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Transforming Children's Attitudes and Knowledge towards Vegetable Consumption through Think Pair Share-Based Health Education

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ABSTRACT

Purpose of the study: The aim of this study was to analyze the effect of implementing health education with the think pair share learning model on the knowledge and attitudes of school-age children regarding vegetable consumption.

Methodology: This study used a pre-experimental design with a one-group pre-post test approach. A sample of 40 fourth-grade students was drawn using a total sampling technique. The independent variable was health education using the Think Pair Share model, while the dependent variables were knowledge and attitudes. Data analysis used the Wilcoxon Sign Rank Test with $\alpha \leq 0.05$.

Main Findings: The results of the Wilcoxon Sign Rank Test statistical test show that health education with the think pair share learning model can influence children's knowledge ($p=0.000$) and attitudes ($p=0.000$).

Novelty/Originality of this study: The novelty of this research lies in the application of the Think Pair Share learning model in health education to improve school-age children's knowledge and attitudes toward vegetable consumption. This approach has not been widely used in the context of child nutrition, thus providing an innovative contribution to effective and participatory health education methods.

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1. INTRODUCTION

Vegetables are an essential part of a balanced nutritional menu and should be consumed at every meal. Not only adults, but children also need regular vegetable consumption to support their growth and development [1]-[3]. Insufficient vegetable intake can lead to deficiencies in essential nutrients such as protein, vitamins, minerals, and fiber [4]-[6]. Children who do not consume enough vegetables are at risk of various health problems, such as obesity and malnutrition [7], [8]. During school age, children experience rapid growth, which requires optimal nutrition.

Dietary patterns formed during childhood significantly influence eating habits as adults [9], [10]. Therefore, it is important to cultivate vegetable consumption from an early age. However, many school-age children still consume insufficient vegetables [11]-[13]. Data shows that the average child's vegetable consumption is 70.4 grams per day, with some children consuming only 15 grams per day. This low consumption negatively impacts children's growth and overall health [14], [15].

Several studies indicate that many children prefer to eat certain types of foods and tend to avoid vegetables. According to the 2013 Basic Health Research (Riskesdas), 93.5% of the Indonesian population does

not consume enough fruits and vegetables [16], [17]. At KHM Noer Elementary School Surabaya, out of 40 fourth-grade students, 16 dislike vegetables. Another 15% are unaware of the benefits of consuming vegetables properly. This indicates a lack of knowledge and positive attitudes toward vegetable consumption among children [18]-[20].

Most children do not meet the WHO's recommended daily vegetable intake of 150–200 grams [21], [22]. This low consumption is driven by the habit of choosing preferred foods and rejecting vegetables. This consumption pattern makes children susceptible to anemia, constipation, and impaired concentration. Vegetables such as spinach and cassava leaves contain iron, essential for red blood cell formation [23], [24]. Iron deficiency can impact children's health and academic performance [25]-[27].

Factors contributing to low vegetable consumption in children are influenced by individual characteristics, the environment, and the role of parents [28], [29]. Children are often more attracted to fast food that lacks vegetables. Parents play a significant role in providing nutritious foods, including vegetables, at home and for school lunches. Children's knowledge of the importance of vegetable consumption needs to be continuously improved [30], [31]. Healthy attitudes and habits can be developed through a health education approach. Research shows that health education is effective in improving children's nutritional knowledge, especially when delivered using age-appropriate methods [32], [33]. One suitable learning method is Think Pair Share, a cooperative model that involves thinking, pair discussions, and group sharing. The Think Pair Share model encourages students to actively think and work together to understand the material [34], [35]. This technique increases children's participation and understanding, particularly regarding health issues such as vegetable consumption. This approach helps children more easily absorb information and change their attitudes.

The Think Pair Share learning model is considered suitable for school-age children because it stimulates reasoning skills and develops positive attitudes toward the material being studied [36], [37]. Although this method requires more time, the discussion and collaboration process provides space for students to understand concepts more deeply. The application of Think Pair Share in health education has the potential to improve children's understanding of the importance of eating vegetables [38], [39].

