

Innovations

Game-Based Pictoword: Science Teaching Innovation for Basic Education

Maria Lourdes G. Tan (EdD)

Leyte Normal University

Abstract: *Game-based pictoword, as an intervention, responded to the quest for making learning an enjoyable experience for students. As a science teaching innovation, this action research design study aims to enhance the science vocabulary words of ten junior high school students who were purposely selected as participants. Data were obtained using an interview guide through in-depth interviews, focus group discussion, and observation. Thematic analysis was used to analyze the qualitative data gathered from the participants. It is anchored on the theory of Constructivism and Mayer's cognitive theory of Multimedia Learning. Findings revealed the students' difficulties in terms of science vocabulary words include understanding the meaning of the word, pronouncing the word correctly, and writing the correct spelling of the word. The coping mechanisms of students include reading their science books, searching for the meaning in the science dictionary, google search using their phones, and asking for help from their science teachers. Results of the study pointed out that Game-Based PictoWord helped enhance students' science vocabulary through an increased number of science vocabulary words learned, giving the correct meaning, pronunciation, and spelling of the science terms, and improved performance in the science subject, both hands-on and mind-on activities. It is suggested that game-based and other interactive activities be integrated into different science fields for comprehensive assessment resulting to an effective and efficient teaching and learning processes.*

Keywords: *Game-based-pictoword, science vocabulary, innovation, grade 7 students, action research*

1.0 Introduction

Teachers incorporate games inside the classroom to help learners gain interest and be motivated to learn. Game-based pictoword lightens up the teaching-learning atmosphere, and learners enjoy learning with the pictoword through games. Learners pay more attention when they want and do even better (Vernon, 2009).

Games create a meaningful bond between the teacher and the learners. For instance, if the teacher correctly plans to use a particular game and successfully incorporates the game into the teaching and learning process, learners have fun and learn the vocabulary. Piaget also supported the contribution to developing problem-solving, creativity, vocabulary, and communication skills, which happen naturally while playing language games (Sylvan, 2012). As claimed by DuBois et al. (2007), the combination of both the Pictoword game and the spelling activity created a fun and meaningful experience for the learners since vocabulary and spelling became more fun and engaging at the same time, not only for the learners but for the teacher as well. Moreover, with the use of games, the students become active learners as Dogg (2012) cited that games could create a convenient and friendly atmosphere in which everyone inside the classroom enjoys and bonds with each other. In addition, it serves as an avenue to practice vocabulary and communication skills (Ersoz, 2010).

Gamification, used in digital pictowords, is an emerging trend, especially in education, for creating gameful experiences (Koivisto & Hamari, 2014). It is used as a tool to promote fundamental things like learning, which is why the widespread interest that gamification is attracting lies in its capability to strengthen engagement, change behaviors, and support innovation. Dominguez et al. (2013) posited that gamification also takes off in education since it supports and motivates learners. It can also lead to enhanced learning processes and outcomes (Kapp, 2012). However, game-based learning mainly emphasizes a type of gameplay with defined learning outcomes rather than that of gamification (Shaffer et al., 2005). In addition, digital pictoword and gamification relate to one another since pictoword is a game-based learning tool that creates meaningful learning engagement of learners through PowerPoint presentations, the latter of which is incorporated with modern digital tools for creating learning materials.

Theories supported the claim of the role of games in improving students' vocabulary. The constructivist theory of Piaget (1973) and Mayer's cognitive theory of multimedia learning (2014) guided the inquiry into the different relationships among the variables in the learner's learning of new things, such as concepts and experiential learning.

Constructivism learning theory affirms that knowledge is best gained through action, reflection, and construction. This claim supported Piaget's theory, where people gain and learn meanings based on their experiences and everyday exploration of things or learning by doing. According to Templeton (2002), Piagetian theory highlighted that spelling skills and techniques were learned through a series of qualitatively distinct phrases that different sources of comprehension used. In relation to this, the study of Fauzi and Aziz (2020) aimed to make the learners aware of mental spelling at higher levels, including visual

imagery that they can effectively utilize to enhance their spelling and vocabulary skills. In addition, Gardner's (2004) theory of multiple intelligences also reinforces the concept that using a digital imaging system was also considered an aid to the spelling strategies, allowing the students to express their emotions and feelings.

