

iPlayAStory: A Language Learning Platform for Interactive Story-Telling

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Abstract. Edutainment is a neologism that combines education and entertainment. It has been found to promote learning in a fun and interesting environment. Edutainment applications covered several fields including language learning. However, applications that focused on reading in language learning suffered from some limitations. These limitations include low interactivity and the lack of users' reading assessment. In this paper, we will introduce iPlayAStory; an interactive online educational platform for language learning. iPlayAStory provides children with an entertaining application where they can read sentences aloud. The system then assesses the correctness of the children's reading. Children are provided with feedback and can listen to the correct pronunciation. Moreover, iPlayAStory provides parents and teachers with a clear profile for their children's performance on the application. Parents and teachers could also record stories with their voice to be played back for their children. iPlayAStory also serves as a platform for speech acquisition. The collected speech data could later be used to build an Automatic Speech Recognition system for detailed assessment of children's pronunciation.

Keywords: Edutainment · Games with a purpose · Serious games · Language learning platform

1 Introduction

Today's environment provides various technology equipment such as laptops, mobile phones and game consoles which made it easier for computer and video games to become widespread among children and adults. Moreover, the quick development of multimedia and online information has remarkably highlighted the concept of digital learning models. These models may include edutainment, game based learning, edumarket games and serious games. [22, 23]

The term edutainment is a combination of education and entertainment. This can be achieved through various media such as games, television programs and movies. The main idea behind edutainment is that people can enjoy their time

while learning new topics and enhancing their knowledge. According to [18], Edutainment is defined as:

“The methodology of combining the methods of teaching and the form of game to attract the students and make the most of the active effect of games to help with our education.”

Edutainment proved to be a successful way to help with learning. According to previously done studies, it was shown that edutainment games have a great positive impact on children learning progress and that the concept of having a game with images, or animations was surely enjoyed much more than traditional text books [21].

Different topics have been covered in Edutainment applications such as: science, mathematics, languages, geography and history. Trivia Crack [11] is an example of a popular game that covers 6 fields: Geography, Science, Art, Entertainment, History, and Sports. This game achieved high popularity in 2014, and it occupied the eighth rank in top free mobile applications [12]. Interest in using these kinds of games to educate has grown impressively in the last period [16]. It is predicted that edutainment will develop and could be of great potential in the future, as it helps in improving the learning interests for children [18].

One of the fields covered by Edutainment applications is language learning. In this paper, the focus will be on applications that target reading through stories. Stories have a great impact on children, where they can learn new languages, experiences, values, morals, etc. One of the most important aspects that could be earned by children from reading stories is to learn a new language, or improve theirs. Efforts have been done in this area, which will be discussed in details later in Sect. 2. However, there were some limitations that existed in some of those applications such as low interactivity and unappealing designs. Moreover, all applications do not assess the children while reading the stories. If this feature was available, children can get feedback on their reading. Moreover, parents and teachers could track the performance of their children easily.

In this paper, iPlayAStory, an online educational platform for language learning, will be presented. iPlayAStory is a learning platform tailored for children as well as their parents or teachers. Children can learn and enhance their English language skills by presenting them with an interactive and fun environment where they read sentences. Children then get feedback on the words that were mispronounced with clear visual effects. Children can also listen to the correct pronunciation of the sentence. Furthermore, parents and teachers can view the history of their children and monitor their performance offline.

The rest of the paper is organized as follows: a review of the relevant literature is given in Sect. 2. In Sect. 3, iPlayAStory is presented in details. In Sect. 4, a primary evaluation for iPlayAStory is shown. Finally, Sect. 5 concludes and gives suggestions for future work.

2 Related Work

In this Section, several learning platforms that teach children through stories will be discussed. In these platforms, children can create their own stories, read them

aloud, listen to them, or decide an ending for them. Each of these categories is described in the following subsections.