Prasetya & Khomsan's [40] study examined mothers' and children's knowledge, attitudes, and practices regarding the Balanced Nutrition Guidelines and their relationship to children's nutritional status. It was observational and focused on general adherence to the nutritional guidelines, rather than on specific pedagogical interventions or targeted vegetable consumption behavior. Mustikawati & Hikma's [13] study was also descriptive and cross-sectional, capturing elementary school students' knowledge and attitudes toward fruit and vegetable consumption in one school without testing specific learning strategies or before-after changes. Different from these two, the current study conducted a health education intervention based on the Think Pair Share cooperative model with a one-group pre-post test design on fourth-grade students, thus not only capturing knowledge, attitudes, and practices, but also testing practical causality—whether Think Pair Share was able to improve knowledge and shape positive attitudes regarding vegetable consumption. The Wilcoxon test results showed a significant increase in knowledge and attitudes ($p=0.000$), adding methodological contributions (a participatory approach in the classroom) and practical contributions (a teacher-replicable learning model) that were not provided by the two previous studies.

The novelty of this research lies in the application of the Think Pair Share cooperative learning model as a structured health education strategy in the classroom to directly change children's knowledge and attitudes towards vegetable consumption, tested with a pre-post design and Wilcoxon analysis so that it does not merely describe the condition but shows the causal effect of the intervention that can be replicated by teachers in elementary schools. The urgency is strong because the data in the introduction shows that children's vegetable consumption is still very low (an average of 70.4 g/day, some only 15 g/day) compared to the WHO recommendation of 150–200 g/day, with consequences of anemia, constipation, obesity, and decreased learning concentration; even the 2013 Riskesdas recorded that 93.5% of the population does not consume enough fruit and vegetables—indicating the need for more effective participatory education methods in the school environment. The findings of this study fill this gap by proving that Think Pair Share not only increases knowledge but also encourages the formation of positive attitudes towards eating vegetables in elementary school students. This study aims to analyze the effect of health education using the Think Pair Share model on knowledge and attitudes about vegetable consumption in school-age children. It is hoped that the results of this study can form the basis for more effective nutrition education interventions in elementary schools.

2. RESEARCH METHOD

2.1. Research Design

This research design uses an experimental research design with a pre-experimental research method with a one-group pre-post test design, where this type of research reveals a causal relationship by involving a group of subjects [41], [42]. The subject group was observed before the intervention was carried out, then observed again after the intervention. This study discusses the causal relationship of health education through the

think pair share learning model on the knowledge and attitudes of school-age children regarding vegetable consumption.

Table 1. Pre-Experimental Research Design (One-Group Pre-Post Test Design)

Subject	Pre-test	Treatment	Post-test
K-A	O	|	O|
	Time 1	Time 2	Time 3

Information:

K : Subject (4th grade students of KHM Noer Elementary School)

O : Measurement of the level of knowledge and attitudes through a pre-test using a questionnaire before providing health education using the think pair share method.

| : Providing the think pair share health education method

O| : Measurement of the level of knowledge and attitudes through a post-test using a questionnaire after being given health education using the think pair share method

2.2. Population, Sample and Sampling

The research population is a subject who meets the criteria established before conducting the research. The target population in this study was 235 school-aged children (6-12 years old) at KHM Noer Elementary School Surabaya, while the accessible population was 40 fourth-grade students. The sample is a subset of the accessible population that can be used as research subjects through sampling [43]. The sample in this study was elementary school-aged children who met the inclusion and exclusion criteria. The inclusion criteria in this study refer to the general characteristics of the subjects who could be reached and studied: fourth-grade elementary school students who were present and participated in all stages of the study, and who obtained consent from their parents or guardians to become respondents. Meanwhile, exclusion criteria were established to exclude subjects who were not eligible for the study, namely students who were absent during the study.

Sampling is the process of selecting a portion of a population to represent it. Sampling techniques are the methods used to obtain a sample that truly represents the entire research subject. The sampling technique used in this study was total sampling. The researchers selected all 40 fourth-grade students at KHM Noer Elementary School.

2.3. Research Instruments

An instrument is a tool or facility used to collect data with the aim of obtaining more complete, accurate, and systematic data, making it easier to process. The instrument used in this study was a structured questionnaire. The knowledge and attitude questionnaire was modified from a research questionnaire used by Sibagariang in 2016. Knowledge and attitudes use ordinal data. Knowledge is divided into three categories: good, sufficient, and poor. Attitudes are divided into two categories: positive and negative.

The knowledge questionnaire consists of 20 questions: types of vegetables (questions 1, 3), benefits of eating vegetables (questions 14, 15, 18), vegetable content (questions 4, 5, 6, 7, 8, 10, 20), proper vegetable preparation methods (questions 2, 9, 12, 13), frequency and quantity of vegetable consumption (question 11), and the impact of insufficient vegetable consumption (questions 16, 17, 19). The knowledge questionnaire is scored 1 for correct answers and 0 for incorrect answers. The knowledge questionnaire contains 20 questions with a correct score of 1, incorrect score of 0, and a maximum score of 20. A score of 76-100% is considered good (code 3), a score of 56-75% is considered adequate (code 2), and a score of <55% is considered poor (code 1).

