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# AGRI O 'DI AGRI: An Educational Game-Based Learning In Teaching Fruit And Wooden Trees

**Joshua R. Teoxon[1], Gio Kasim B. Guevarra[2], Clark Haven Romitman[3], Rogge Joseph Peduca[4], Flannan Joy Z. Duero, Rob Tare[5], Mark Anthony R. Aribon III[6]**
[1,2,3,4,5,6] *Polytechnic University of the Philippines, Quezon City, Philippines*

Abstract

Both people and the environment depend on trees in important ways. The presence of trees around can enhance people's physical and mental well-being, children's focus and test scores, and neighborhood property values. Game-based learning refers to the application of specific gaming concepts to real-world settings to engage the students. Agri o Di Agri is an educational game designed for students specifically in grade 6 of the Philippine K-12 Curriculum. The game includes active participation from the learners and its goal-directed storylines as well as activities to apply their learned knowledge. Moreover, students choose between two options in every stage: Agri or Di-Agri like a true or false test question. This study presents the usability of the system involving five (5) students using the System Usability Scale (SUS). Based on the findings, the researchers therefore concluded that students were highly pleased with the game's usability. SUS score revealed that the students are very confident in playing the game, that the system is easy to use, and the functions are well integrated. Future work includes the development of a full-fledged, programmed system and the use of a quasi-experimental research design to determine its efficacy.

Article Info

*Keywords:* Influence, Game-based learning, Educational game, User-experience, Usability testing, Gamification

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## INTRODUCTION

Trees play a critical role for humans and the environment (Turner, 2019). Studies have shown that the presence of trees can improve people's mental and physical health, students' academic performance and neighborhood property values (Turner-Skoff and Cavender, 2019). While trees can provide economic benefits, they can also be a source of food in a community. As the human population continue to increase (United Nations, 2015), the researchers want to make people, especially children, aware of the value of planting trees and their adverse consequences. To ensure food security and improve the well-being of the growing and expanding populations, more trees must be planted.

Matsuoka (2010) revealed a significant positive relationship between trees and the students' academic performance. Similarly, games can provide engaging learning experiences to students. Game-based learning refers to the application of specific gaming concepts to real- world settings to engage people (Trybus, 2015). It also increases students' motivation and allows them to be more engaged with educational materials in a playful and dynamic way. It is designed to help educators to balance subject matter with gameplay to retain and apply the knowledge learned by the students to the real world. Students must own their learning, moreover, McClaskey (2018) stated that ownership to learning means that a learner is motivated, engaged and self-directed. It implies that they can monitor their own progress and are able to reflect on their learning based on mastery of content. Thus, the game, Agri o Di Agri, is a game that helps students to hit that optimal experience to become more engaged with the subject matter.

Agri o 'Di Agri is an educational game designed for students, specifically the 6th graders, in the Philippine K-12 Curriculum. This game aims to teach students the difference between wooden trees and fruit-bearing trees and its benefits to human and the environment. The game involves active participation from the students, goal-directed storylines, and practical application exercises for the material learned. Further, this game is based on one of the lessons in Edukasyong Pantahanan at Pangkabuhayan (EPP): Benepisyo ng Punongkahoy and Bungangkahoy (Benefits of Wooden and Fruit-Bearing Trees). The game includes game elements such as rewards, motivation, and graphics that engages the students while playing the game.

In this game, students choose between two options in every stage: Agri or 'Di Agri like a true or false test question. For each correct response, the game will give a brief explanation of the item so that students can read and understand about trees, then move on to the next item. If a student gives an incorrect response, however, the game will share some awareness of the effects of a lack of trees in the environment, and they will be prompt to go back to the previous question. Additionally, by interacting with an in-game character as it progresses to a new level, the player has complete control over the pacing.

The game was created using the Microsoft PowerPoint application. The primary objective of this study is to ascertain how successful the material may be utilized in the classroom setting, hence the creators gathered respondents to examine the usability of the material rather than its efficacy. Additionally, testing was done using the System Usability Scale (SUS) to identify any improvements that could be made as a future work to enhance the user learning experience.