The aforementioned theories hold onto the presumptions that auditory and visual are two channels for learning. As cited in Mayer and Moreno's (1999) Cognitive Theory of Multimedia Learning, profound learning occurs when information is presented in both text and graphics rather than by text alone. It highlighted how words and pictures that teachers use for instruction are essential and effective. Incorporating multimedia learning verifies the concept of understanding how a person's brain processes information, which is why proper utilization and incorporation of media in the teaching-learning process is beneficial since it captures the learners' interests. Using multimedia in a class discussion is like adding spices to a food to make it more delightful and tastier. Learners will find it dull if they constantly see words in front of them and keep listening to the teacher alone without incorporating any pictures and multimedia.

Moreover, the Cognitive Theory of Multimedia Learning (CTML), as applied in the study of Kanellopoulou et al. (2019), examines how people learn from multimedia presentations. The theory is based on Witrock's (1974) Generative Theory and Paivio's (1980) Dual-Coding Theory. It supports the notion that learners build meaningful connections between words and pictures and later process them actively in their long-term memory.

Yawiloeng (2020) learners viewed audiovisual media as helpful to their easier understanding of the meaning of a particular language and even with other subject areas. For instance, vocabulary images presented in the video or PowerPoint presentations were viewed as interesting and helpful for understanding science vocabulary. Hence, learners could understand unfamiliar words through images representing the words and understand the meaning of the words. Yawiloeng (2020) also claimed that in this digital era, previous studies have investigated the effects of multimedia in promoting learners' vocabulary knowledge while facilitating second language learning development. Likewise, Shao's (2012) study showed that vocabulary acquisition and learning can derive from applying effective multimedia in a classroom.

Meanwhile, Tabar and Khodareza (2012) found that multimedia supported the learners in learning and retaining significant information, such as more vocabulary, compared to participating in teacher-led groups alone. In essence, the findings of the previous studies on vocabulary learning showed the interconnectedness between using multimedia materials and vocabulary learning. However, some studies still neglected how multimedia modalities can enhance language learners' vocabulary learning. Specifically, multimedia and games play significant roles in

teaching and learning since both learning tools enhance and help improve the learners' vocabulary, whether in Science or other subjects. Therefore, the CTML theory has implications for research on learners' vocabulary learning, in which multimedia can promote such learning by connecting visual and audio information to enhance learners' vocabulary knowledge.

Specifically, the study is conducted to determine the difficulties encountered by Grade 7 students in terms of the meaning of science vocabulary words, pronunciation, and spelling. It includes how students cope with problems and suggestions for enhancing the implementation of Game-Based Pictoword as an innovative science strategy in basic education.

The gap between previous studies was the limitation of showing or presenting pictowords through games as learning tools to enhance students' science vocabulary words. Further, there were still limited studies about employing game-based activity, referred to in this study as pictoword.

How is the implementation done? The actual implementation of game-based pictoword as an intervention tool includes strategies and solutions and an understanding of its nature and characteristics.

The study focuses on enhancing the grade 7 students' science vocabulary using "Game-Based PictoWord," incorporating games as a learning tool through PowerPoint presentations, to enhance the grade 7 students' science vocabulary words. It allowed a fun, meaningful learning atmosphere and building collaborative relationships. Instead of the main subject of the class being covered, this kind of game-based learning method aims to enhance students' science vocabulary words while being motivated to learn.

During the actual demo onsite, the students participated the games aided with PowerPoint presentations through PictoWord, Jeopardy, and Word Collage. With this, the researcher preferred Game-Based PictoWord, a game-based learning tool, to enhance the vocabulary words of Grade 7 students in the science class. Students actively participated in the class with the use of their cellular phones. It demonstrated that learning resources, classroom environment, and technical configuration play a vital role in implementing Game Based Learning or GBL (Dickey, 2011; Sabourin & Lester).

