



## **Improving Food Choices of Elementary School Children Using Nutriscie-Card Game**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Author ROO designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript in collaboration with authors ROO and RBO managed the analyses of the study, do the editing and proofreading and wrote the final manuscript incorporating the review of the three reviewers.*

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### **ABSTRACT**

Filipino children are put at risk with the increasing intake of junk foods which often resulted in health problems such as obesity, malnutrition, gastro-intestinal and urinary related illnesses such as constipation, stomach ulcers, urinary tract infection, kidney stone, and others, This Study was conducted to develop and validate a nutri- scie card game intended to foster awareness on healthy foods consumption among school children. The researcher made use of the Research and Development model by Borg and Gall with the following phases: identification of learning competencies; development of nutria scie card game; and validation of the nutri-scie card game by subject experts and experts in instructional materials development. Result of the validation revealed that Nutri-Scie Card game is highly valid. A significant improvement was noted in most food choices of the pupil respondents.

*Keywords: Nutrition; nutriscie card game; card game; food choices; elementary school children.*

## 1. INTRODUCTION

Research results revealed that dietary intakes of school going population are not consistent with national recommendation [1,2]. School children and adolescents usually consume food with high saturated fats, total fats, sodium, and sugary foods. They have lower intake of healthy foods such as high in fiber to include fruits and vegetables, whole grains, and calcium-rich foods. The high intake of saturated fats often may result to increase the risk of heart disease and stroke because they raise the “bad” LDL cholesterol in the blood. Sources of saturated fats include coconut oil, cheese, fatty cuts of meat, hard hydrogenated margarine, and butter [3].

Eating patterns of children and adolescent is influenced by factors such as media [4], individual food preferences, family meal patterns, and parental role modeling. Harris, Bargh and Brownell [5]. found out that Children consumed 45% more when exposed to food advertising. Adults consumed both unhealthy foods and unhealthy snack foods following exposure to snack food advertising compared to the other conditions. The larger time spent by children and adolescent in school also influences their eating and food preferences [6].

In the Philippines, malnutrition remains a serious problem especially among children. An estimated 3 million children in the Philippines are undernourished. According to the latest study by the country's Food and Nutrition Research Institute (FNRI), three in every 10 Filipino children aged five and younger are too short for their age, while two in every 10 are underweight [7]. Also, FNRI reported in the 7th National Nutritional Survey conducted in 2008 that for every 100 adolescents aged 11-19 years, 17 were underweight and 5 were overweight. This could mean that 22 % of adolescents were unhealthy.

Providing food safety to Philippine schools the Department of Education issued Department Order number 52, s. 2008 that sets regulations to Philippine elementary and secondary schools on the quality of food served in school canteens [8]. That food served in school canteen should be safe, nutritious and affordable. School children and adolescents do not end up eating inside school premises. Processed foods in groceries, sari stores are mostly patronized by consumers. Fostering awareness on healthy, nutritious and affordable foods, this nutri-Scie card game has

been conceptualized. This study is focused on the development science card games selected topics in Elementary science which can be used as instructional materials for nutrition related topics and test the effectiveness of nutri scie card games to improve food preferences of elementary school children.

## 2. METHODOLOGY

The study made use of R and D method for the development of instructional materials in Elementary Science. The research consists of four phases. Phasel of this study is the identification of learning competencies followed by phase II which is the development of the game, and phase III is the validation of the game.

In testing the effectiveness of the Nutri Card game, the researcher made use of the Quasi Experimental Pretest-Posttest single group design. The design is Quasi experimental because respondents are from intact classes. The research design is presented below:

O1 x O2

Where:

O1- the pre test score of the experimental group  
O2- Post Test score of the experimental group  
x- Experimental Treatment (use of Nutri Card Game)

During the validation phase, the study was conducted at San. Francisco Elementary School, Tumog Elementary School and, Bacsay Elementary School. These schools are located at Luna, Apayao.

In testing the effectiveness of the Nutri Scie Card games, the study was conducted at Sta. Lina Elemetary School.

The respondents of the study were the 10 elementary teachers from Luna District, 5 instructional materials experts from the Apayao State College and 18 elementary pupils from Sta. Lina Elementary School for testing the effectiveness of the Nutri Scie Card game.

Face validation tool was designed wherein questionnaire was used to evaluate the game. A 5 point scale was used: 5 – highly valid; 4 – valid; 3 – undecided; 2- not valid; 1- strongly not valid. The questionnaire was used to determine the validity. It consisted of 4 subs – criterion as follows: the material used, rules, questions, and the card game itself. Space for comments and

suggestions was also included below the questionnaire.

