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# Augmented Reality-Based Board Game for Learning English for Junior High School Students

**Handy Putra Maslan[1], Erdhi Widyarto Nugroho[2], FX Hendra Prasetya[3]**
[123]Department of Information System, Soegijapranata Catholic University
[123]Jl. Pawiyatan Luhur Sel.IV No.1, Bendan Duwur, Kota Semarang, Jawa Tengah 50234
[1]handymaslan7@gmail.com
[2]erdhi@unika.ac.id
[3]hendra@unika.ac.id

Abstract— English is the language used by all countries as the main communication tool. By understanding English, young people can have the opportunity to work abroad and gain more knowledge and better job opportunities. But education in Indonesia and the willingness of young people to learn is still low, young people tend to prefer to play games rather than learn. Therefore, a game made with Augmented Reality technology was combined with a Board Game called the game "ArReadSpeed" in hopes of helping young people especially those still sitting in junior high schools (SMP) to learn while playing. This game can be played by 4 people, so we can give free time children the game "ArReadSpeed". But because currently there is a Corona pandemic, the data search and testing process must be changed by going through online classes. The purpose of this study is about how to formulate games so that it can make young people more easily learn English lessons. The formulation in it determines the gameplay, reward system, and punishment for incorrectly answering questions. After the game was finished, some junior high school children were tested and the results were that performance expectations (usability) and entertainment (pleasure) had a correlation with the variable wanting to continue to use (desire to use again)

Keywords— English, Games, Education, Augmented Reality, Board Game

## I. INTRODUCTION

English is the language used by all countries as the main communication tool. By understanding English, young people can have the opportunity to work abroad and gain more knowledge and better job opportunities. But education in Indonesia and the willingness of young people to learn is still low, young people tend to prefer to play games rather than learn.

Middle school students (SMP) are among the teenage age groups. Teenagers both physically or psychologically can influence behaviour patterns. Therefore they have high enough conformity and think activities outside of learning are more interesting. A concrete example occurred in SMP 1 Mamuju, West Sulawesi, which 85% graduation but only 30% graduated. Many ways have been tried such as practice exercises and lectures by the teacher to increase student motivation to learn English[1].

According to Saragih and Kumara (2009), motivation to learn English in junior high school students in Indonesia is still lacking because English still does not have a social function that is widely used in society [2].

English is an international language that has been used as the official primary language in all countries [3].

Encouraging students to learn English is a challenge for teachers especially for students who do not have special goals and feel no need to learn them [4]. The aim for learning English is to develop students' communicative competence in English both oral and written [5]. Games can also be a medium for distributing education to players [6].

There are many game developers who are trying to apply new technologies for innovation in this gaming world. One of them

is Augmented Reality (AR). This technology has been used in many ways such as design, business, and games [7]. Augmented Reality Technology can enhance the enthusiasm of learning of First Middle School Students. Much literature attempts to answer questions about the use of technology to influence student learning [8]. Teachers can also use games as a tool to implement their learning [9].

Through games, teachers can provide an atmosphere of learning while playing for students in the hope that students will be more enthusiastic in learning. This game will focus on providing AR and Board Game experiences as a new way to provide information in an interesting way to increase student motivation, especially for English lessons. The use of Board Games and AR will make students feel learning and playing together because this game requires 4 people to play. In addition to playing and learning, students can also get closer to their peers because this game requires direct communication between students and teachers.

In language terms, Augmented Reality is reality in the media or paper markers. Augmented Reality is different from Virtual Reality because what is combined is the integration of digital elements in the real world [10]. This technology has been used in various fields such as health, military, entertainment and video games [11].

The main programming language in Unity is C # with the MonoDevelop IDE. Besides C #, Unity can also be used with languages such as JavaScript, C Sharp (C #), and Boo Script [12]. Vuforia works by combining the camera on a mobile device as input information and as an electronic eye that recognizes special markers so that they can bring up animated objects in real life [13].

According to research, the number of people playing games has begun to lead the education game industry. Besides providing entertainment, players can also gain knowledge [14]. Some things that need to be considered in making Board Game are identifying game specifications, game mechanism, game visualization, and estimated time of project execution [15].

## II. METHOD

**Primary Data Source**

This primary data source was obtained through interviews with Literature Lecturer Mr. Anton as the leader of the research game "ArReadSpeed".