Story maker [9] and My StoryMaker [5] are examples of platforms for creating stories. These applications provide children with an interesting and engaging environment for reading. The child gets to create his/her own stories by first choosing the main theme for the story, then choosing the main characters appearing in the story, and finally after following some steps, the story is generated.

Many applications focused on providing stories in the form of text and images for children to read. Magickeys [3] is a website that offers a variety of stories designed for children. There exists a list of stories that the user can choose from depending on what he/she wants to read. Similar to MagicKeys, there exist many other websites that offer the same functionality, such as: Kidsgen [1], Pitara [7], and Vtaide [15].

In Goodnightstories [14], children get to decide the story flow. The child chooses a story from the list, then he/she proceeds with reading it. At the end of every page, the child is left with a decision that he/she has to take in order to continue with reading the story. Depending on the child's decision, the story flow changes, and accordingly it has different endings.

Other applications allow children to listen to the system's voice narrating the story. In Kizclub [2], the user chooses a story from a full list of available stories, and then the story starts to play page after another. In each page the child can see the full text and an image, and for each word that is being narrated by the system, it is highlighted in different color. Similar applications do exist under this category such as Curiousgeorge [13], Speakaboos [8], Storynory [10], and Freechildrenstories [4]. Moreover, there exists Pinky Dinky Doo [6], which combines the feature of creating stories along with listening to stories. The advantage of these types of applications over the previously presented ones is that they allow children to listen to the correct pronunciation. This may help children improve their pronunciation skills.

All the presented applications suffer from the same limitation; there is no assessment done for the child to test his/her performance and progress in reading, or whether he/she can actually read the text correctly or not. In this paper, we will present iPlayAStory as a learning platform that overcomes this limitation. iPlayAStory provides the children with an interesting and fun environment for reading. It allows children to read aloud and assess their reading. Children get feedback as well as score on their correctness of reading. iPlayAStory also presents the children's parents and teachers with an interface where they can monitor their children's history of readings along with their performance.

3 iPlayAStory

iPlayAStory is successfully launched online on iPlayAStory.cf. In iPlayAStory, there exist two types of users that can be categorized into either children or parents.

Children have the ability to play any of the following games:

1. Quiz: which is explained in Sect. 3.1.
2. Story: which is discussed in Sect. 3.1.

Parents have two main roles in iPlayAStory:

1. View children's progress: which is illustrated in Sect. 3.2.
2. Record audio for their children: which is elaborated in Sect. 3.2.

3.1 Games

In this application, there are two types of games, which are: Quiz, and Story. In this section, a detailed description will be given for each.

Quiz. A quiz consists of a set of questions. Each question consists of an image, and three text choices. Two of those choices are not related to the shown image, and only one of the three is related. The child is required to choose the text related to the image by reading it aloud. After the child reads the text aloud, in order for the system to give feedback on whether the chosen text was correct or not, the following process is performed:

- Child's speech is recorded: this is accomplished using Web-RTC library.
- Child's speech is recognized: this is done using Google Speech api.
- The system approximates what the user has said to the nearest matching choice: this is done by comparing the speech transcription produced by Google Speech api to the three choices, and selecting the text with the highest string similarity.

If the user chooses the correct answer, it will be colored in green. Otherwise, the user's choice will appear in red color, and the correct answer will appear in green color, as shown in Fig. 1. Finally, the user can proceed to the following questions.



Fig. 1. A question in a quiz (Color figure online)



Fig. 2. Stories - new game

In [19, 20], research was done to identify the factors that make game enjoyable and fun. Among several other factors, score-keeping and different difficulty levels were found as key aspects to make games more challenging. Both factors were incorporated in the application as follows:

- Score-keeping: The child gains points for each correct answer. The score is updated after each question.
- Difficulty level: The child can choose a difficulty level for the quiz. The difficulty levels vary between easy, medium, and hard.

Story. The story is one of the most important features found in iPlayAStory. The application offers several stories that the user can choose from. A Story consists of several slides, where each slide has an image and text, as shown in Fig. 2.

