

Development and Validation of Sci-Math Board Game for Teaching Selected Topics in Science and Mathematics 6

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Abstract: Filipino learners struggle to grasp concepts in science and mathematics and frequently have low performance in these subjects. The purpose of this study was to develop and validate a Sci-Math board game to help elementary learners understand concepts in science and mathematics. The Borg and Gall R&D model was utilized by researchers, in the following phases: identification of learning competencies, development of Sci-Math board games, and validation of Sci-Math board games and instructional material experts. The findings indicate that the Sci-math board game is highly valid.

Keywords: Sci-Math Board Game, Instructional Materials, Filipino learners, low performance.

1. INTRODUCTION

A recent study found that educational board games are a great way to help children learn while having fun. As we observe in this fast-changing world of education, young learners of today's generation have a small span of attention. To provide a unique opportunity to teach students, games can be a great option to use as an instructional tool for them to acquire skills in an interactive and engaging way [1].

Board games are a valuable tool for reinforcing classroom lessons while also promoting problem-solving, teamwork, decision-making, and strategic thinking [2], [3]. In addition, they can help improve literacy and numeracy skills, promote healthy competition and cooperation, and even teach important life lessons [4], [5]. The versatility and wide variety of board games can be used in the classroom to suit any age or grade level.

The Philippines has one of the highest dropout rates in Southeast Asia. The Department of Education reports that around 1.5 million students drop out of school every year, the majority of whom are in Grades 5 to 6. In an effort to address this, various non-government organizations (NGOs) and private companies have designed educational board games that aim to teach basic subjects such as Math, English, and Science.

These games come in different formats, from card games to table top games to apps. They typically hold great potential for helping students learn while having fun.

The Department of Education released DepEd Order No. 32 s. 2015 in order to create localized, contextualized, and indigenous learning resources in schools. This order posits criteria for Philippine elementary and secondary schools for the development and use of instructional materials with suitable learning competencies and in the teaching and learning process. Teachers know that students learn best when they are engaged. Board games provide a fun and interactive way for students to learn. Not only do students have the opportunity to practice their academic skills, but they also develop important social and teamwork skills. This Sci-Math Board Game was designed to help learners fully understand the concepts of science and mathematics [6].

Research Objectives:

1. Develop Sci - Math Board Games for specific Elementary Math and Science topics that may be utilized as educational resources.
2. Validate Sci - Math Board Games among elementary teachers and learners.

2. THEORETICAL/CONCEPTUAL FRAMEWORK

With strong foundations in the constructivist approach of Vygotsky, Piaget, and Dewey, where Concept-Based Instruction started, it can be effectively used when there is an underlying teaching theory and principle like the meaningful theory of learning by Ausubel [7]. Ausubel's theory emphasizes meaningful learning. Individuals must link new knowledge to important ideas they already know, as to their concept, in order to learn meaningfully. New information should interact with the learner's conceptual basis [8]. This study offers a Board Game based approach that minimizes the user's learning curve and aids in the integration of game material as the player progresses. Such an approach may be used in both educational and non-educational video games, always giving context, i.e. relevant material, through the design of board games.

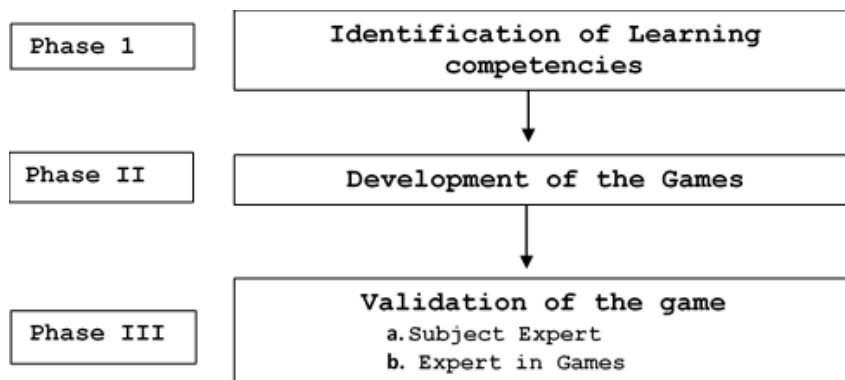
Conceptual Framework

Figure 1: The research paradigm depicts the different processes of game preparation and validation.