**Secondary Data Source**

This Secondary data sources was obtained through several scientific journals on matters relating to the game.

**Method of Collecting Data**

Library Study

Data collection techniques by finding sources of written information such as online journals

Questionnaire

Data collection techniques by giving several statements to respondents who have tried directly the game "ArReadSpeed".

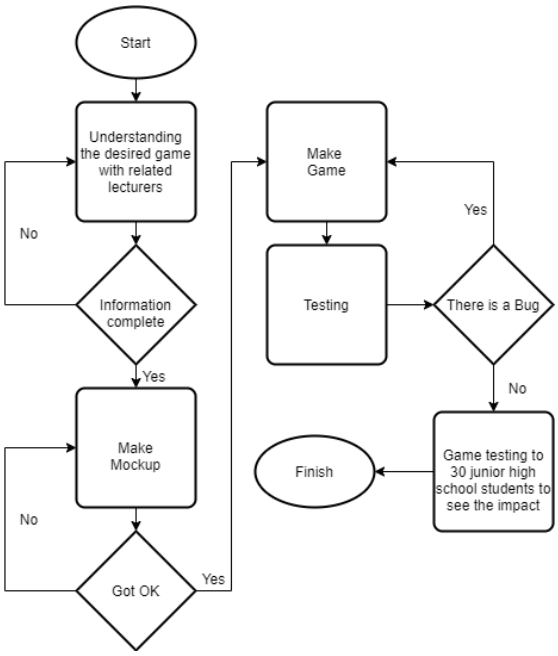
Interview

Data collection techniques by asking questions with related sources.

**Game Development Method**

Game development is done by understanding request from related lecturers about the game design that is desired and with the information held game design (mockup) is made.

After the design gets okay, start into coding for making games with the C# program language. After the game is finished, start go to testing to find bugs. Finally when the game is declared safe and there are no more bugs, this game can be used as research material. Figure 1 illustrates the "ArReadSpeed" game development framework.




**Figures 1 Research Framework**

## Testing Method

Three types of tests were carried out, namely validity, reliability and correlation tests. And by using these 3 types of tests, we can be sure that the data that will be generated from the questionnaire is valid and can be justified. With the model of the relationship between variables as in Figure 2 below.

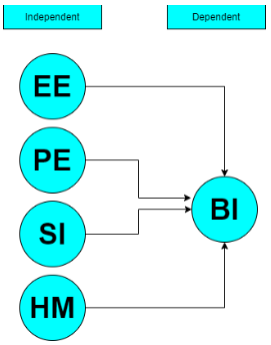



**Figure 2 Model of variable relationships**

Figure 2 shows the model of the relationship between variables, where for EE (Effort Expectancy = ease), PE (Performance Expectancy = usability), HM (Hedonic Motivation = pleasure), and SI (Social Influence = social) variables are predicted to have influence strong towards BI variables (Behavioral Intention = the desire to continue to use), which make the BI variable an independent variable.

# III. RESULTS AND DISCUSSION

## Game Design

The game "ArReadSpeed" was made with the aim of increasing children's learning enthusiasm in learning English. Created by combining Board Games and Augmented Reality to attract the attention of children with theme of learning and playing.

Board games are used as a place to play and communicate with teacher in the game in the form of cards which will be randomized and distributed to each player. Augmented Reality is used as a place for players to answer questions and save as many points as possible which will be calculated at the end of the game.

## Game Concept

The game "ArReadSpeed" was made in the form of a quiz game with English story problems. This game will use Augmented Reality technology and Board Games as a place to do Augmented Reality scan. The game will have characters in the form of children in it and fun music to listen to in the game.

How to play this game is the first Board Game in the form of cards will be shuffled and set randomly with 7x7 and the rest of the cards are stored for later taken by the player at each turn. Players do a jump to determine who plays first and put the player's character at each end of the Board Game. Players rotate clockwise. Players will be given the opportunity to use random cards from the deck of cards. When getting a card, the player moves the card left, right, up or down according to the movement you want to do. The shifted cards are collected on their own pile.

The player moves according to the path he opens. When a player reaches a card that can be scanned, the player scans using a smart phone with Augmented Reality technology to get the questions to be answered. Players try to collect as many points as possible by answering the questions. Each card has different + and - points. Like the Atlantis and Pyramid cards +600 and -400, junk cards +400 and -600, and ordinary Chest cards +100

and -50. The player must reach the finish line to finish the game and the player who gets the most points is the winner. If at the end of the game there are players who have the same score, it will do Sudden Death by trying to answer 1 question from the junk card and the one who can answer faster is the winner.

