

Stories Content Management for Dyslexic Children: A Case Study of Grandma Oak Storyteller System

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Abstract: Stories told in an interesting way can be compelling to children, and this is especially true for dyslexic children as storytelling is a way to captivate and motivate them to read more. Given the need for a multi-sensory experience, Grandma Oak Storyteller System, or simply Grandma Oak (GOSS), is designed and developed, allowing the children to listen to the stories and at the same time read the story together and look at the pictures for and audio-visual stimuli (multi-sensory). Hence, the need for teachers to customise and manage stories in the classroom is significant so that teachers can manage the stories according to the class's needs, reading levels, syllabus, and reading/learning preferences. Therefore, the objective of this project is to provide a storytelling system that can be accessible anywhere and allow teachers to manage stories accordingly. This project follows the prototyping model as methodology, starting with requirement analysis, design and development, evaluation, and finally refinement. GOSS's user evaluation scores 86.6% for usefulness 96.6% for satisfaction (n = 30). The advantage of GOSS is that it can store selected stories (in text, audio, and illustrations) so that the children can enjoy reading while listening to the audio accompanied by the illustration. The limitation of GOSS is also identified, so improvement can be made in terms of interactivity to make it much more fun and interesting design. Nonetheless, GOSS promotes a multi-sensory learning experience for dyslexic children and allows teachers to manage and plan stories for reading or learning sessions more conveniently.

Keywords: *Technology in Education, Content Management, Dyslexia.*

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1. Introduction

A web-based application is part of educational technology for learning, where users "learn about processes and knowledge related to technology" [1]. The system is developed for dyslexic children, and it can help to control them to be quiet and listen to enjoy the stories [2]. Taking advantage of technology, a web-based application we named Grandma Oak Storyteller System (GOSS) is proposed. As for now, Grandma Oak is a prototype. This web-based application is applicable to provide visual storytelling for special education teachers and dyslexic children. The key idea of this prototype is that it provides more flexibility to

teachers to manage the stories according to their preferences and syllabus, facilitating teachers to create a multi-sensory reading session for the children. Web-based also have GUI to display the stories like text, audio, and illustration that can provide an interesting platform for storytelling.

The use of technology in education is desirable in today's era, as most of the learning process among students is highly encouraged among them. However, most teachers learn activities with their students face-to-face, causing students not to explore or try something new and lack confidence in reading. In order to increase the interest of students to read in the classroom and assist teachers in managing the stories

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(content), Grandma Oak provides the necessary features.

Grandma Oak is specifically designed for teachers and dyslexic children as a learning tool in reading activities, especially storytelling in the classroom. So, the advent of an online website can allow teachers and students to explore new ways of managing the stories and experiencing the storytelling session with the system. In addition, Grandma Oak can be used to manage and store relevant stories (text, audio, and graphics).

2. Background and Related Studies

This section explains the background of the meaning of digital storytelling through computer-based tools to tell stories or present ideas (Use of Digital Storytelling Education, n.d.) and related studies investigating the use of educational application tools in technology, either web-based platforms or application platforms [3]. Web-based applications can be used by teachers and students for learning, such as multimedia presentations that incorporate various elements of Digital in narrative structure (Digital Storytelling, n.d.).

Secondly, Digital Storytelling is an important teaching tool for students and educators [4]. In addition, it can also display a clear picture, such as reading material. The teaching tool can improve the literacy skills of students and educators to use technology to be applied in learning. In addition, reading the information can also be conveyed more thoroughly and compactly through attractive and neat diagrams. Table 1 depicts some of the available free tools for storytelling.

Table 1. Free storytelling tools for educational application in technology [5].

Apps	Description
Someris	Someris is a great storytelling site. It consists of a constant stream of new stories and can be read aloud by children. The published stories are all made by children, and English language learners can also benefit from the site. Someris also provide subtitles in the video so kids can read and listen to what they read.
Digital Story Telling in The Classroom	Digital storytelling in the classroom provides resources and materials for teachers to use with their students in storytelling. It also helps students focus more on learning and show good performance. Students can also use the materials to create a movie or interactive slideshow to tell their stories.
Story Bird	The fantastic site allows students and teachers to create art-inspired short stories to read, share or print.