A preference checklist was used to determine food preferences of respondents. A 3 point scale was used with 1 as the most preferred, 2 as preferred and 3 as least preferred. For each given food item in the first column, students are tasked to check on their preference opposite each item.

The materials were validated by subject experts and instructional materials development experts.

The face validation tool was then administered for the purpose of the games' validity. After which, the answered questionnaires were collected then tabulated, analyzed and interpreted. Nutri Card Game was used in the experimental group in teaching the topics covered within the duration of the experiment.

The game is validated using the 5 point scale. Descriptive statistics such as mean and standard deviation were used to describe food preferences and characteristics of the group when they are exposed to experimental and control treatments. Mean was used to describe respondents' response to each statement on the face validation tool.

Food groups were categorized for purposes of processing data gathered from the checklist. Food items are categorized as follows: Snacks (processed or natural), fruits, vegetables, processed products.

The t- test for independent sample was used to compare food preferences of the two groups in their pre-test and posttest.

### **3. RESULTS AND DISCUSSION**

#### **3.1 The Game and Its Rule**

##### **3.1.1 Number of player**

The game consists of two players. The first player to set nutri category is determined through tossing of coin in two to three tosses. The player with the greater number of head appearing in a toss will be the first one to set the nutria category. The nutria categories are nutritional content of the food in the card each player is holding.

##### **3.1.2 The goal of the game**

The aim of the game is to get all the cards from the opponent player.

##### **3.1.3 How to start the game**

The game starts by means of tossing a coin. The winner of the tossing of the coin will be the first one to set the nutri category.

##### **3.1.4 Choosing a category**

The first to draw the game chooses a category. Categories are nutrient component found in foods as iron, calcium, potassium, vitamins, sodium or cholesterol fat.

##### **3.1.5 Commence playing**

The one who won the tossed coin is the first one to choose and pick his/her card. After choosing and picking his/her card, the player looks the content for the opponent player to beat according to the content of the set nutri category. For nutritious food (natural/ no preservatives) Player with the higher nutri category gets the card of the opponent player. In the case of food additives (usually found in junk foods and preserves) food additives such as sodium, carbonates and others, winner of the nutri category will be the lesser one.

In case of a tie, cards will be shuffled in the deck of card in which each player is holding, then player will set another category.

##### **3.1.6 Continue playing**

In matching the card; the card with higher substantial content such as iron, calcium, potassium and vitamins is declared winner. The player holding the card takes the card of the opponent player. On the other hand if content of the card is not substantial like such as sodium, bicarbonates and cholesterol and fat, the card losses the turn and will be taken by the opponent player holding the other card. The play continue until no more card is left in one of the player. The player with greatest number card left will be declared winner.

Highly valid results were obtained in all the criteria set for evaluation. On materials used a mean rating of 4.51 Which is highly valid, 4.31 on rules which is also highly valid, 4.32 on card content which is also highly valid, 4.24 on the scie-card describe as highly valid and an overall mean of 4.33 describe as highly valid. Ocampo [9].developed a card pairing game intended for topics in Math 8. A highly valid results was achieved when the card game was validated by experts as revealed in Table 1.

A food checklist was given before and after the intervention (playing the Nutri Scie Card game). This serve as evaluative tool in determining the food preference of the respondents. The result of the pretest is presented Table 2.

Meat and poultry products and potato chips, curls, etc. are the most preferred food groups of elementary school children with mean ratings as 2.61 and 2.5 respectively. This findings is substantiated by Murphy [3]. Who stated children and adolescent usually consume food with high saturated fats, total fats, sodium, and soft drinks. Processed foods, softdrinks, fish, canned goods, fruit drinks, fruits and vegetables are preferred foods with mean ratings of 2.33, 2.33, 2.28, 2.11, 1.94, 1.89 and 1.72 respectively. Rootcrops and herbal fruit drinks such as lemongrass tea, pandan juice are the least preferred. This situation may contribute to the high incidence of malnutrition of school children in Apayao.

Table 3 reveals that after the game, a change in the food preferences of pupils is noted. The most preferred food groups were fish, fruits and vegetables with mean rating of 2.61, 2.44 and 2.39 respectively. This is being followed by fruit drink (2.28), meat and poultry products (2.17), soft drinks and processed products (1.89), rootcrops and junk foods (1.78), and canned goods (1.67). A change in the preference of school children from preferred to most preferred was noted to food groups such as fruits, vegetables and fish. Likewise, a change from least preferred to preferred was noted to rootcrops and herbal drinks. No change (preferred) was noted to soft drinks, fruit drinks, canned goods and processed foods.

