



## The Teaching of Basic Nutrition Concepts for Grade 3 Students through A Nutrition-Based Card Game: Teachers' Perspectives

Dee Jean ONG, *College of Hospitality Industry Management, Suan Sunandha Rajabhat University, Thailand, [dee.on@ssru.ac.th](mailto:dee.on@ssru.ac.th) ORCID:0000-0002-4155-2819*

**Abstract.** It is becoming increasingly popular for teachers to use games to teach scientific concepts in the classroom. The use of card games for teaching nutrition concepts to grade three students is rare. Therefore, a nutrition-based card game called "Food Mission" was developed and modified to help teach grade three students basic nutrition concepts. Two elementary science teachers and 128 grade three students from two elementary schools in Nakhon Pathom Province, Thailand, participated in the study. Classroom observations and interviews were recorded and transcribed verbatim. Results showed that the "Food Mission" card game was engaging and fun. It was effective to some extent in helping students acquire simple food vocabulary and learning about the five food groups. The teachers became more confident in using card games in the classroom. This article discusses the implementation of "Food Mission" card game in the classrooms. It also provides guidelines for further enhancement of "Food Mission" card game in the teaching of basic nutrition concepts for grade three students.

**Keywords:** Game-based learning, nutrition education, elementary science teachers, grade 3

Received: 15.01.2021

Accepted: 10.02.2021

Published: 19.02.2021

### INTRODUCTION

It is becoming increasingly popular for teachers to use games to teach scientific concepts in the classroom. Nevertheless, there are differing opinions about the characteristics of game-based learning and its benefits. One important element in game is interactivity (Thornton and Cleveland, 1990). Dynamic visuals, rules, goals and interaction are central aspects of a game (Johnston and de Felix, 1993). While Baranauskas, Neto and Borges (1999) believed that the essence of a game is risk and challenge, Malone (1981) suggested that computer games are defined by four unique elements: fantasy, curiosity, challenge and control. *Fantasy* refers to the imaginary virtual world in which the activity is set up and is independent of the real world. Malone (1981) claimed that students' learning efficiency increased when they were drawn into the fantasy world. *Curiosity* is sustained when new information is continually introduced, together with unpredictable outcomes in a game. Although what happens in the game play is set apart from the real world, players are governed by a set of game rules. These rules guide players towards a goal and set boundaries which define player's actions and the game world. *Challenge* is described by the level of difficulty in a game. Players can set the challenge based on their abilities. *Control* refers to the players' decision-making in a game to solve different tasks to reach the goal.

Like computer games, similar characteristics are observed in educational games. Educational games should be motivating, arouse curiosity, engaging and challenging (Pivec, Dziabenko, & Beikircher, 2014). The unique element that defines an educational game is that instructional content is built into a game and blended with game characteristics (Garris, Ahlers, & Driskell, 2002). Game-based learning has a unique way to entice the students to want to enjoy the experiences repeatedly (Chen et al., 2012, Ernest, 1986; Kirikaya et al., 2010; Tobar-Munoz et al., 2017).

A good educational game should be engaging enough for the learner to want to play the game again. Literature review demonstrated that students benefitted cognitively in the increase of knowledge gain when they are engaged with the game (Delacruz, 2011). This was evident in Yien (2011)'s study where students in the treatment group had greater nutrition knowledge,

nutrition attitudes and learning attitudes towards food eating habits than students in the control group. Contrast to the control group, preschool students in the treatment group in Iran preferred to select more healthy food after playing the nutrition-based Snake and Ladder game (Hassanzadeh-Rostami et al., 2018). The Kaledo boardgame improved nutrition knowledge and dietary behaviour of students in the treatment group in Campania, Italy (Viggiano et al., 2018). Elementary school students had better memorization skills at the English vocabulary with the Dart board game (Puspasari and Malik, 2017). Vietnamese students acquired new English vocabulary by playing games (Nguyen and Khuat, 2003). Kindergarteners in the experimental class in Indonesia had better reading and writing skills when they learnt with word card games and picture cards (Ernawati et al., 2021). Word card media influenced children's early literacy skills (Iftitah and Dorlina, 2012) and early reading skills (Novianti, 2013).