Attitude assessment was measured using a Likert scale. Attitude statements consist of 20 questions regarding children's attitudes toward and responses to vegetable consumption. These questions include the benefits of eating vegetables (questions 1, 7, 8, 9, 11, 12, 13, 15, 16, and 19), the nutritional content of vegetables (questions 3, 5, and 14), proper vegetable preparation methods (questions 4, 17, and 20), the frequency and amount of vegetable intake (questions 2, 10), and the impact of insufficient vegetable consumption (questions 6, 18). Positive (favorable) questions on questions (1,2,3,4,6,7,8,11,14,16,18,19) with a value of strongly agree = 4, agree = 3, disagree = 2, strongly disagree = 1. Negative (unfavorable) questions on questions (5,9,10,12,13,15,17,20) with a value of strongly agree = 1, agree = 2, disagree = 3, strongly disagree = 4.

2.4. Data Collection Procedures

The study began after the researcher obtained permission from the school, accompanied by a letter of introduction from the Dean of the Faculty of Nursing at Airlangga University. The researcher then conducted an initial survey of fourth-grade students to determine their knowledge and attitudes regarding vegetable

consumption. Following this, negotiations with the school regarding the research schedule were conducted and informed consent was obtained from the students' parents as respondents.

All 40 fourth-grade students were recruited using a total sampling technique. The researcher explained the research objectives and distributed a pre-test questionnaire covering demographic data, knowledge levels, and attitudes. The health education intervention, conducted using the Think Pair Share learning model, was conducted in three consecutive days, with the assistance of the homeroom teacher and three trained research assistants.

In each Think Pair Share session, students were asked to think independently, discuss in pairs, and then present the results of their discussions to the class. Topics covered included case studies on obesity, constipation, and nearsightedness, with the aim of emphasizing the importance of vegetable consumption. After all sessions were completed, the researcher administered a post-test using the same instrument as the pre-test to compare changes in students' knowledge and attitudes.

2.5. Data Analysis

Data analysis is a process carried out starting from the preparation stage and systematic data tabulation of data that has been collected by researchers with the aim of detecting trends and relationships. The data analysis used in this study is descriptive analysis and statistical analysis. Descriptive analysis, analyzing data using distribution tables and confirmed in the form of percentages and narratives. The collected data is tabulated, data analysis is carried out using the Wilcoxon Signed Rank Test to determine the comparative of two samples correlated in ordinal data in each dependent variable. If $\alpha = 0.05$ is set and the p value is obtained ≤ 0.05, then H1 is accepted, namely there is a change in the level of knowledge and attitudes of children after being given health education with the think pair share learning model.

3. RESULTS AND DISCUSSION

3.1. Knowledge about vegetable consumption before and after being given health education using the think pair share learning model

Table 2. Knowledge about vegetable consumption before and after being given health education using the think pair share learning model.

Category	Before		After	
	n	%	n	%
Good	1	2.5%	33	82.5%
Sufficient	17	42.5%	7	17.5%
Poor	22	55%	0	0%
Total	40	100%	40	100%
Wilcoxon sign rank test p=0,000				

Based on Table 2, it shows that the majority of respondents had increased knowledge after being given a health education intervention on the importance of vegetable consumption with the think pair share learning model. Most respondents were in the good category after the intervention. Knowledge increased to 33 respondents with good knowledge and 7 respondents with sufficient knowledge. The results of the Wilcoxon sign rank test statistical test with a sig value (2-tailed) showed that there was a difference in the level of knowledge before and after with a significance value of $p = 0.000$, namely $p \leq 0.05$. H1 was accepted, namely there is an effect of health education with the think pair share learning model on the knowledge of school-age children in vegetable consumption.

3.2. Attitudes about vegetable consumption before and after being given health education using the think pair share learning model

Table 3. Attitudes about vegetable consumption before and after being given health education using the think pair share learning model

Category	Before		After	
	n	%	n	%
Positive	20	50%	24	60%
Negative	20	50%	16	40%
Total	40	100%	40	100%
Wilcoxon sign rank test p=0,000				

Based on table 3, it shows that before being given health education on the importance of consuming vegetables with the think pair share learning model, respondents had the same attitude with a positive attitude of 20 respondents and a negative attitude of 20 respondents. The majority of respondents showed an improvement in attitude. Respondents after being given the intervention who had a positive attitude were 24 respondents, while those who had a negative attitude were 16 respondents. The results of the Wilcoxon sign rank test statistical test with a sig value (2-tailed) showed that there was a difference in attitude results before and after the significance value $p = 0.000$, namely $p \leq 0.05$. H1 is accepted, namely there is an influence of health education with the think pair share learning model on the attitudes of school-age children in consuming vegetables.