A positive difference between the posttest rating and pretest rating indicates an increase in the preference of the food belonging to the food groups given in the checklist. Result of the posttest- pretest difference indicates an increase in the preference of the following food groups: fruits, vegetables, fruit drinks, herbal drinks, rootcrops and fish. This implies an improve in the food choice decision making of the respondents after they are exposed to nutria scie card game. It is also noted that a decrease in rating from pretest to posttest on the following food groups: junk foods, soft drinks, canned goods, processed foods, and meat and poultry products.

Research makes it clear that abnormal blood lipid (fat) levels have a strong correlation with the risk of coronary artery disease, heart attack and coronary death. In turn, abnormal blood lipids are

related to what you eat. A diet high in saturated fats (e.g. cheese) and trans fats (often used in cakes, cookies and fast food) leads to high levels of cholesterol.

Saturated fats are found in animal products. Trans fats are oils that have been hydrogenated to turn them into semi-hard fats. Hydrogenated fat is found in processed food like shop-bought cakes, biscuits, stock cubes and a range of other products you buy every day. Saturated and trans fats raise cholesterol levels in the blood, which in turn can lead to atherosclerosis.

Unsaturated fats, polyunsaturated and monounsaturated are beneficial for heart health. They are present in fish, nuts, seeds and vegetables. The essential fatty acids omega-3 and omega-6 are found in oily fish and in nuts and seeds. Our bodies cannot make these acids so we have to eat them to gain their benefits, which include improving cholesterol levels in the body.

But it is important to note that if your total fat intake is greater than 37% of your total calories, then even if that fat is unsaturated you increase your risk of cardiovascular disease. Saturated fat intake should not exceed 10% of total energy and for high-risk groups, like people with diabetes, total fat intake should be 7% or less of total energy.

High blood pressure (hypertension) is a major risk factor for cardiovascular disease. If you have a diet high in sodium you risk hypertension. It has been estimated that a universal reduction in dietary intake of sodium by about 1 g of sodium a day, about 3 g of salt, would lead to a 50% reduction in the number of people needing treatment for hypertension. The same decrease would lead to a 22% drop in the number of deaths resulting from strokes and a 16% fall in the number of deaths from coronary heart disease [10].

A high animal fat diet is dangerous particularly when there is also a lack of fiber and exercise in ones daily routine. Pathologies such as atherosclerosis (hardening of the arteries, due to fat lining the inside of veins and arteries, which then blocks oxygen to the heart, causing a portion of the heart to 'die'), heart attack, stroke, arthritis, inflammation and kidney failure may then develop.

Excess consumption of foods that come from animals are the obvious risk factor. These

include beef, beef fat, veal, lamb, pork, lard, poultry fat, butter, cream, milk, cheeses and other dairy products made from whole milk [11,12,13,14,15]. The risk is associated with the use of excessive antibiotics in animal production such as poultry, piggery and the like [16].

A significant change on the preference test is obtained on food groups such as fruits, vegetables, junk foods, soft drinks, herbal drinks, canned goods, processed foods, rootcrops, and meat and poultry products after comparing the pretest and posttest using the t-test for

independent sample as shown in Table 4. The computed values of 3.38, 3.71, 4.51, and 2.91 are greater than the tabular value of  $t @ 5\%$  level of significance. Hence the null hypothesis is rejected. Likewise the computed values of -4.57, -2.48, -2.78, -2.48 and -2.98 are within the area of rejecting the null hypothesis. Thus, a significant result is obtained in the t- test. This means that significant change in the preference rating of the respondents after they are exposed to nutria scie card game. On the other hand, no significant result is noted after comparing the pretest and posttest preference test on fruit drinks and fish food products.