What are the nature and characteristics of the Pictoword Game? It is a vocabulary learning game that can help enhance learners' vocabulary mastery with the help of their gadgets. It is one of the vocabulary games that is essential in the teaching-learning process since it helps in improving the vocabulary mastery of the learners not only in the acquisition or learning of a language but also in other learning areas or subjects, such as Mathematics, Filipino, Science, AralingPanlipunan, etc. In this part, the researchers review the definition of the Pictoword Game, the application of the Pictoword Game, and the advantages of the

Pictoword Game. According to Pratiwi et al. (2023), Pictoword Game is a word puzzle game developed by Kooapps; the player must "read" the two shown pictures to form the correct word hidden behind the two images linked together by the word formed. In the Pictoword Game, the players must guess the picture that becomes the clue to string the correct words; in the application, two images are next to each other, and a player has to guess the picture. Below the two pictures, letters are randomly arranged to fill the sentence above. In the game, a help column can help players guess sentences; if players need help, then the player can click on the bottom right to get the clue. Pictoword Game is hilarious and challenging. For instance, it sounds simple but has a twist because it is not as easy as other vocabulary games, such as Wordscapes.

One of the advantages of playing the Pictoword Game was that it made the learners practice their logical thinking and add new vocabulary from the existing ones. Learners are more interested in learning when the teacher utilizes visual media or images to attract students (Pratiwi et al., 2023). For instance, visual or learning aids from a PowerPoint presentation are one example that captures the learners' learning interests since they can view images or videos on the TV screen or what is projected on the projector. With the help of visual media, the teacher can use it as an alternative to make the learners more active and participative in the classroom. Further, Pratiwi et al. (2023) pointed out that Pictoword Game is one of the interesting vocabulary games that can make the learners feel challenged but learn simultaneously as they will be more curious to play it. They will remember and explore new vocabulary. Consequently, the Pictoword Game shows a picture and gives many rewards when the players win the stage, encouraging learners' engagement with it.

Moreover, Pratiwi et al. (2023) concluded that based on the data analysis, the Pictoword Game Application as media for learning science vocabulary words is more fun and makes learning easier for students. The results of the post-test and questionnaire were obtained from the experiment class. Learners think that learning through pictures is fun and not stressful or dull. Most researchers use media pictures or photos because this application is easy to understand and provides many explanations compared to words. Using images from the Pictoword Game Application should optimize learners' interest and level their motivation in learning when they can see or view images in front of them rather than merely discussing through words. Thus, based on the conclusion of all the data in the research, there are significant differences in the student's vocabulary mastery when using Pictoword Game.

In addition, the study of Annisa (2019) showed that using the Pictoword Game could help students learn vocabulary much easier yet in a fun way, stimulate students to learn more actively, and increase their vocabulary achievement. On the

other hand, Widaningsih (2009) asserted that puzzles or crossword games can also help students enhance their learning performance. For instance, teaching vocabulary using puzzles is a great way to achieve poor language learning performance. A puzzle game can also create an attractive and engaging teaching-learning process. Widaningsih (2009) also added that learners can successfully practice, learn, and explore new vocabulary. They can only achieve such learning if teachers see and use various adequate vocabulary and learning techniques to stimulate and cater to their needs.

Furthermore, Jiang's study (2014) explained how the picture-word inductive method (PWIM), one of the teaching approaches, was effective in teaching and learning. Wang et al. (2008) asserted that PWIM is a teaching approach which combines both constructivism and behaviorism. According to Wang et al. (2008), PWIM focuses on the learners' understanding of pictures, together with the meaning of words, phrases, sentences, and paragraphs, which is according to the constructivist ideas of learning (Von Glasersfield, 1987). PWIM is an instructional approach to enhance vocabulary acquisition and inductive thinking.