The research paradigm covers the stages of the game development process.

These were divided into three phases. This study's phase 1 is the identification of learning competencies, followed by phases II and III, which are the development and validation of the game [9].

3. METHODOLOGY**Research Design**

This study used the Bough and Gall R & D model. It is here that the educational game will develop and validate to use the basic level. Especially for those who will prepare and validate it. The R & D paradigm shows research through the R & D cycle (Fig. 1).

Locale and Respondents of the Study

A total of twenty-four (24) respondents, twenty (20) Grade Six pupils, and four (4) teachers of Cabatacan Elementary School for the S.Y. 2021 – 2022.

Research Instrument

The researcher used the developed Sci-Math board game. A face validation tool was designed wherein a questionnaire was used to evaluate the game. In this, the following scale will be used: 5 – highly – valid; 4 – valid; 3 – undecided; 2 – invalid; 1 – highly invalid. The questionnaire will use to determine the validity of the board game. It consists of 4 sub-criteria as follows: the material used, rules, questions, and the Sci–Math board game itself. Space for comments and suggestions is also included below the questionnaire [9] – [11].

Research Procedure

Initially, the researchers forwarded a letter of approval to the concerned offices for the conduct of the study. First to the president of Apayao State College, then to the school's division superintendent of Apayao Division, and the school heads where the validation try-outs were conducted.

After approval has been made, learning competencies were reviewed and identified as the basis for the development of the game. Then, Sci-Math Board Games were developed. 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.

Statistical Treatment of Data

The mean was used to describe respondents' response to each statement of the face validation

Table 1: Limits and verbal description from the scale has been used in the study.

Scale	Limits of Description	Verbal Description
5	4.20 – 5.00	Highly Valid
4	3.40 – 4.19	Valid
3	2.60 – 3.39	Undecided
2	1.80 – 2.59	Not Valid
1	1.00 – 1.79	Highly Not Valid

4. RESULTS**The Game and its Rule: How to Play the Game****1. About the Game:**

The game is similar to and patterned after the snakes and ladders board game. Only math and science concepts are intended in the game.

2. Start Playing:

The player who rolls the die with spot 1 first gets to enter the board (sometimes 6). To enter the board, each subsequent player must likewise toss a 1 to 6. A new die must be rolled to determine how many squares the player joining the board can advance at first. Put the marker in the appropriate square. Only one die roll is allowed per player [12] - [14].

3. Continue Playing:

Each of the players will take a go. The person with the highest number starts first. The second highest goes next and so on. But do not move the counter.

4. Board 1: Nutritious VS Junk Foods**a. Junk Foods:**

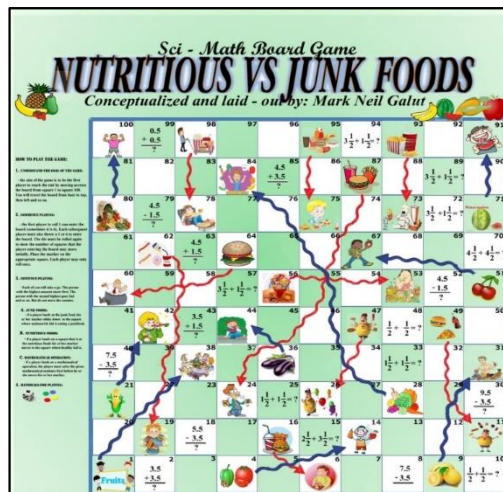
- If a player lands at the junk food, his/her marker slides down to the square where a malnourish kid is.

b. Nutritious Foods:

- If a player lands at the nutritious foods his/her marker moves to the square where a healthy kid is.

c. Mathematical Operation:

- If a player lands on a mathematical operation, the player must solve the given mathematical sentence first before he or she moves his/her marker.



