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DEVELOPMENT OF AN EDUCATIONAL ONLINE GAME FOR THE INTERVENTION OF KOREAN DYSLEXIA - A GAME UTILIZING SYLLABLE COUNTING FOR PHONOLOGICAL AWARENESS INTERVENTION -

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Abstract

5% of the world population suffers from dyslexia (difficulty in reading), and according to research, the brain begins to distinguish characters at the age of 60 months. Thus, at the time when children are learning to speak at the age of 60 months, the dyslexic intervention is most needed. During intervention, the teacher needs to use a verified method according to the educational needs of the students with dyslexia. In Korea, the number of teachers specialized for dyslexia education is highly insufficient. Therefore, a program that accessible to as many dyslexic children as possible in highly in need which can offered independent yet effective learning. This study aimed to develop an effective online game program for the treatment of dyslexia. We first researched the contents and characteristics of the current phonological dyslexia interventions, and examined the needs of stakeholders. Then, based on the survey results, we designed a game for phonological awareness (syllable counting).

Keywords

Dyslexia, Intervention, Online Education Game, Syllable Counting, Phonological Awareness

1. Introduction

Dyslexia is a condition where a person has no problem understanding the spoken language, but has trouble reading and understanding words in a written content. This causes the person to avoid reading, which in turn results in a lack of vocabulary skills and background knowledge. Eventually, this will lead to difficulties in learning. The International Dyslexia Association has stated that dyslexia is caused by the impairment in a neural circuit of the brain, which plays a crucial role in decoding the language (International Dyslexia Association, 2002).

It is estimated that 5% of the world population has dyslexia (European Dyslexia Association and Barbara Riddick, 2001), and reports reveal that 4.6% of Korean elementary students are dyslexic (Korean Education Department, Dyslexia Research Report, 2014). In Korea, the dyslexia intervention program is offered in an offline one-on-one teaching format; however, only a few clinicians are available in Korea, mainly in the cities. To provide a program for students who cannot access specialized teachers for dyslexia, and who are restricted by time and distance, an online-based dyslexia intervention program can provide alternative learning opportunities. Our intention program was designed to in the form of a game, because it would have the following advantages. Games are effective in improving attentiveness and self-control

(Miyoung Kwon, 2015). Also, since games are fun to play, the students will be playing the game repeatedly on their own, thus inducing learning by repetition (Dae Sik Lee, 2004).

Dyslexia intervention is most effective when phonological awareness, phonics, fluency, vocabulary, and reading comprehension are taught in a sequential order (National Reading Panel, 2000). Therefore, we firstly tried to design the game for phonological awareness as a basic level game of our dyslexia intervention program.

2. Method

In order to develop an effective intervention program, we conducted a survey to find the needs of the teachers, parents, and students themselves. The results of the survey were used to define crucial elements of the online intervention program. Based on the survey responses and the offline intervention algorithm, the online game intervention algorithm was developed.

2.1 Analysis of the requirements for a phonological intervention program for dyslexia

The requirements were collected by examining the requirements the stakeholders (students, parents, and teachers) involved in a phonological dyslexia program, and are shown in Table 1 below.

Table 1: Stakeholders' requirements for a phonological dyslexia intervention program

Stakeholders Domain	Students	Parents	Teachers
Educational Requirements	Intervention method utilizing familiar objects (e.g. animals, toys) that can motivate students.	Improvement of basic reading/writing skills is desired.	Accuracy of phonemic sounds is important. The program needs to be approached in a way to enhances student interest. The intervention program must last at least 6 months.
Patterns of the Intervention Program	PC/online game experience could induce interest.	Face-to-face method preferred	10-15 minutes to complete each activity is appropriate. Each session could be 1 hour long; however, proper brain rest and stimulation should be included in the program to sustain concentration.
Characteristics of the Intervention Program	A passive, dictating approach decreases motivation; while an active participatory approach induces motivation.	A simple dyslexia self-testing program whose usefulness could be evaluated.	Continued efforts are needed to improve concentration.

2.2 Development of the Online Game Intervention Algorithm

The offline phonological dyslexia intervention program has five questions in a set, as is shown in Figure 1 (Top) and a reward action is provided when the set of questions has been completed. Also, the program is designed in such a way that the mission is complete if the student gets all the questions right while carrying out the mission (Figure 1, Top).

The “Syllable Counting” game’s algorithm has been designed to enhance the learning effects by increasing the number of questions per set to 10. This game provides reward actions both after the student answers five questions and after the student answers 10 questions, thus inducing the motivation. Answering all 10 questions right earns the student a badge, while earning two badges from the most recent three sets completes the mission (Figure 1, Bottom).