But because a pandemic is happening, the game can also be played online using online class groups. The teacher will distribute cards to be scanned for all players in the group and the player who can answer correctly and get the highest points is the winner. The teacher will then distribute 10 cards in groups that can be scanned by children. Each question, children are required to do a Screen Shoot on the results of points earned so there is no cheating and send the results to the group. If at the end of the game someone has the same score, it will do Sudden Death by answering 1 question from the random card chosen by the Teacher and who can answer faster and send the result is the winner.

The target of this game is children who are still in junior high school (Middle School). This game is made with the hope of increasing children's enthusiasm for learning, especially English and utilizing existing technology for education.

## Flowchart

The first thing to do is create a Flowchart to find out the workflow of the games that will be made in detail with the aim to make it easier in making games later. Figure 3 explains the Flowchart of the "ArReadSpeed" game..

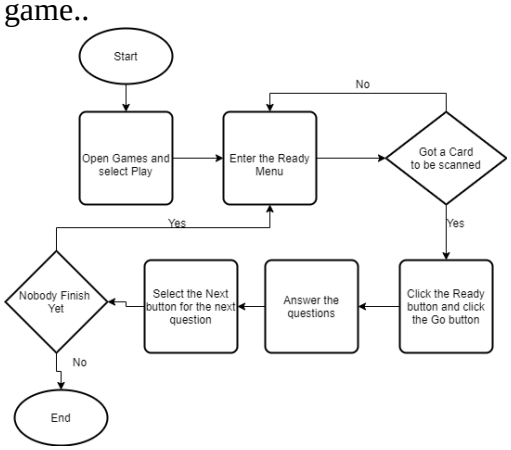



**Figure 3 "ArReadSpeed" game flowchart**

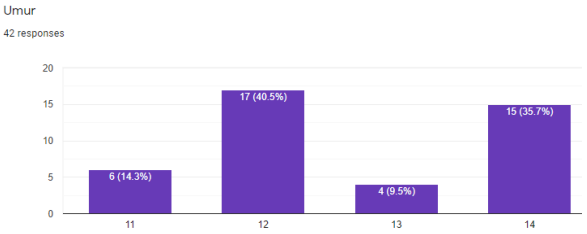
## Respondent Data Analysis

After the game is finished and there are no more problems, testing the game is then carried out and collecting data by distributing questionnaires to 42 people between the ages of 11 and 14 at Mondial School and some children who try the game and get the following results:

## Profile of Respondents

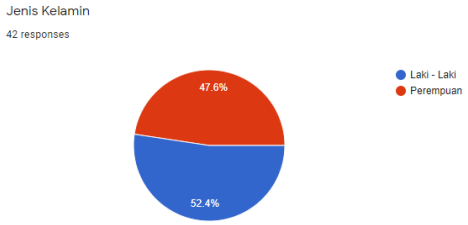
Age

The most respondents are 12 years old with a total of 17 people.




Gender

Most of the 42 respondents were Men with a total of 22 people, and 20 women.




## List of Questionnaire Questions

The results of the questionnaire data are based on 5 supporting variables, namely EE (convenience), PE (profit), SI (social influence), HM (enjoyment), and BI (periodic use).

**Table 1 Data from the questionnaire**

| EE1 | EE2 |
|---|---|
| Learning how to play "ArReadSpeed" is easy for me | My interaction with "ArReadSpeed" is clear and understandable |
| EE3 | EE4 |
| I feel "ArReadSpeed" easy to use | It's easy for me to be good at playing "ArReadSpeed" |
| PE1 | PE2 |
| I feel "ArReadSpeed" useful in my daily English study | I feel "ArReadSpeed" enhances my skills in learning English |
| PE3 | PE4 |
| I feel "ArReadSpeed" helps me learn English faster | With "ArReadSpeed" I can learn English better |
| SI1 | SI2 |

| | |
|---|---|
| My English teacher thinks I should use "ArReadSpeed" | My schoolmates think that I should use "ArReadSpeed" |
| SI3 | HM1 |
| My parents think that I should use "ArReadSpeed" | Playing “ArReadSpeed” is fun |
| HM2 | HM3 |
| Playing "ArReadSpeed" is exhilarating | Playing "ArReadSpeed" was very entertaining |
| BI1 | BI2 |
| I plan to use "ArReadSpeed" for my studies in the future. | I intend to use "ArReadSpeed" in my daily life. |
| BI3 | - |
| I plan to continue using "ArReadSpeed" as often as possible | - |