## AGRI O 'DI AGRI

### *1. Storyline*

De Freitas (2011) stated the importance of narrative in game-based learning that it provides a cognitive framework for problem-solving. In the game Agri o 'Di Agri, this depicts a story of a farmer that explores various punongkahoy and bungangkahoy (wooden and fruit bearing trees) and their importance. The farmer or the player must choose the appropriate option for the seed to mature into a tree. On the other side, if people chose the incorrect response, they would witness the consequences of an absence of trees in the environment. As the game progresses, the level will become more challenging. The sapling tree will eventually show up on the screen when the farmer reaches the last level, at which point they can go on to the game's final task.


Figure.1 Agri o Di Agri

**2 Path**

The game treasure hunting for pirates inspired Agri o 'Di Agri. Researchers modified and created a game that is nearly identical to it, except a farmer is the one who obtains the seedling tree in the pot.

A map will show once the game has begun so that the participants can go on to the first level. Each stage must be passed by the players. The sapling tree increases with each right response. The fully developed sapling itself is the objective at the game's conclusion.

There are a total of 10 questions in the game, five (5) items cover identifying which tree is being presented and five (5) items prompts to defining the importance of trees. Students who have little to no prior understanding of different trees and their importance are the intended users of Agri o 'Di Agri.

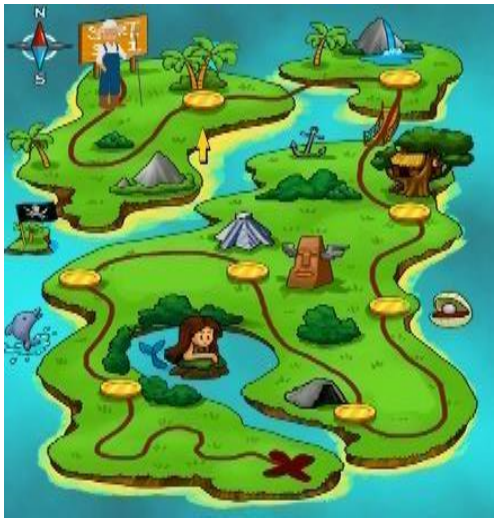

Figure 2. Map

**3 Assessment**

The researchers made sure that the learning objectives of the subject matter will be met during and after the game. Moreover, the feature of the game is designed to evaluate the player's learning progress.

1. Questions 1-5. In this level, players will guess the image and it is designed to test the student's level of

knowledge when it comes to identifying bungangkahoy from punongkahoy after the lesson is taught at the beginning of the game.

2. Questions 6-10. In this level, players will define theThe importance of trees in human lives and the environment. They are designed to evaluate the learner's prior knowledge regarding the subject matter.
3. The importance of trees in human lives and the environment. They are designed to evaluate the learner's prior knowledge regarding the subject matter.


*Figure 3. Sample Question*
*Translation: Question No. 7: Wooden trees provide pollution into the air. True or False?*

## METHODOLOGY AND CONSTRAINTS

In this section, target participants, metrics used for usability, platform of the game, methods used in the game, and constraints while conducting the testing will be discussed thoroughly.

**1 Participants and Testing**

Agri o 'Di Agri involved five (5) students ages 11-13 years old since the lesson presented in this game is based on one of the lessons in Edukasyong Pantahanan at Pangkabuhayan (EPP): Benepisyo ng Punongkahoy and Bungangkahoy (Benefits of Wooden and Fruit-Bearing Trees). The researchers utilized the video conferencing platforms to test the system with the students with consents and guidance from their parents and guardians.

The participants were first shown the game during the testing, and unless they requested assistance, they were left to play it alone. The researchers employed performance metrics during the testing to keep track of the timing of each distinctive event, their behavior, and comments. After the game, students are tasked to do the

post-game activity. They were asked to answer test-questionnaires that comprised of their self-report metrics to determine how simple and understandable the instructions and the contents are, issue-based metrics to identify difficulties encountered by the participants, and behavior metrics to measure the level of frustrations of the participants.

**2 Constraints**

a. Participants – The researchers ended up testing only two 6th grade students, two of them are in 5th grade and one is in 4th grade since the researchers were not able to gather expected participants.
b. Testing – Researchers relied on video conference calls for data gathering because of the pandemic
c. Limited Programming Knowledge – The researchers were not fully equipped with skills to develop a full-fledged running system.