A person's knowledge is influenced by several factors, including age, education, occupation, interests, experience, culture, and information [44], [45]. The increase in knowledge among 35 respondents was the result of a health education intervention using the think-pair-share learning model. Previous research has shown that the Think Pair Share learning model encourages students to work independently and in groups through a structural approach that emphasizes structures designed to influence students' thinking and interaction patterns [46], [47].

Respondents with good knowledge were those who correctly answered 15-20 questions. Respondents with adequate knowledge were those who correctly answered 11-14 questions. Respondents with insufficient knowledge were those who correctly answered fewer than 10 questions. Thirty-five respondents experienced an increase in their knowledge scores, five respondents experienced no change in their scores, and none experienced a decrease in their scores.

Prior to the intervention, respondents frequently answered incorrectly to items regarding the nutritional content of vegetables and the impact of a lack of vegetable intake. Thirty-one respondents answered incorrectly to items regarding the impact of vegetable consumption. This was because the questions were theoretical in nature, and respondents were unfamiliar with the nutritional content of vegetables and the impact of insufficient vegetable intake on the body. Therefore, they found it difficult to answer these questions. After the intervention, 31 respondents who answered incorrectly on the impact of insufficient vegetable intake were correct, while 25 respondents answered correctly. These results indicate that the respondents had received adequate health education. Statistical analysis of the knowledge variable using the Wilcoxon signed-rank test showed a significant effect after the intervention, with a significance value of $p = 0.000$ (2-tailed), i.e., $p \leq 0.05$, indicating that H1 was accepted. This indicates an increase in knowledge among respondents after the health education intervention using the think-pair-share learning model. The majority of respondents reported an increase in knowledge in the good category after the health education intervention using the think-pair-share learning model. The Think Pair Share learning model encourages students to process information and communicate effectively, while developing thinking skills [48]. Research shows that the Think Pair Share learning model helps students develop conceptual understanding, information, draw conclusions, and form opinions and consider others' perspectives.

Although the respondent group was given an intervention in the form of health education using the Think Pair Share learning model, 5 respondents still experienced no change in their scores or remained stable. This is due to several factors, including (1) internal factors, namely factors within the individual, such as intelligence, interests, and physical condition; (2) external factors, namely factors originating outside the individual, such as family, community, and facilities; and (3) learning approach factors, namely factors that influence a person's learning efforts regarding an innovation, such as learning strategies and methods. The occurrence of stable knowledge among respondents is due to both internal and external factors. Data showed that respondents (P5, P12, P23, and P28) had never received health education or counseling regarding vegetable consumption behavior. The reason for the lack of or sufficient knowledge regarding the importance of vegetable consumption in children is due to information media. This fact is supported by Green's theory (1991), which states that a lack of facilities and infrastructure, in this case information or health education, can influence children's level of knowledge, which is not yet categorized as good. Post-test data showed that 7 respondents still had sufficient knowledge. Respondents number P20 and P25 have sufficient knowledge because they experienced an increase in knowledge from the poor category. Respondents number P5, P12, P23, P28 have the same/constant category, namely the sufficient category. This shows that there is information that can be absorbed when health education using the Think Pair Share learning model takes place, however, the information received cannot be optimal due to the respondents' ability to focus attention and receive information due to the time of implementation of this learning during the fasting month, so it cannot change the respondent's knowledge category from sufficient to good.

Before receiving health education using the Think Pair Share learning model, respondents had both positive and negative attitudes. Pre-test results showed similar scores: 20 respondents had positive attitudes and 20 respondents had negative attitudes. Some of the respondents with negative attitudes had never received information about vegetable consumption. This is supported by the theory that information obtained from mass media and educational institutions can shape one's opinions, providing a cognitive foundation for developing

positive attitudes. Previous information can influence a person's attitude toward becoming positive. After receiving health education, some respondents with previously negative attitudes changed to positive ones.

The stages of attitude formation involve shifting a person's attitude from negative to positive. After health education using the Think Pair Share learning model, respondents answered all questions correctly. However, the item with the lowest response rate was about children's attitudes toward managing the nutritional content of vegetables and consuming them properly. This item falls under the responsible category. Responsibility is the highest level for developing positive attitudes, requiring frequent health education.