**Table 1. Degree of agreement of the teacher and students on the developed card game in some specific criteria**

| <b>Criterion</b>                               | <b>Computed mean</b> | <b>Descriptive value</b> |
|--|----------------------|--------------------------|
| <b>Materials are</b>                           |                      |                          |
| suited to the activity                         | 4.73                 | Highly valid             |
| easy to use                                    | 4.33                 | Highly valid             |
| appropriate to the game                        | 4.6                  | Valid                    |
| user – friendly                                | 4.4                  | Valid                    |
| Mean   | 4.51                 | Highly valid             |
| <b>The rules are:</b>                          |                      |                          |
| easy to follow                                 | 4.33                 | Highly valid             |
| strongly implemented                           | 4.13                 | Valid                    |
| concise and clear                              | 4.47                 | Highly valid             |
| Mean   | 4.31                 | Highly valid             |
| <b>Criterion</b>                               | <b>Mean</b>          | <b>Descriptive value</b> |
| <b>The content of the card are:</b>            |                      |                          |
| based from science topics                      | 4.6                  | Valid                    |
| clear and easy to understand                   | 4.27                 | Highly valid             |
| Challenging                                    | 4.27                 | Highly valid             |
| categorize into easy, average, difficult       | 4.13                 | Valid                    |
| Mean   | 4.32                 | Highly valid             |
| <b>The Science Card game is:</b>               |                      |                          |
| Captivating                                    | 4.07                 | Valid                    |
| an aid to enhance the student learning ability | 4.4                  | Valid                    |
| Mean   | 4.24                 | Highly valid             |
| Grand Mean                                     | 4.33                 | Highly valid             |

**Table 2. Pretest preference rating of the different food groups by the respondents**

| <b>Food tem</b>                                     | <b>Mean</b> | <b>Interpretation</b> |
|---|-------------|-----------------------|
| Fruits  | 1.89        | Preferred             |
| Vegetables  | 1.72        | Preferred             |
| Potato chips, corn chips, curls, etc. (Junk Foods ) | 2.5         | Most preferred        |
| Soft Drinks   | 2.33        | Preferred             |
| Fruit drinks  | 1.94        | Preferred             |
| Herbal drinks                                       | 1.22        | Least preferred       |
| Canned Goods  | 2.11        | Preferred             |
| Processed foods                                     | 2.33        | Preferred             |
| Rootcrops   | 1.33        | Least preferred       |
| Meat and Poultry Products                           | 2.61        | Most preferred        |
| Fish  | 2.28        | Preferred             |

**Table 3. Difference of posttest pretest rating on the different food groups**

| Food Item                 | Pretest Mean | Posttest mean | Difference | Interpretation  |
|---------------------------|--------------|---------------|------------|-----------------|
| Fruits                    | 1.89         | 2.44          | 0.55       | Improved Choice |
| Vegetables                | 1.72         | 2.39          | 0.67       | Improved Choice |
| Junk Foods                | 2.5          | 1.78          | -0.72      | Improved Choice |
| Soft Drinks               | 2.33         | 1.89          | -0.44      | Improved Choice |
| Fruit drinks              | 1.94         | 2.28          | 0.34       | Improved Choice |
| Herbal drink              | 1.22         | 1.83          | 0.61       | Improved Choice |
| Canned goods              | 2.11         | 1.67          | -0.44      | Improved Choice |
| Processed foods           | 2.33         | 1.89          | -0.44      | Improved Choice |
| Rootcrops                 | 1.33         | 1.78          | 0.45       | Improved Choice |
| Meat and Poultry products | 2.61         | 2.17          | -0.44      | Improved Choice |
| Fish                      | 2.28         | 2.61          | 0.33       | Improved Choice |

**Table 4. Comparison of the pretest and posttest preference rating using the t -test**

| Food item                 | Pretest mean | Posttest mean | T computed | T tabular@5% | Interpretation  |
|---------------------------|--------------|---------------|------------|--------------|-----------------|
| Fruits                    | 1.89         | 2.44          | 3.38       | ±2.11        | Significant     |
| Vegetables                | 1.72         | 2.39          | 3.71       | ±2.11        | Significant     |
| Junk Foods                | 2.5          | 1.78          | -4.57      | ±2.11        | Significant     |
| Soft Drinks               | 2.33         | 1.89          | -2.48      | ±2.11        | significant     |
| Fruit drinks              | 1.94         | 2.28          | 1.99       | ±2.11        | Not significant |
| Herbal drink              | 1.22         | 1.83          | 4.51       | ±2.11        | significant     |
| Canned goods              | 2.11         | 1.67          | -2.78      | ±2.11        | significant     |
| Processed foods           | 2.33         | 1.89          | -2.48      | ±2.11        | significant     |
| Rootcrops                 | 1.33         | 1.78          | 2.91       | ±2.11        | significant     |
| Meat and Poultry products | 2.61         | 2.17          | -2.98      | ±2.11        | significant     |
| Fish                      | 2.28         | 2.61          | 2.07       | ±2.11        | Not significant |

\*significant @5%

#### 4. CONCLUSION

In the light of the findings, it can be concluded that the developed nutri-scie card game is highly valid as a result of the validation. Nutri Scie Card game can improve food choice of school children.

#### CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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