Thus, according to Annisa (2019), the Pictoword Game is one alternative way of promoting vocabulary activity to change the learners' mindset, in which vocabulary is not only learned by reading and memorizing words from a dictionary but also through answering a series of questions on paper aided by multi-media.

2.0 Methodology

2.1 Research Design

This study is qualitative research using an action research design. Action research design is a research method that aims to investigate and solve an issue simultaneously. It is a highly interactive method often used in social sciences, particularly in educational settings (George, 2023). Action research designs are systematic procedures teachers use to gather information about and subsequently improve how their educational setting operates, teaching methods, and student learning. Further, action research is an inquiry to understand, evaluate, and modify educational programs to improve educational practice (Koshy, 2005 & Bassey, 1999).

2.2 Research Participants

The participants in this study were Ten Grade Seven (7) students in one of the Junior High Schools in Leyte for School Year 2022-2023. Participants were given consent forms, and their availability was considered in the conduct of the classroom observation, in-depth interview, and focus group discussion. Confidentiality of information was observed, and pseudonyms were used in the transcript adhering to the Data Privacy Act.

The researcher utilized a purposive sampling technique to select participants for the study. Purposive sampling is one of the nonprobability sampling techniques that is selected based on the purpose of the study and the population's knowledge (Creswell, 2012). It is also known to squeeze a lot of information out of the collected data. This sampling technique also allows the researcher to describe the significant impact of the findings.

2.3 Research Instrument

The validated researcher made instrument which is the interview guide was used to conduct the in-depth interview and focus group discussion (FGD). The instrument is divided into two parts: Part I aims to gather participants' profiles, such as name, age, course, and grade level. Part II is composed of open-ended questions on the difficulties, coping, and how the intervention material helped enhance the science vocabulary words of the students. In order to triangulate the data gathered, the researcher used observation notes during actual science class observations and recorded video teaching using game-based pictoword as intervention material.

2.4. Data Analysis

Braun and Clarke's (2013) thematic analysis was used to analyze the Qualitative Research Data obtained from the Observation, In-depth interview, and Focus Group Discussion (FGD). It is a method for describing data that involves interpretation in selecting codes and constructing themes. The analysis consisted of six steps: (1) Becoming familiar with the entire data set. Transcripts were read repeatedly and exhaustively analyzed to gain a complete understanding of the data, highlight essential answers, and take note of the themes and codes. The participants' responses were highlighted by pointing out verbatim keywords and phrases that supported the topic (2) Generating initial codes. Here, encryption was performed openly and sequentially—the previously mentioned process generated seven codes. (3) Searching for themes. (4) Reviewing themes. (5) Defining and naming themes. Eventually, the process came up with three themes for the difficulties of the students in terms of science vocabulary words, namely, (a) Understanding the meaning of the word, (b) Pronouncing the word correctly, and (c) Writing the correct spelling of the word. Meanwhile, other themes emerge as their coping mechanisms, namely, (a) Reading the Science book, (b) Searching the meaning in the Science dictionary, (c) Searching on Google using their phones, and (d) Asking for help from their Science teachers. (6) Produce the report/manuscript. Here, the results of the analysis process were capsulized to align with the research question.

2.5 Ethical Consideration

Before choosing to participate in the study, the participants filled out an informed consent form. After they had given their consent, the interview and observation were undertaken. In compliance with the terms of Republic Act 10173, also known as the Data Privacy Act of 2012, the researcher guaranteed that any information received from the participants would be treated with utmost confidentiality.