After the user chooses a story, he/she starts reading each slide. After reading the text in a slide, the user is shown the transcript for what he/she said according to how it was correctly pronounced. The words that match with the original text will be colored in green, while those that do not match, or even do not exist in the original text are shown in red color.

This assessment is done through the following steps:

- Speech recording: this is accomplished using Web-RTC library.
- Speech recognition: this is done using Google Speech api.
- String matching: this is done using the Brute Force String Matching algorithm.

After the assessment is done, the child will hear the correct pronunciation for this text. It might have been recorded earlier by his/her parent/teacher and saved to the database for iPlayAStory, as described in Sect. 3.2. In case no recording is available for the parent/teacher, the default system voice is played back. The application takes into consideration the child's dialect (US/UK), which is provided by the parent/teacher at registration.

The score for each slide is updated according to the matching percentage between the transcript produced by Google Speech api, and the original text. The score is then shown to the user. Finally, if the end of the story is reached, an overall score is shown to the user, which is calculated as the average of each slide score.

3.2 Parents Mode

The role of the parents could be categorized into two main points:

- Recording their voice over stories, to be heard by their children.
- Viewing their children’s profile in order to track their performance.

Recording Stories. Research has shown that it is beneficial for children to hear familiar voices with words that they already know. Moreover, their processing ability is improved when hearing those familiar voices [17]. Therefore, the application allows parents to record their voice over the stories. Children can then hear their parent’s voice instead of the system’s voice.

Viewing Children’s Performance. iPlayAStory allows parents and teachers to view their children’s history. This allows them to keep track of the children’s performance anytime. In this section, the feature of viewing the children’s performance will be described. The child’s parent/teacher could view his/her child’s profile, in which he/she will presented with the following data:

1. Quizzes: parents/teachers can view all of the quizzes taken by the child along with the overall score earned in the quiz. For each question in a quiz, they can view the child’s as well as the correct answer.
2. Stories: parents/teachers can view all of the stories that were read by the child. They can view the date the story was read on, and the score the child has earned in this story. For each slide in a story, the parent/teacher can view: (1) its original text, (2) the transcript obtained from Google Speech api for the child’s reading and (4) the accuracy, which is how much does the original text match to the obtained transcription. The parent/teacher can also listen to the recording of the child’s reading for each slide.

4 Evaluation

A preliminary evaluation has been done in order to assess iPlayAStory. Respondents were divided into three different groups; children, parents, and teachers. Questionnaires were distributed on respondents after trying the application. In this section, the gathered data will be presented for each group.

4.1 Children

In order to evaluate the impact of the application on children, a sample of 18 respondent was randomly selected, age ranging from 6 to 8 years old. The questionnaires show the following:

1. On a scale from 1 (lowest) to 5 (highest), iPlayAStory was found to be interesting with an average of 4.3.
2. 67% of the children stated that they prefer to hear their parent's voice over the system's voice.
3. 67% of the children preferred the story mode over the quiz mode.
4. All children stated that they would play it again.

The following is quoted from some of the children who tried the application:

"I adore it!"

"The application is very interesting, but I want more stories."

"I had so much fun!"

4.2 Parents

A sample of 5 parents participated in the evaluation process. Parents recorded stories for their children and explored the feature that enables them to track their children's progress. The results of the parents questionnaires are as follows:

1. On a scale from 1 (lowest) to 5 (highest), iPlayAStory was found to be user-friendly with an average of 4.6.
2. On a scale from 1 (lowest) to 5 (highest), parents find iPlayAStory to be beneficial with an average of 4.8.
3. On a scale from 1 (lowest) to 5 (highest), parents find the feature of viewing their children's profile (showing his/her history) to be beneficial with an average of 5.
4. All parents agreed that the child's profile is clear enough to see his/her progress.
5. All parents agreed that online educational applications can assist in the learning process.
6. 60% of the parents prefer their children to hear the system's voice over the parent's voice.
7. 80% of the parents preferred the story mode over the quiz mode.

