (6-12 Tahun) Di Desa Semangat Dalam Rt. 31Handil Bhakti. Jurnal Pengabdian Al-Ikhlas Universitas Islam Kalimantan Muhammad Arsyad Al Banjary, 2(2).

ROSLIYANA, R. (2020). PENGARUH PENERAPAN MEDIA PEMBELAJARAN PUZZLE PICTURE TERHADAP KEMAMPUAN BERPIKIR KRITIS PADA MATERI SISTEM PENCERNAAN MANUSIA DI SMPN 2 WAY SEPUTIH (Doctoral dissertation, UIN Raden Intan Lampung).

Salam, R. A., Das, J. K., Irfan, O., Ahmed, W., Sheikh, S. S., & Bhutta, Z. A. (2020). Effects of preventive nutrition interventions among adolescents on health and nutritional status in low‐and middle‐income countries: A systematic review. *Campbell Systematic Reviews*, *16*(2), e1085.

Salsabila, U. H., Seviarica, H. P., & Hikmah, M. N. (2020). Urgensi Penggunaan Media Audiovisual dalam Meningkatkan Motivasi Pembelajaran Daring di Sekolah Dasar. INSANIA: Jurnal Pemikiran Alternatif Kependidikan, 25(2), 284-304.

Sharps AM, Thomas E, Blissett JM (2020) Using Pictorial Nudges Of Fruit And Vegetables On Tableware To Increase Children's Fruit And Vegetable Consumption

Silmi M, Kusmarni Y (2017) Menumbuhkan Karakter Rasa Ingin Tahu Siswa Dalam Pembelajaran Sejarah Melalui Media Puzzle. FACTUM J Sej Dan Pendidik Sej 6:230–242.

Sumaryo B (2013) Kebijakan Pembangunan Destinasi Pariwisata.. YogyakartaSangMeDia

Surijati KA, Hapsari PW, Rubai WL (2021) Faktor-Faktor Yang Mempengaruhi Pola Makan Siswa Sekolah Dasar Di Kabupaten Banyumas. Nutr J Pangan,Gizi,Kesehatan 2:95–100.

Vittrup, B., & McClure, D. (2018). Barriers to Childhood Obesity Prevention: Parental Knowledge and Attitudes. *Pediatric Nursing*, *44*(2).

Wolff, L.-A., Skarstein, T. H., & Skarstein, F. (2020). The Mission of early childhood education in the Anthropocene. *Education Sciences*, *10*(2), 27.