4. Board 2: Biodegradable VS Non-Biodegradable Wastes

a. Non - biodegradable:

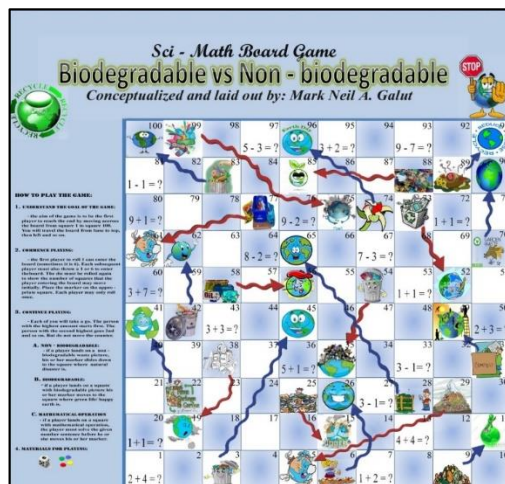
- If a player lands at the non - biodegradable, his/her marker slides down to the square where sad and sick earth is.

b. Biodegradable:

- If a player lands at the biodegradable waste his/her marker moves to the square where a happy and healthy earth is.

c. Mathematical Operation:

- If a player lands on a mathematical operation, the player must solve the given mathematical sentence first before he/she moves his or her marker.



5. Board 3: Renewable VS Non-Renewable Energy

a. Non-Renewable Energy:

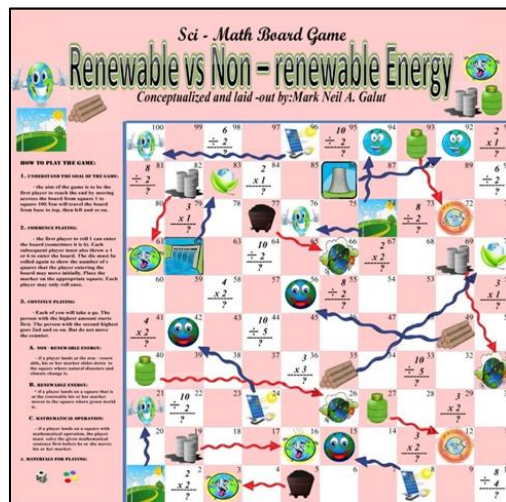
- If a player lands at the non-renewable energy, his/her marker slides down to the square where sad and sick earth is.

b. Renewable Energy:

- If a player lands at the renewable energy his/her marker moves to the square where a happy and healthy earth is.

c. Mathematical Operation:

- If a player lands on a mathematical operation, the player must solve the given mathematical sentence first before he/ she moves his/her marker.



Validation

Degree of the agreement for both teacher and students on the developed board game in some specific criteria:

Criterion	Computed mean	Descriptive value
Materials used are:		
• suited to the activity	4.80	Highly valid
• easy to the activity	4.88	Highly valid
• easy to use	4.80	Highly valid
• appropriate to the game	4.76	Highly valid
• user-friendly	4.92	Highly valid
MEAN	4.83	Highly valid
The rules are:		
• easy to follow	4.88	Highly valid
• highly implemented	4.88	Highly valid
• concise and clear	4.88	Highly valid
MEAN	4.88	Highly valid
The questions are:		
• based from mathematical topic	4.88	Highly valid
• clear and easy to understand	5.00	Highly valid
• challenging	4.00	valid
• categorize into easy, average, difficult	4.80	Highly valid
MEAN	4.67	Highly valid
The Sci – math board game is:		
• captivating	4.80	Highly valid
• an aid to enhance the student learning ability	4.76	Highly valid
MEAN	4.78	Highly valid
GRAND MEAN	4.79	Highly valid

The mean in its criterion showed a score ranging from 4.67 to 4.88 which means that the respondents agreed that of Sci – Math board game is highly valid. It is also justified by the grand mean of 4.79 describe as highly valid.

5. CONCLUSION

Based on the results, it can be concluded that Sci-Math board game developed is highly valid.

6. RECOMMENDATION

The following are forwarded as recommendations:

1. The use of Sci – math board game as teaching tool for specific learning competencies in teaching Science and Math.
2. Encourage Science and Math teachers to use Sci – math board game in delivering the lessons to catch the learner's attention and desire to keep their focus on the lesson.
3. Test the effectiveness of sci - math board game on other groups of learners.
4. Develop other instructional games for specific topics in Science and mathematics.

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