ZimmerTwins	ZimmerTwins is about creative storytelling. ZimmerTwins uses web2.0 tools that inspire students to their imaginative power and exercise storytelling skills from an early stage to advance people.
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Referring to Table 1, none of the available tools allows teachers or parents to create their own database of stories. It is crucial as it allows teachers to use stories related to their lesson plan for the day, which must be based on the children’s reading level. What is more important is to be able to use stories other than English – such as Malay or using Jawi.

3. Methodology

In this project, the method that has been applied is the prototyping methodology model to identify the requirement for each phase. In the first phase, i.e., requirement analysis, the focus is on why this system should be built and to show the general structure preferred. Second, in the design, and development, the step is to determine the system requirement from the user included the chart and flow of the system. Third, for design is evaluation to how Grandma Oak Storyteller System will work based on a design in a physical system, architecture, interface, programs and files, database. The last phase is refinement related to usability testing to delivery and support to maintain the completed system.

A prototype methodology model is a system development method in which a prototype has been built, tested and then re-processed, if necessary, until results can be received from the system or a complete product to be created [6]. This model works well in every scenario where the project does not know the full need to obtain detailed information.

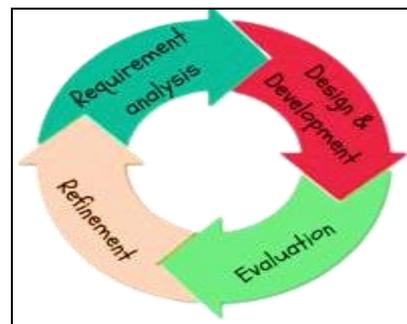


Figure 1: Prototyping methodology model.

The prototyping methodology model includes the following 4 phases:

1) Requirements Analysis

This prototype model begins by analysing the user needs and system requirements that need to be researched in detail. Therefore, an interview with teachers and students at Inkubator Disleksia UUM was performed to discover the needs and requirements in detail for GOSS.

2) Design and Development

When the user’s needs are known, the initial design development process or the design of GOSS is performed. After that, the focus is on program and development tasks and menus using a graphical user interface and the tools for processing this system through sublime text, HTML, cPanel, PHP and MySQL.

3) Evaluation

The GOSS is presented to the users to evaluate the prototype thoroughly should the system have problems or disadvantages in terms of prototype processes. It is obtained from comments and user suggestions collected online or through face-to-face questionnaires. The number of users involved was 30. After that, the developer analysed and made a conclusion based on the data collected to improve the project.

4) Refinement

Meanwhile, the system was refined to fulfil user requirements fully, and the user will give clearance to build the final prototype. Thus, the refinement of final products was carefully evaluated and quality and done routinely for the maintenance of this system.

4. The Design of GOSS

This section describes the design of GOSS based on the need gathering conducted using a questionnaire and interview with teachers from Inkubator Disleksia, who explained daily learning and the interests of children in the classroom. During the interview, several open-ended questions were asked regarding the children’s activities, likes and dislikes, etc. Examples of questions include the types of interfaces and menu arrangements to facilitate their teaching sessions with students as we view the layout and proper design of user interface is essential for both teachers and users to ensure smooth interaction.

Meanwhile, for the secondary requirements gathering process, the document was searched using Google search based on the development of “digital storytelling” as an educational tool. Table 2 lists the functional requirements, and Table 3 presents the non-functional requirements.

Table 2: GOSS functional requirements.

Num.	Requirement ID	Requirements Description	Priority
1	GOSS_01	Login	
	GOSS_01_01	Teacher can enter username, password	M
	GOSS_01_02	Teacher reset username and password	O
	GOSS_01_03	Teacher can view invalid username, password	D
	GOSS_01_04	Teacher does confirmation login	M
2	GOR_02	Manage Story	
	GOSS_02_01	Teacher can edit story	M
	GOSS_02_02	Teacher can delete story	M
	GOSS_02_03	Teacher can click the button for manage story	M

3	GOSS_03	Choose Story	
	GOSS_03_01	Children can select story	M
	GOSS_03_02	Children can cancel select story	O
	GOSS_03_03	Children click the button for choose story	M
4	GOSS_04	View Story	
	GOSS_04_01	System display story	D
	GOSS_04_02	System display audio story	D
	GOSS_04_03	System allow Teacher or Children to view story	D

Referring to Table 2, we identified a set of mandatory, optional, and desirable requirements from the teacher interview. All these are based on our discussion with the teachers and considering their needs and ideas so we could really cater for them. The system’s essential features include managing the stories, editing, deleting, and selecting the stories. In addition, teachers requested they have a login ID and password so that they could safely guard the story database and its content from the children possibly meddling around with it. The same goes for the non-functional requirements as listed in Table 3.

