An Observation of Usability Website for Down Syndrome Children

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Abstract. This study focuses on quality in a view of usability on website for Down Syndrome Children (DSC). The website specially designed for children with Down Syndrome to gain benefit and to learn how easy to use the website. This study wants to know how easy of exist website which are focus on DSC and really easy to use with using usability principles: learnability, efficiency, memorability, errors and satisfaction. The usability principles used to evaluate the website. The result shows that the website applies usability approach successfully through games which resembles learning material in it for children with Down Syndrome to learn.

1. Introduction

Website is a method used by all people, organization, or others in sharing information, business, promote product and many. Due to this purpose the website should be a very good quality for all users. It already discussed many years back. In software quality assurance there are many factors quality proposed by McCall [1]. In this study we focus on usability factor. According to [2] a website usability are determined by factors such as effectiveness, efficiency and satisfaction. Users satisfaction can be easily earned if the website interface is good, easy to understand, limited errors and reliable. Meanwhile, [3] said usable interface should be easy for users to gain their goal via the usage of the website and easy to remember the user interface and the way to apply it to next visits.

Child with Down Syndrome have certain characteristics such as poor muscle tone, unusual shaped or small ears, slanting eyes, small head and protruding tongue. Child with Down Syndrome have some level of mental disability. Most children with Down Syndrome have mild to moderate cognitive impairment. There will be some delay in language, and both long and short term memory is affected [4]. Children with Down Syndrome should be given opportunities for them to grow to be valued and to be efficient individuals in their families and the community.

A suitable website for Down Syndrome children should be well designed. It is important to understand the research on the characteristics of individuals with Down Syndrome related to communication because computer involves communication. Children with Down Syndrome have difficulties to understand, concentrate, remember and communicate. The current study aims to create a good website which could be easily used, understood and gives benefit to Down Syndrome children.
Children suffering from Down Syndrome need a website that they can easily use and understand in order to gain benefit and learn something. Children with Down Syndrome find it really hard and confusing to use normal website since it is hard for them to understand and use. There is limited platform to attract interest of Down Syndrome children to learn something beneficial. Children with Down Syndrome have different abilities and their own level of understanding in learning. They have special requirements to satisfy thus it is quite hard to attract their attention. The aim of the study is to develop a usability website for Down Syndrome specially for children.

This paper explains about background of study on Website Usability Analyst for Down Syndrome children in Section 2, Section 3 discuss on methodology and framework and the overall approach of project. Section 4 discuss on interface design. Then, Section 5 discuss about the result from the observation. Lastly, discuss about the conclusion, and future work of the research in Section 6.

2. Background of Study

Down Syndrome [5] is the most common chromosome abnormality. People with Down Syndrome have some special characteristics. Physical characteristics of Down Syndrome include low muscle tone, flat nasal bridge, protruding tongue, short neck and slanted eyes [6]. The phenotype characteristics of Down Syndrome are delayed in communication, intellectual disability, difficulty in short term memory and recalling, difficulties with complex conversational skills and difficulty in understanding something. Children with Down Syndrome prefer fonts with bright colors, large size words and without font decoration as it is difficult to read. In colors preference, they prefer darker colors especially blue and purple and dull colors are not advisable to be used. For image preference, images like action and photographic have strong preference. Cartoon sounds and pop music are highly advisable. Children with Down Syndrome shows interest in clicking button which is in large size and buttons with a dark background color and light text on top [7]. Usability website that is developed for Down Syndrome children should cover all their characteristics and their requirements for a good usability website.

Website for Down Syndrome is really an important necessity. In order to help people with Down Syndrome to access website and to gain benefit from it the website should simple and easy to understand. A usable interface should satisfy users need and provide the facilities that need by the users. Users can feel relax and enjoy when playing the educational games that consist of learning material that have been provided. Users normally can easily gain knowledge in a fun way. Children with Down Syndrome needs motivation to do certain task such as “Well done”, “You are almost there. Try again” and etc. should be provided to boost them. This website should consider all the aspects that will satisfy the needs of Down Syndrome children. Website Usability Analyst for Down Syndrome will consider the colors, animations, images, music, font size, font style, font decoration and simplicity of words that will be comfortable for the children with Down Syndrome.

Existing research [8] [7], [9], [10] discuss about Down Syndrome (DS) children and compare functionality for learning. Their websites were compared in order to give a precise and profound comprehension on important attributes and necessity needed for the new proposed website. The viewpoint from the existing research can be used to develop a more desirable and better website development. From the website studied, the research papers that have been discussed have implement few usability principles out of usability principles. It can be concluded that different research papers will have different effects and satisfaction on children with DS since all the papers covers different usability principle. So, there will be a dissatisfactory among children with DS because the researches does not satisfy all the usability principles [11].