Students are more motivated to learn when a teacher turns learning into play (Baines and Slutsky, 2009). Several studies (Chan and Lin, 2000; Zheng, 2008) mentioned that students' motivation and confidence can be enhanced when they achieve their learning goals in games. Whilst studies had shown that game-based learning can result in an increase of nutritional knowledge, dietary change or vocabulary acquisition, the use of game-based learning to teach nutritional concepts were skewed towards higher elementary grades. The use of card games for teaching nutrition concepts to lower elementary grade students was less studied. We have therefore simplified the Food Mission card game to meet the gap in the literature. This study will investigate the teachers' perspectives in using the Food Mission card game to teach basic nutrition concepts to grade three students.

## METHODS

The researcher first sought approval from the school principals for the teacher and student participation in the research. A formal invitation letter was then hand-delivered to the school and teachers detailing the purpose and nature of the research. Teachers attended the one-day training to learn about game-based learning and the Food Mission card game. 16 sets of Food Mission card games were prepared. Eight sets were given to each teacher after the training. Thereafter, the teachers informed the researcher for an appointed date and time for the classroom observation. Parent consent forms were distributed and collected prior to the classroom observation. Classroom implementations and interviews were video-recorded and transcribed verbatim.

### **Research Objective**

This paper attempts to investigate how the nutrition-based card game Food Mission helps elementary science teachers teach basic nutrition concepts to grade three students in the classroom.

### **Research Participants**

The research participants were two elementary science teachers and 128 students from two schools in Nakhon Pathom Province, Thailand. Two classes, total 48 students from School A participated. 2 classes of 80 students from School B. Each classroom implementation lasted 40 minutes with 20 minutes game play and 20 minutes teaching.

Both schools are prestigious government schools in the Nakhon Pathom Province. Science and Health subjects are taught in English in both schools. School A has a small class size of 20 to 25 students with a classroom teacher. Class size in School B is big, up to 40 students in a classroom with only one classroom teacher.

The elementary elementary science teachers are both female Filipinos and Masters graduates. Teacher A is 49 years old and Teacher B is 50. Both teachers had taught elementary students for more than 15 years. Teacher A teaches Science to grades three to six students. Teacher B teachers Health and Science to 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> graders.

### Research Question

This paper attempts to answer the following question: How does using the nutrition-based card game Food Mission help elementary science teachers in teaching basic nutrition concepts to grade three students in the classroom?

### Food Mission: A Nutrition-Based Card Game

Food Mission is a nutrition-based card game first developed to teach basic nutrition concepts to grade six students. The content was developed based on the Nutrition Flag indicated in “Figure 1.” Nutrition Flag is a dietary guideline implemented by the Thailand Ministry of Public Health (MOPH) to teach Thai citizens about healthy eating. The basic nutrition concepts included the different food groups: rice, rice products and other starchy foods group, vegetables and fruits group, meat and milk group, oil, sugar and salt group. Content of the Food Mission card game was validated by a panel of educational experts and elementary science teachers. The card game was later modified for playability for grade three students.

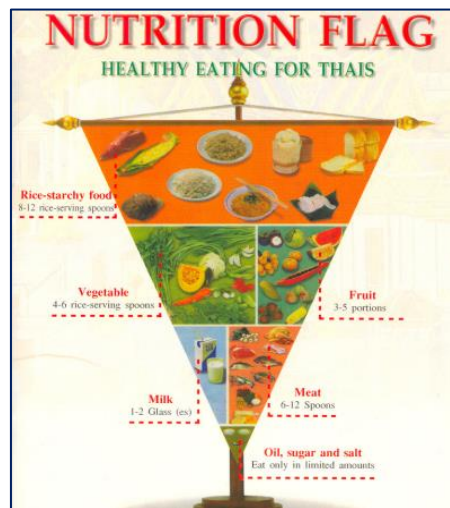


FIGURE 1. Nutrition Flag

### Card Design and Features

The Food Mission card design is attractive and colorful. It has an icon, a picture corresponding to the word and an inverted image like “Figure2.”