## Validity Test

Table 2 shows the validation of the questionnaire which can be seen from the grouping variables (converging) and the value of variables above 0.5. But because the BI1 and EE3 variable is not clustered, BI1 and EE3 is forced to be dropped from the table. With that, we obtain data for the EE variable clustering with a value of 0.855 - 0.880, the PE variable with a value of 0.616 - 0.817, the SI variable with a value of 0.697 - 0.765, the HM variable with a value of 0.803 - 0.900 and the BI variable with a value of 0.810 - 0.834.

**Table 2 Table of validity test results**
**Rotated Component Matrix[a]**

| | Components | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| HM2 | **.900** | .169 | -.060 | -.107 | .168 |
| HM1 | **.895** | .247 | -.070 | -.008 | .189 |
| HM3 | **.803** | -.016 | -.109 | .073 | .251 |
| PE3 | .355 | **.817** | .197 | .100 | -.181 |
| PE2 | .081 | **.747** | -.243 | -.196 | .266 |
| PE4 | .034 | **.739** | .100 | .336 | .330 |
| PE1 | .120 | **.616** | -.020 | -.460 | .272 |
| EE2 | -.222 | -.009 | **.880** | -.101 | .239 |
| EE1 | -.200 | -.147 | **.876** | -.034 | .218 |
| EE4 | .170 | .172 | **.855** | .000 | -.173 |
| SI2 | .139 | -.193 | .017 | **.765** | .098 |
| SI1 | -.129 | .017 | -.187 | **.744** | .007 |
| SI3 | -.009 | .381 | .083 | **.697** | .294 |
| BI2 | .319 | .120 | .082 | .015 | **.834** |
| BI3 | .192 | .151 | .138 | .215 | **.810** |

## Reliability Test

In accordance with the data in table 3, it shows that the PE variable can be accounted for, the EE and BI variables show good, which means it is more accountable and the HM variable shows excellent, which means it is very accountable. As for the SI variable, it shows questionable, which means it is still questionable.

**Table 3 Table of reliability test results**

| VARIABLE | CRONBACH'S ALPHA | INTERNAL CONSISTENCY |
|---|---|---|
| EE | 0.865 | Good |
| PE | 0.777 | Acceptable |
| SI | 0.659 | Questionable |
| HM | 0.901 | Excellent |
| BI | 0.811 | Good |

## Correlation Test

Table 4 shows the correlation of PE and HM variables with BI. Data with grey background shows that variable values above 0.3 have a correlation to BI variables. The SPE / PE variable has a value of 0.364 which shows that the PE variable correlates with BI and for SHM / HM has a value of 0.455 which shows a strong correlation with BI.

**Table 4 Table of correlation test results**

| | SPE | SSI | SHM | SEE | SBI |
|---|---|---|---|---|---|
| SPE | 1 | .073 | .367* | .040 | .364* |
| SSI | .073 | 1 | .050 | -.048 | .255 |
| SHM | .367* | .050 | 1 | -.135 | .445** |
| SEE | .040 | -.048 | -.135 | 1 | .163 |

| | SPE | SSI | SHM | SEE | SBI |
|---|---|---|---|---|---|
| SBI | .364* | .255 | .455** | .163 | 1 |

## IV. CONCLUSION

The conclusion from the research results of the game "ArReadSpeed" is:

The design of "ArReadSpeed" starts from learning what is needed from using Board Game, Unity and Augmented Reality so that the work can run properly and correctly. Continue to make game concepts and Flowcharts to get the flow from the game "ArReadSpeed" is good.

Games are made using Unity and Vuforia for Augmented Reality and built for mobile games to make it easier to use and use cards as Board Games to become game templates.

Due to the Covid pandemic, the effects tested are only from the Augmented Reality application, and the results of the questionnaire that show a correlation with the results of the variables PE (user usability), and HM (user pleasure) have a strong correlation with BI (the user's desire to continue using the application Augmented Reality in the game "ArReadSpeed".

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