The following is quoted from one of the parents who tried iPlayAStory:

"It is amazing! I think this could really help my child to learn. We really do miss those creative and interesting ideas in today's schools. I hope that you can expand this platform to include more stories and handle different age groups, in order to publish it for schools."

4.3 Teachers

Teachers played a crucial part in the evaluation process since the game is based on reading and language learning. After showing teachers a demo for the application, questionnaires were distributed on a sample of 7 English teachers with a part of open ended questions, for giving them more space to freely express their opinions including any future enhancements. The results of the questionnaires are as follows:

1. On a scale from 1 (lowest) to 5 (highest), iPlayAStory was found to be user-friendly with an average of 4.4.
2. On a scale from 1 (lowest) to 5 (highest), teachers find iPlayAStory to be beneficial with an average of 4.86.
3. On a scale from 1 (lowest) to 5 (highest), teachers find the feature of viewing their children's profile (showing his/her history) to be beneficial with an average of 4.86.
4. All teachers agreed that the child's profile is clear enough to see his/her progress.
5. All teachers agreed that online educational applications can assist in the learning process.
6. 86% of the teachers preferred the story mode over the quiz mode.

All of the teachers found this application very beneficial and important for kids. Moreover, they stated that children nowadays are obsessed with technology and computers, and by having an online platform like iPlayAStory, children would love to read more and learn. Considering the design of the application, they found it extremely appealing and eye-catching. Some of the teachers focused on the same point that was the need to handle and assess children's intonation, which is how correctly the child changes his voice pitch to differentiate between statements and questions or to express certain emotions.

The following is quoted from one of the teachers who were shown a demo for the application:

"This application should be patented or copyrighted and distributed over schools. The service provided in this application is unique and cannot be compared to any other existing application. Both children and schools will benefit a lot from having such an application."

5 Conclusion and Future Work

Edutainment is found to be an effective technique to help children in the learning process. Language learning is one of the fields targeted by Edutainment applications. Work done in this field focused mainly on stories for children, where the child can create a story, read a story, listen to a story, or decide an ending for a story. The main shared limitation between these applications was that no assessment for child's performance was available. To solve these problems, iPlayAStory was introduced. iPlayAStory is an online educational platform for

language learning. The application provides children with a fun and interesting environment, in order to be motivated to learn reading. Additionally, it helps parents to track their children's performance through an easy interface.

iPlayAStory is successfully launched online on iPlayAStory.cf. Children and parents were presented with this application. Children enjoyed their time, and found the application very interesting. Parents as well as teachers found the application very beneficial. Parents also liked the design of the application with its easy interface. They found the feature that enables them to view their children's performance very useful and beneficial.

Moreover, the application serves as a means for speech acquisition. Throughout the duration of the evaluation, data collected has an average of 35 min of recordings with an average recognition accuracy over 80%. Such collected data could be later used to build an ASR system tailored for the stories in the application. This will make it possible to have a more detailed assessment of the children's pronunciation to include phonemes rather than words.

In order for iPlayAStory to attract more users and to motivate children to use the application more, several improvements could be done. The following list states some of the enhancements for future work:

- Further evaluation: iPlayAStory was launched during school recess, therefore the evaluation was done on a small scale. Further evaluation is needed in order to assess the effectiveness and usefulness of iPlayAStory.
- Minimize uploading time: the application collects speech data by recording users' speech into audio files, these files are then uploaded to the server. Further research should be done in this area in order to minimize the time that the user waits for this file to be uploaded.
- Intonation: it would be extremely beneficial if the application was capable of assessing children's intonation, which is how correctly the child changes his voice pitch to differentiate between statements and questions, or to express feelings and emotions.
- More stories: more stories should be added to the application. Stories should be obtained from a publisher to have a correct level of stories for different age groups.

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