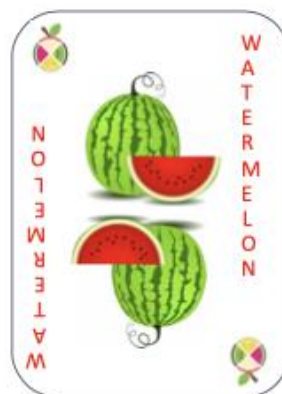


FIGURE 2. Nutrition Flag

Food Mission card game is made up of a standard deck of 52 cards with 13 types of food indicated in **“Figure 3.”** Food selection for the cards is based on conversation with local restaurant owners, fruit sellers and parents with elementary school-going children. Popular fruits and vegetables are mango, pineapple, watermelon, carrot, cucumber and pumpkin. Rice starchy food are staple food in the Thai diet like rice, noodles and buns. Meat group includes fish, shrimp and chicken. Milk group are all milk-based products sold in Thailand.



**FIGURE 3.** *The Thirteen Types of Food in Food Mission*

Five different icons are used to represent the five food groups. This is shown in **“Figure 4.”**



**FIGURE 4.** *Icons Representing the Five Food Groups*

A homemade prototype was used for the research purpose. The card was resized from 89mmx64mm to 85mmx55cm for better grip. The cards were printed on 180gram A4 paper with an Ink-jet printer and laminated for durability. The four sides of the cards were trimmed with a round cutter for safety. A total of 16 sets were made (8 sets each for the two schools).

The additional action cards were reduced from 22 to 14 cards for playability. These are: six WILD cards, four REVERSE cards, two SKIP and UNSKIP cards action cards as seen in **“Figure 5.”**



**FIGURE 5.** *Action Cards*

Simple and easy to follow game rules are used. The action cards are introduced to create challenge, strategic thinking and decision-making skills in the Food Mission card game.

### ***Teacher Training***

Prior to the classroom implementation, the elementary science teachers attended a one-day training workshop with the researcher. They learnt about game-based learning and the genesis of the Food Mission card game. They also learnt to play the Food Mission card game and the nutrition concepts embedded in it. Two weeks later, the researcher visited the teachers to observe their classroom implementation at an appointed date and time.

### ***Classroom Implementation***

Teacher A conducted the game in the science lab. She pre-assigned the students in groups of six based on their personality, abilities and needs. Prior to the classroom implementation, she already pre-trained all the students by electing a student-leader in each group to play Food Mission card game. She started the class by using power point presentation with real food pictures. After that, she instructed the student-leader to collect the cards and initiate the game play. She moved about in the classroom to facilitate the card game while the students played the card game. There were 23 students in the first class and 25 in the second class. The same process was repeated in the next class.

Teacher B carried out the game in the regular classroom. She pre-arranged the classroom setting into groups of eight, five students per table. She placed the students in mixed-ability groups based on their current needs (Ardasheva et al., 2019). Prior to the classroom implementation, she pre-trained all the students in groups of four. She made sure that all students knew the game rules. There were 40 students in both classes. She started the class by instructing the students to sit down while she distributed the Food Mission card game to each group. She instructed the students to start playing while she moved about in the classroom to facilitate the game play. After 20 minutes of game play, she instructed the students to tidy up and quizzed them using the questioning technique.

## **RESULTS**

Teacher A was pleased with how she could draw the attention of the grade three students with the Food Mission card game.

The Food Mission card game is very helpful for students and it's like a big help for teachers to introduce the game to students. Students can have fun and at the same time, they are learning and engaged throughout the entire period.

She said that before she was introduced to the Food Mission card game, she struggled to keep the grade three students interested in learning.

In the past, I used a lot of pictures to show in the power point presentation. I asked the students to categorize and classify the pictures into five groups. They get bored easily.

She enjoyed using the Food Mission card game to teach grade three students basic nutrition concepts.

I like the Food Mission card game. The students can learn about vocabulary. They can learn to categorize the food groups and they can follow directions of the game past. The Food Mission card game is like a mind game. [To win the game, students] must become aware or alert of the flow of the game. The game can help students develop decision-making skills.

It's a good motivation for the students to learn and to develop the [food] vocabulary, and to use their mind [to think] quickly. [...] Students are exposed to different types of pictures, even when they sleep, they can remember the pictures.