Table 3: GOSS non-functional requirements.

Num.	Requirement ID	Requirements Description	Priority
5	GOSS_05	Reliability Issues	
	GOSS_05_01	Teacher private manage story in database from children	M
	GOSS_05_02	Children cannot select more than one story to view story before system finish reading story	D
6	GOSS_06	Security	
	GOSS_06_01	If the teacher enters the wrong password in log in system, system will show invalid detail	D
	GOSS_06_01	Teacher can repeat log in if the system gives notification invalid detail.	M
	GOSS_06_02	System be protected to manage story in database from the children	D
7	GOSS_07	Operational	
	GOSS_07_01	Able to run on application (using the tablet)	M
8	GOSS_08	Usability	
	GOSS_08_01	System provide friendly graphics and button	M
	GOSS_08_02	Children can select story using click button	M
	GOSS_08_03	System will display story	D
	GOSS_08_04	Teacher available edit story, and delete story at menu	M

The functional and non-functional requirements listed in Table 1 and Table 2 are then used to form use cases for GOSS as shown in Figure 2.

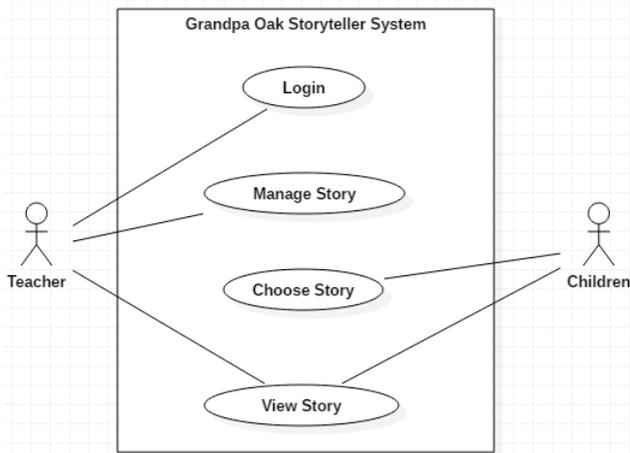


Figure 2: The use case diagram.

Based on Figure 2, teachers must log into GOSS to manage the stories. They can manage stories and view the stories stored in GOSS, as detailed in Figure 3. On the other hand, children can choose and view the stories they would like to listen to and read along. We only provide the content management authorities to teachers, who should know better what stories they wish to cover for any particular storytelling session. It is essential as they can design their teaching and learning materials into storytelling, for example, introducing new vocabularies to the children or teaching good values within the stories.

The minimal interaction for the children is as requested by teachers as they wish them to be focusing on the stories more. However, it could be improved so the children could interact more with the system and not be bored. Nonetheless, such interaction requires a careful design and therefore is not included in the current prototype for now.

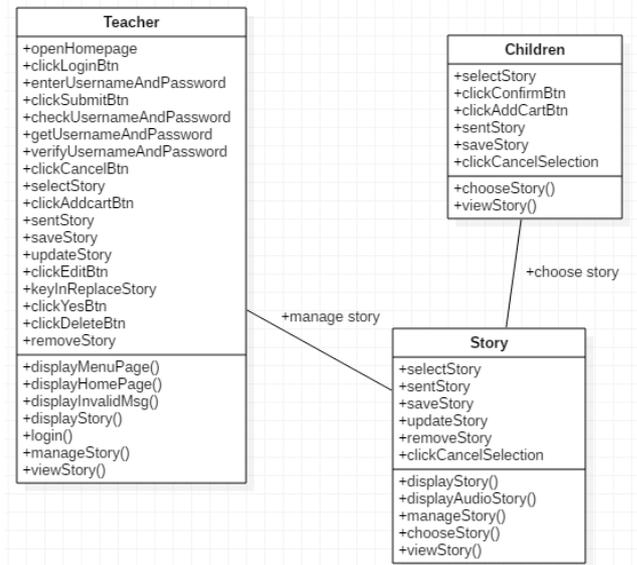


Figure 3: The Class Diagram of GOSS.