After the intervention, namely health education using the Think Pair Share learning model, 24 respondents showed positive attitudes. This positive attitude is demonstrated by the respondent's T score > T mean. Sixteen respondents had negative attitudes, as indicated by T scores < T mean. Based on Table 3, the difference in respondent attitudes in the pre-test and post-test using the Wilcoxon signed rank test yielded a $p = 0.000$, where $p \leq 0.05$, indicating that H1 is accepted: there is an effect of health education using the think-pair-share learning model on the attitudes of school-age children regarding vegetable consumption at KHM Noer Elementary School Surabaya. This relationship indicates that the intervention provided by the researchers was effective in improving student attitudes, with significant results. The improvement in attitudes observed in the post-test was a 30% increase in 12 respondents, from negative to positive attitudes. This improvement aligns with the theory explained by Green (1991), which states that providing health education can change predisposing factors, one of which is a person's attitude. Health education using the Think Pair Share learning model allows children to absorb information that can shift negative mindsets to positive ones.

The think-pair-share learning model used in this study utilizes cooperative learning, a method that allows all students to actively participate in learning [49], [50]. Each individual has time to think, then pairs up to discuss the given problem, and presents the results of the discussion to the class. All students are able to think critically and strive to solve problems while respecting the opinions of others. This can be effective in developing each individual's positive attitude towards independent thinking and cooperation within the group. Attitude changes occur because respondents receive the material, respond to it with responses from other group members, discuss the case study together, and then appreciate that the material presented has positive value.

There are three components that form the structure of attitudes: (1) the cognitive component (perceptual component), which contains beliefs related to an individual's perception of the attitude object, based on what they see and know, their views, beliefs, thoughts, personal experiences, emotional needs, and information from others; (2) the affective component (emotional component), which reflects an individual's subjective emotional dimension toward the attitude object, whether positive or negative; (3) the conative component (behavioral component), which represents the predisposition or tendency to act toward the attitude object they encounter.

Despite the intervention of health education using the Think Pair Share learning model, post-test results still showed a decrease in attitudes in 7 respondents, and no significant change in attitudes in 21 respondents. The analysis revealed that, when related to knowledge, some respondents had negative attitudes but had good knowledge, while others had negative attitudes but had sufficient knowledge. Factors influencing attitude formation include personal experience, culture, significant others, mass media, institutions, and the individual's emotional factors.

Respondents with sufficient knowledge will likely respond less than optimally, resulting in a lack of fundamental reinforcement for their beliefs about their behavior. Respondents with good knowledge will likely respond, despite having good knowledge, but their affective and conative factors may be lacking. Furthermore, the persistence of attitudes after the intervention could be attributed to a lack of confidence in the health education material, or to respondents' emotional factors that were not supportive during the health education because the intervention was conducted during school hours and during the month of Ramadan. Another possible contributing factor is the relatively short duration of health education, which has not significantly improved attitudes, as the attitude formation process takes considerable time.

The findings of this study demonstrate that health education interventions using the Think-Pair-Share learning model effectively improved both knowledge and attitudes toward vegetable consumption among school-age children. However, the research also presents several limitations. The observed improvements were not uniform among all respondents, indicating that individual internal factors—such as intelligence, interest, motivation, and emotional readiness—as well as external factors—such as family support, learning environment, and timing of the intervention—significantly influenced the outcomes. The implementation of the intervention during the fasting month may have affected students' focus and engagement, thereby limiting the effectiveness of the learning process. Furthermore, the relatively short duration of the intervention and the small sample size restrict the generalizability of the findings.

4. CONCLUSION

Based on the research results, it can be concluded that health education using the Think Pair Share learning model is effective in improving school-age children's knowledge regarding vegetable consumption.

After the intervention, the majority of students showed an increase in knowledge to the good category. The Think Pair Share model encourages students' active involvement in the thinking and problem-solving process, making it easier for them to understand and remember the material presented. In addition to increasing knowledge, health education using the Think Pair Share model also fosters positive attitudes in students toward vegetable consumption. While high levels of knowledge do not always equate to positive attitudes, the Think Pair Share model provides a space for students to respect each other's opinions and learn in a collaborative atmosphere, ultimately fostering positive attitudes. These positive attitudes are formed through discussions, social interactions, and emotional engagement developed throughout the learning process. Future studies should extend the intervention period, include a larger and more diverse sample, and integrate longitudinal follow-ups to assess the long-term retention of knowledge and the stability of attitude changes.

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