2.6 Trustworthiness

Trustworthiness or rigor of a study refers to the degree of confidence in data, interpretation, and methods used to ensure the quality of a study (Pilot & Beck, 2014). In each study, researchers establish the protocols and procedures necessary for a study to be considered worthy of consideration by readers (Amankwaa, 2016). Lincoln and Guba created stringent criteria in qualitative research to establish trustworthiness, which is known as credibility, dependability, confirmability, and transferability. The credibility of the study, or the confidence in the truth of the study and, therefore, the findings, is the most important criterion (Polit & Beck, 2014). Thus, in this study, the researcher's approach to establishing the trustworthiness of the gathered information is authentic and valid

3.0 Results and Discussion

Difficulties of Pupils in terms of Science Vocabulary Words

Theme No. 1. Understanding the Meaning of the Word

According to the participants' responses, one of the difficulties in learning Science vocabulary words is understanding the meaning of a word without any images representing it. Without a series of images or pictures shown to the students, they would most likely be imagining what the teacher was presenting to them, which eventually led them to confusion about the meaning of the word.

Relative to this, Piaget's theory best explains this phenomenon in which people gain and learn meanings of a particular concept or word based on experiences and everyday exploration of things. For instance, if the teacher uses a particular word that the learners find confusing to understand concretely and applies it to real life, create a visual image that helps learners understand the word's meaning. Al-Tarawneh (2016) also explained that one of the challenges learners encountered in learning scientific concepts was a lack of scientific background, leading them to confusion between scientific terms and their meaning because the latter complications are denoted by implementing traditional science teaching. Furthermore, Yawiloeng (2020) explained that learners viewed audiovisual media as helpful to their easier understanding of vocabulary meaning. Hence, learners could

understand unfamiliar words through images representing the words and understand the meaning of the words.

Significant Response1: "I was able to understand the meaning of cell when the teacher showed a model of the plant cell and its parts using a power point" (P5)

Significant Response2." It is amazing I was able to see the actual egg cell from sperm cell and understand its meaning when teacher shows it using gumamela flower through picture and real one" (P2)

Theme No. 2. Pronouncing the Word Correctly

According to the participants' responses, the prominent difficulty they encountered was pronouncing the word correctly because they found the word profound and complex to pronounce. This finding was reinforced by the observation done by the researchers in SMP Kesatrian 2 Semarang within the study of Pratiwi et al. (2023), in which one of the main problems faced by students in mastering and learning a language, such as English, is lack of vocabulary. Apart from language learning, students also found difficulty in mastering and learning other vocabularies found in other learning areas, such as highfalutin words in Science, Filipino, and Mathematics subjects, among others. Hence, difficulty pronouncing the word correctly was one of the participants' dominant difficulties in learning Science vocabulary words.

Significant Response3: "I am nervous when called to recite since there are terms hard to pronounce like scientific names" (P7)

Significant Response4: "My classmates were laughing at me when I mispronounced the science terms "(P9)

Theme No. 3. Writing the Correct Spelling of the Word

Another difficulty the participants encountered was writing the word's correct spelling. Relative to this, the study of Fauzi and Aziz (2020) claimed that, indeed, the learners should be mentally aware of the word's spelling. Similarly, according to Templeton (2002), the Piagetian Theory of Constructivism highlighted that spelling skills and techniques were learned by following a series of qualitatively distinct phases with different sources of comprehension.

Significant Response 5: " I have difficulty writing the spelling of some science terms (P1).

Significant Response 6:" When we are told to explain the process of typhoon formation,I misspelled some science terms" (P8).

Coping Mechanisms of Students in terms of Science Vocabulary Words

Theme No. 1 Reading the Science Book

The participants' responses claimed that reading their science book was the coping mechanism they considered to address their difficulty in learning science vocabulary words. All the participants supported this. The science book was their primary source for looking for the meaning of the profound words that they found confusing and difficult to understand.

Significant Response7: "I noticed that the more I read the book, the more science vocabulary and its spelling became familiar." (P3)

Significant Response8: Reading our science textbook helped me a lot to connect the terms with the pictures presented by the teacher and its meaning (P10).