Paper prototyping is then used to sketch the design of GOSS to get the initial idea of for example, button placement, columns, and specific items. Paper prototyping is used as it is fast, cheap, and easy. We had several sketches at the earlier stage of the design with a few adjustments made before we showed it to the teachers. This is important so that they can ‘see’ our ideas and try to understand how the system might have worked. Paper prototyping is good to serve this purpose at an earlier stage of the design and development of the prototype.

5. The GOSS Prototype Development

The GOSS prototype is developed using sublime text as a coding tool while the PHP My Admin serves as the database. The developed prototype is as depicted in Figures 4, 5, 6, and 7 where they showcase some of the selected interfaces and features of GOSS.

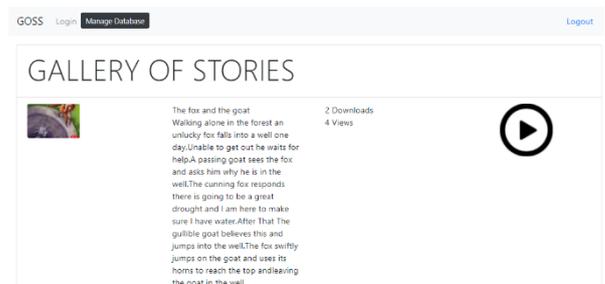


Figure 4: The gallery of stories.

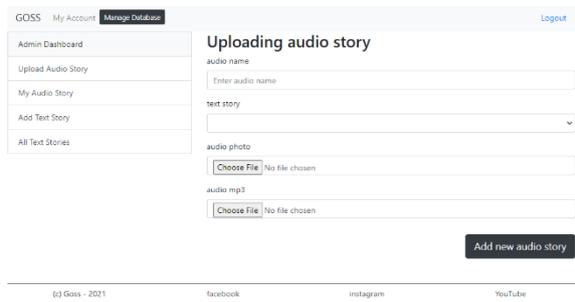


Figure 5: Interface to upload a story into the database.

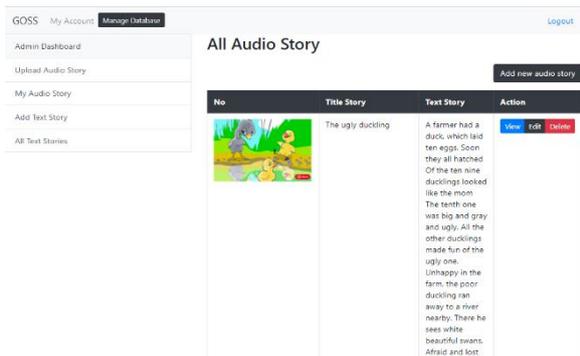


Figure 6: The interface for managing stories.

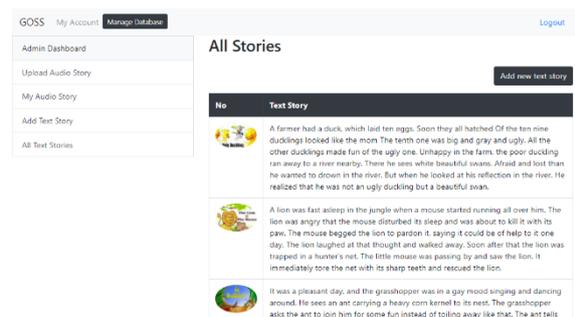


Figure 7: Displaying all stories.

Once the prototype is ready for testing, we opt for a usability test to evaluate the prototype, as discussed in the next section. Please note that this prototype is not the final version. We performed the evaluation so we could gauge any issues in terms of its usability and design.

6. The Evaluation and Discussion

A. The Evaluation Setting

In the usability evaluation, 30 respondents, who are teachers, participated. The respondents that were recruited for the online usability test are teachers from Inkubator Disleksia Universiti Utara Malaysia (UUM) and public school teachers. The instrument used to evaluate this system is a post-task questionnaire with several sections the respondents have to answer. Section A asked about the respondent's demographic and background. In contrast,

Section B asked the respondents about GOSS's usefulness, and Section C was about satisfaction, where we asked the respondents their opinion about GOSS by using a five-point Likert scale – 5 presents Strongly Agree, 4 presents Agree, 3 presents Neutral, 2 presents Disagree, and 1 presents Strongly Disagree. The respondents performed the following step-by-step procedure for the evaluation: (1) read and signed a consent form, (2) click the link server for GOSS web-based application, and (3) answered the post-task questionnaire.