She suggested to “add more common food the students are eating like pasta” into the game. After she has introduced the game rules to the grade three students, they wanted to play Food Mission card game repeatedly.

Actually, they like that game because [game] is the trend. One thing that the Mission Food card game is different from the game outside is, it is educational. It is liked related to the topic, which is about nutrition. Another thing is they can develop their speaking skills like when they asked, “Do you have some ...”, “Do you have any ...”

Teacher B shared that her experiences in using the Food Mission card game to teach basic nutrition concepts in grade three students had allowed her to gain new insight in game-based learning

I am very glad to use game-based learning with my students. For example, if the students are so tired and bored sometimes, this is the time you can make them happy [by playing card games]. When they play the Food Mission card game, they can motivate themselves and to become more interactive with other students.

I am 100% for game-based learning. [I believe that game-based learning] will help the students to enhance their interest in learning and to motivate them. This is one way we could assess the students’ knowledge about what they know about the names of the food, the food type and what they eat.

Food Mission is a very simple but effective game. It can help the students to enhance the brains’ memory by reflexing the brain memory muscles.

She mentioned that she was excited to teach basic nutrition concepts to the grade three students with Food Mission card game. She saw that

After the students learnt to play the Food Mission card game, they kept asking when they could play it again. At the end of the game, you can see the interest of the students, going back to the lesson. They are looking forward to play the Food Mission card game again.

Both teachers reported positive feedback about using the Mission Food card game in the classroom to teach basic nutrition concepts to grade three students.

## **DISCUSSION and CONCLUSIONS**

From this study, we found that elementary science teachers enjoyed using the Food Mission card game to teach basic nutrition concepts to grade three students in the classroom. When the teachers have the knowledge of game-based learning and how to implement the card game in the classroom, they become more confident in using the Food Mission card game. Both teachers found that grade three students began to acquire new food vocabulary and were able to ask simple questions in English after playing the Food Mission card game. Similar observation was found in “Quartet Card”, teachers reported that the card game motivated the students to speak in English in a playful context (Elviza and Ratmanida, 2019). The teachers become more motivated to use game-based learning in the classroom.

The elementary science teachers also reported that the students like the Food Mission card game because it was easy to play. It appeared that the level of difficulty was dependent on how well the students performed in the game. Consistent with Smith (2003) and Cordona et al. (2008) findings, elementary school students enjoyed the gameplay because they had fun. The psychological basis of gameplay in learning is constructivism as it helps construct knowledge (Agarkar, 2019).

The elementary science teachers mentioned that pre-training the students has created a positive game-based learning environment. Co-construction of learning opportunities happened between teachers and students when teachers adopted the role of empowerers, scouts, scaffolders and assessors (Bishop et al., 2020). They felt that games can be a good teaching tool

to replace the pencil-and-paper learning. The Food Mission card game had the potential to be utilized as a teaching and learning tool to teach basic nutrition concepts to grade three. Several studies mentioned that the materials and game content in sustained play could influence students' increased knowledge of science knowledge (Mostowfi et al., 2016). The colorful cards and attractive visuals appeared to appeal to the students and promoted their learning interest (Kirikkaya et al., 2010). Visual graphics were necessary for helping students to have better understanding of the topic (Guo et al., 2018).

Overall, the findings suggest that the use of educational card games in classrooms can be effectively applied to a wide range of audience and disciplines. Educational card games can be used as supplementary teaching materials for science teachers.

The teaching of basic nutrition concepts in grade three students through a nutrition-based card game is useful and enjoyable for both teachers and students. Elementary science teachers were open to using game-based learning to teach basic nutrition concepts in the classroom. Game-based learning appeared to be an appealing way for them to capture grade three students' attention in learning basic nutrition concepts in the classroom. In general, grade three students appeared to enjoy playing Food Mission card game. Game-based learning was a fun way of teaching and learning basic nutrition concepts. It is envisioned that following implementation of the Food Mission card game, elementary science teachers can facilitate subsequent classroom teaching via a game-based learning approach.

## ACKNOWLEDGEMENT

The researcher expresses her gratitude towards the educational experts, principals, elementary science teachers and student participation in this research.

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