Theme No. 2 Searching the Meaning in the Science Dictionary

According to the data collected, the frequent response of the participants was in order to understand the word; they searched for its meaning in the science dictionary to supplement their understanding of what they had read in their science book. In the study of Annisa (2019), it was revealed that apart from merely searching for the meaning of the word from a dictionary, Pictoword Game is one of the alternative ways of promoting vocabulary activity to change the learners' mindset in which vocabulary is only learned by reading and memorizing the words from a dictionary, but through answering series of questions on the paper and using media mainly. Pictoword Game can effectively enhance learners' knowledge and help them analyze their vocabulary achievement.

Significant Response9: During our game activities, I refer to the Science dictionary to understand the term (P7).

Significant Response10: "Science and Webster's dictionary help me to know how to pronounce the science word." (P4).

Theme No. 3 Searching in Google using their Phone

The participants also added that searching through Google for the word's meaning was the easiest and most convenient way because they would tap the application on its search engine and type down what they were looking for, and then answer would already be there. However, they claimed that searching on Google was only an alternative when they could not understand the meaning of the word. Hence, using the Google application was still one of the primitive ways to find the answer to what was bothering the participants' minds.

Significant Responsell:" Google helped me " understand the meaning of science vocabulary (P6).

Significant Response 12: When confused about the meaning and application of the science term to another, I click GPT, and it gives me the clarification "(P8)

Theme No. 4 Asking for help from their Science Teachers

Finally, according to the participants' responses, the last coping mechanism was asking for help from their Science teachers. Teachers consider various ways to cater to the learners' needs so they have strategies and alternatives to effectively teach and ensure that he/she meets the learners' needs. With this, teachers utilize different tools and techniques, such as multimedia or games, in teaching-learning. Likewise, Mayer's Cognitive Theory of Multimedia Learning (2014) reinforced how the words and pictures used for instruction are essential and effective. Additionally, Mayer and Moreno's (1999) Cognitive Theory of Multimedia Learning asserted that profound learning occurs when information is presented in both text and graphics rather than by text alone. The abovementioned theory holds onto the presumptions that auditory and visual are two channels for learning. Moreover, according to Tolentino et al. (2018), teachers nationwide adapt to the changes brought by the new curriculum in producing holistically developed and globally competitive learners, particularly in science.

Furthermore, according to Chirandon (2010), using a game is one of the effective techniques teachers use to stimulate learners' interest in learning. A game can help improve learners' vocabulary mastery and, at the same time, their communication and critical thinking ability. Teachers must continue to innovate strategies and approaches to make science teaching and learning more engaging, fun, and collaborative through various fun activities. Thus, incorporating Pictoword Game as a vocabulary learning game that can help enhance learners' vocabulary mastery in Science class. As explained by Rogayan and Macanas (2020) learning to think critically is an essential skill that learners must manifest through vocabulary games. Games involving vocabulary activities are essential in the teaching-learning process since it helps in improving the vocabulary mastery of the learners not only in the acquisition or learning of a language but also in other learning areas or subjects, such as Mathematics, Filipino, Science, Araling Panlipunan, etc.

Significant Response 13: During solving problem, when confused about the science term, I asked help from our science teacher" (P5)

Significant Response: 14" I take note of the terms that the teacher says which are challenging to understand, and I asked what it means after class" (P2)

Conclusions

Game-Based Pictoword help enhance science vocabulary, pronunciation, spelling, and understanding of the term's meaning. The said learning game tool helped identify who among the participants were having difficulties in learning science vocabulary and how students coped with their difficulties. Based on the data collected, students were more engaged in participating during science class because of the Game-Based Pictoword, which helped them understand the word and its meaning, pronunciation, and spelling and made the teaching and learning process fun and engaging.

Recommendations

The researcher recommended the incorporation of Game-Based Pictowords in teaching. The study could also be extended to other science disciplines and subjects for a comprehensive assessment of the effectiveness of the intervention game-based tool. Incorporating Pictoword Game as a vocabulary learning game can help enhance learners' vocabulary skills in Science and other subject areas. Teachers must continue to innovate research game-based strategies and approaches to make science teaching and learning more engaging and fun.

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