B. The Respondents' Demographic and Background

Out of 30 respondents, 12 are male, which is equivalent to 40%, and 18 are female, which is equivalent to 60%. 14 respondents or 46.6% age between 21-25 years old, 6 respondents or 20% age 26-35, 7 respondents or 23.3% age 36-45, and only 3 respondents or 10% are 46 and above.

Figure 8 shows the percentile of respondents who have used any application or website for stories (audio). Out of 30 respondents, 9 respondents (30%) said yes while the rest responded no (n=15, 50%) and not sure (n=6, 20%).



Figure 8: Prior experience using any application or website for stories.

We asked this question mainly because we wanted to see if any participant has used it before and if they have anything to comment or critique on the previous experience so we can learn from it and incorporate it into our design and development of GOSS.

C. The Usability of GOSS

An analysis was conducted on the respondents' responses to the usability evaluation of GOSS. First, a questionnaire answered by 30 respondents (12 males and 18 females) is compiled and analysed. Most of them are between 21 to 25 years old. The overall results are encouraging for Section B 'ease of use' and Section C 'satisfaction' with 86.6% and 96.6%, respectively. Figures 9 and 10 depict the overall scores for ease of use and satisfaction. Based on the results and discussion of evaluation from the average score from the questionnaire, out of 30 respondents, most answered "Agree" and "Strongly Agree". Therefore, we can say that GOSS can be potentially implemented as the results show that users are generally satisfied.

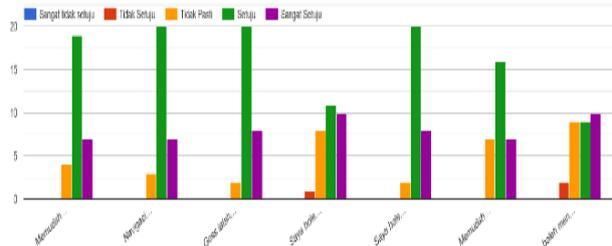


Figure 9: Usefulness of GOSS.



Figure 10: Satisfaction of GOSS.

Given the results, we can say that GOSS has the potential to be implemented for future use at Inkubator Disleksia or perhaps in schools or kindergartens. Reading with computers can sometimes be interesting for children. Therefore, GOSS could potentially provide that experience to the children so they are more motivated to learn, read, and listen to the storytelling. It could attract the children to read more, but it is also handy for teachers to manage stories concerning individual teaching plans and lessons. Teachers can store stories in text, audio, and images into GOSS and can retrieve any story they want for their storytelling session.

There are also a few limitations to this prototype, as it was a very crude idea for such content management for storytelling for children. Firstly, the prototype's design is very basic, with everything kept minimal, just so we could get the basic ideas and run it through with the teachers as we notice that it is quite a challenge for them to visualise and imagine such a system without looking at one. Of course, improving the design is our future work so we can deliver a professional-looking system for our essential users.

Secondly, the parts where the children listen and enjoy the stories need major improvement so that they could look more fun and interesting. We envisioned providing a feature where children can click on the characters of the stories and interact more with them, not just presenting still images as we have now. It would engage more and hopefully draw the children into reading as it is more fun than reading on paper.

7. Conclusion

Reading skill development for dyslexic students requires appropriate tools [7-10]. Therefore, this paper described the design and development of a web-based prototype named

GOSS that has been developed for users at Inkubator Disleksia UUM. The main users are teachers and students, i.e., children. GOSS provides teachers more flexibility to customise and manage stories for a storytelling session with the children according to their syllabus and reading level. With audio and pictures, the performance of the developed prototype has been successfully demonstrated. Future works include improving the display of the stories for a more child-friendly and dyslexia-friendly interface.

8. Acknowledgements

Thank you to teachers at Inkubator Disleksia, Universiti Utara Malaysia, for the informative feedback and comments and for participating in the project.

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