## RESULTS AND DISCUSSIONS

The researcher employed the standard version of the System Usability Scale (SUS) to determine the system's usability. SUS is a Likert scale which is done after the player made use of the system (Brooke, 1996). It encompasses 10 questions about user experience and the players will have to rate their agreement or disagreement on a 5-point scale, 1 being the lowest. This is to determine what the users think of the system's design and ease of use and data will also be used as a basis for future improvements of the game.

Ta ble 1. System Usability Scale (Standard Version)

| Indicator | P1 | P2 | P3 | P4 | P5 | Average |
|---|---|---|---|---|---|---|
| 1. I think that I would like to use *Agri o 'Di Agri* frequently | 3 | 3 | 4 | 4 | 4 | |
| 2. I found the *Agri* o '*Di agr*i unnecessarily complex. | 2 | 2 | 2 | 1 | 2 | |
| 3. I thought the *Agri* o '*Di agri* was easy to use. | 4 | 5 | 5 | 3 | 5 | |
| 4. I think that I would need the support of a technical person to be able to use this *Agri o* '*Di agri.* | 2 | 3 | 1 | 4 | 2 | |
| 5. I found the various functions in this *Agri o* '*Di agri* were well integrated. | 5 | 5 | 4 | 4 | 5 | |
| 6. I thought there was too much inconsistency in this *Agri o* '*Di agri* | 1 | 1 | 3 | 1 | 2 | |
| 7. I imagine that most people would | 4 | 5 | 4 | 4 | 5 | |

*Legend: >80.3 = Excellent; 68 – 80.3 = Good; 68 = Okay; 51 – 68 = Poor; <51 = Awful*

To determine the score of the SUS, first, the sum of the score per item needs to be computed. For the sum of score of odd number [X] questions (1,3,5,7,9) that is equivalent to X0=X-5. 5 should be subtracted from the sum of X score and for the even number [Y] questions (2,4,6,8,10) that is equivalent to Y0=25-Y. 25 minus the sum of Y score. Afterwards, to get the SUS score, the sum of X0 and Y0 is multiplied to 2.5 to get the value of System Usability.

In Table 1, P1 and P2 rated the system "excellent" while the other participants (P3, P4, P5) evaluated the system's usability performance "good" in terms of the aspects of effectiveness, efficiency, and overall ease of use. Specifically, the participants mentioned that they are very confident in using the system to learn about the topic presented (item 9). However, the participants noticed that there were too many inconsistencies in the presentation of the system in terms of its design and materials used (item 6). Nonetheless, the system was very easy to use, and the various functions were well integrated (item 2,5).

## CONCLUSION AND FUTURE WORK

This paper presented the usability study of an educational game that teaches the difference between wooden trees and fruit bearing trees and the importance of trees to the environment and human lives. This system includes game elements such as rewards, motivation, and graphics that engages the students while playing the game.

Based on the findings of the System Usability Scale for the user-experiences, the researchers therefore concluded that participants were highly pleased with the game's usability. SUS score revealed that the game falls under "Good". More specifically, the participants employed that they are confident playing the system. Despite the system's structure, the participants stated that the system is easy to use and that the various functions are well integrated. However, this is only an indication of its usability of the system, which is the objective of this study, and not conclusive of the learning retention of the students

Through conducting of instruments, respondents gave recommendations such as improvements on the sounds effects and lagging screen. Researchers filtered these enhancements based on the frequency of comments done when the instructional material testing was happening.

In order to apply it on the game and improve both the playing and learning experience, early design draft was made. The feedback gathered during the study was duly taken into consideration for the improvement of this educational game, even if the game's development is still ongoing. For additional research, the professor's opinions on the game's usability, the application of feedback, and assessment of students' understanding of the significance of Punongkahoy and Bungangkahoy will be undertaken. Furthermore, the researcher recommends to develop a programmed system of the game and to conduct educator's testing on its usability, testing of learning to students, and consultations with developers will also be part of the future work to consult expert validity of the game.

## CONFLICT OF INTEREST

There is no conflict of interest.

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