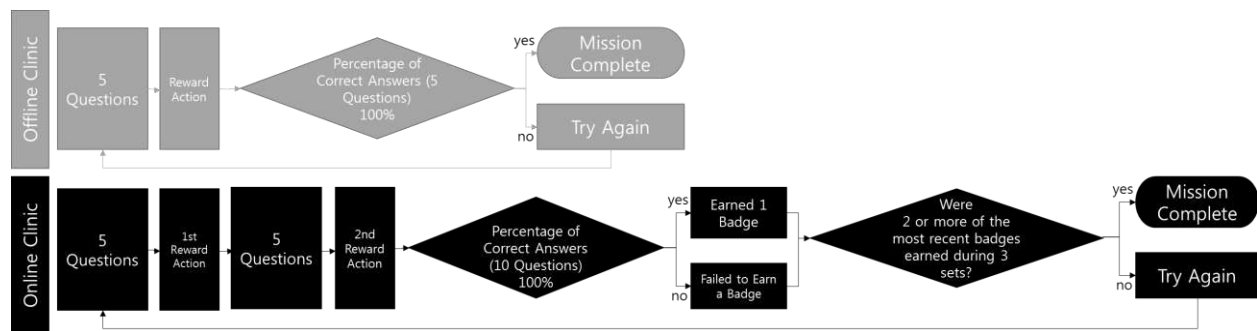


Figure 1: Offline Intervention Algorithm (Top), Online Intervention Game Algorithm (Bottom)

3. Development

3.1 Game Story and UI Design

The theme of the “Syllable Counting” game is “Escape from the Submarine”. The game’s storyline goes like this. The audio pronunciation of a word is played, and upon hearing the word, the student needs to count the number of syllables present in the word. The game has been designed so that a fish trapped in the submarine can be freed by clicking on the fish the same number of times as the number of syllables in the word. In addition, Table 2 shows how the requirements displayed in Table 1 have been implemented in the intervention game.

In order to enhance student concentration, a number of factors (characters in the game, deep sea underwater background, the movement of fish, the movement of bubbles, the movement of the submarine, etc.) which could pique a child’s interest have been reflected in the game. Also, reward objects (stars, badges, voice feedback) have been provided to induce active participation.

Furthermore, by having 10 questions per set, the UI (User Interface) has been designed to allow the game to be completed in 1~15 minutes (Table 2, Figure 2).

Table 2: Requirements implemented in the intervention game

Requirements	Implemented in the Intervention Game
Should be able to enhance student concentration by utilizing familiar objects.	Characters in the game (monsters), deep sea underwater background, varieties of fish, submarine
Fully utilize an active participatory approach to induce motivation.	Stars, badges, and voice feedback are provided as rewards.
Completion of each activity should last between 10 and 15 minutes.	Game can be played in 10~15 minutes.



Figure 2: Characters in the Game

3.2 Game Development

Using Adobe Flash Builder tool, the game was developed based on the Action Script 3.0. Certain motions not implemented by Animate CC were implemented using the Tween Lite plugin by Green Sock. In addition, the Sound API was used for sound loading and playback, and the Swf Loader was utilized to load the tutorial by parsing XML data. An XML Loader, developed in-house to support data communication with the server, was also utilized. The game screenshots are shown in Figure 3.

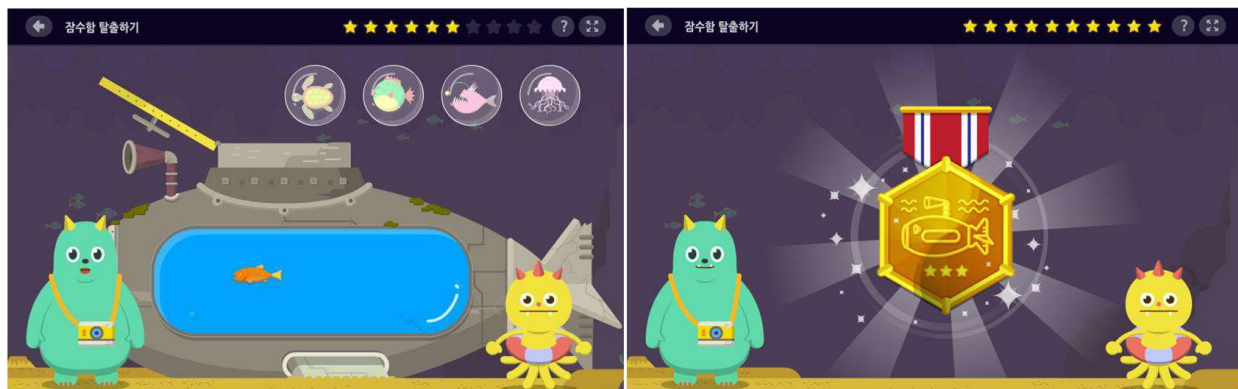


Figure 3: Screenshot of the Game in Progress (Left), Reward Screen (Right)

4. Conclusion and Discussion

The intervention game was developed by designing an algorithm that was based on the stakeholders' requirements and by performing UI design work. Going forward, the game should be continuously improved by testing its effectiveness. The effectiveness test will consist of an educational evaluation and a brain function evaluation. This research is particularly significant in that it has led to the first development of an online educational program, in a game format, for the intervention of Korean dyslexia.

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