3. Methodology on Down Syndrome Children Website

Research methodology is about the tasks that are conducted for answering the research questions. The tasks that involve in this research is shown in Figure 1. This research activity is mainly composed of three phases: Literature review and analysis, development and evaluation.
3.1 Phase One: Literature Review/Analysis

In literature review and analysis phase, this research discuss about Website Usability Analyst for Down Syndrome Children and Learning is Fun website. Issues, challenges and method pertaining to Website Usability Analyst for Down Syndrome Children has been identified. The website approaches are identified. Analysis has been conducted to identify the suitable approach to the website. This research also discusses about the evaluation. Evaluation metrics are identified. Analysis have been conducted to identify the evaluation metric for this research. The discussion in
3.2 Phase Two: Development
Development phase is divided into four main activities which are requirement and analysis, design, implementation and testing. Requirement and analysis involve activities in collecting data and analyzing data. The data collected will be about the information of Down Syndrome Children to create a suitable website.
System design activity is about the website interface. System implementation is about gathering characteristics of Down Syndrome Children to identify suitable questions for them and enclose Website Builder software. System testing conducted the functionality test of the website.

3.3 Phase Three: Evaluation
Evaluation conducted base on the five usability principles: learnability, efficiency, memorability, error and satisfaction.

- **Learnability**
  This learnability measured by the easiness of this website used by the DSC. The researcher record time taken to finish the game. The small number of time shows the better performance in learnability of this website. All of them should be new to the website.

- **Efficiency**
  Children with Down Syndrome should be able to quickly perform task once they have learned the website. After tried many times for the website then the efficiency of website was measured. They re-do the game after learn the website. The time were taken to measure this principle.

- **Memorability**
  They should be able to remember what to do with their activity. It is because sometime they just clicking without notice anything. Quality website should make them easily to memorize the step for the task given. This principle also measured by time taken to memorize the game.

- **Errors**
  The website interface should be easily recover from errors and gives chances to the children with Down Syndrome to re-correct their mistakes. In this interface, once the Down Syndrome Children click the wrong answer, the wrong answer will be disappeared. The interface will be remained with the other answers which have not been click yet. It will not move to the next interface till the children click the correct answer. In this measure, the number of attempt is recorded to show their performance to do the task.

- **Satisfaction**
  The problems that facing by children with Down Syndrome are the general websites are not satisfactory to them. They do not feel like using the websites again or come back to it because they do not know how to use it or it is really hard for them to understand. Eventually, they find it not useful or boring because it does not satisfy their needs. This principle, the caretaker will look into these children how their respond towards the game within the time given.

3.4 Observation Strategy
The children of Down Syndrome who are between the age of 6 to 12 were randomly picked and asked to use the website given. At the beginning, the first task for website testing is by guiding the children to answer the questions and to use the website. Then, the children were observed. Next is to give questionnaires to the caretakers of Down Syndrome Children to identify the effectiveness of the website. It will be helpful to improve the website after website testing. The website will be tested again from high priorities to the lowest and this is because to increase the functionality and the effectiveness of the website.
4. New Website Interfaces

This website is a static website which display the same information for every user on every visit. This website only contains few questions or instructions that can be responded by Down Syndrome Children.

![New website interfaces](image)

Figure 2 New website interfaces

Figure 2(a) shows the home page of the website for the users. Home page contains the information and the objectives of Learning is Fun website. There is a start button in the home page. “Start” button is linked to Programs Page of Learning is Fun website. There are 3 navigation tabs in this website which is Home, Programs and Contact. An icon with the word “WE CARE ABOUT YOU” is to make the website attractive.

It also Figure 2(b) shows the programs page of the website for the users. The interface consist of questions/instructions in terms of learning modules as the questions are beneficial for the children. This question is for the children to recognize the colour. Green, yellow and blue colour is chosen because it attracts Down Syndrome children. Down Syndrome children like bright colours.

5. Result

Based on the bar graphs below, the lowest the minutes/attempts, the greater the website applied the usability principles according to the users.

![Learnability Principle](image)

The learnability principle took highest minutes compare to other principles in Figure 3. Child 1 took 13 minutes to understand the website and to get used to it while child 2 only took 7 minutes to understand the website and shows he/she familiar with computer usage. Child 3 took 16 minutes to understand the website which is the highest compared to the others while child 4 took the second highest minutes to get used to the website. Child 5 took the 11 minutes to use the website.
In term of efficiency for Figure 4, Child 1 took 8 minutes to answer the question while child 2 only took 4 minutes to understand the website because child 2 have used website before and familiar with computer usage. Child 3 took 7 minutes to answer the questions which is the second highest compared to the others while child 4 took the 4 minutes to answer the questions. Child 5 took 5 minutes to answer the questions. This is because the DS takes time to perform tasks even though they have learned the website. They are still new to using computers as they still stumble to understand how it works. Other than that, efficiency principles have been successfully applied in this website as the instruction is clear and simple and the website does not take long time to buffer.

Meanwhile, Figure 5 shown the memorability for Child 1 and Child 3 took 6 minutes to recall the user interface on the next visit while child 2 took 4 minutes to recall the user interface on the next visit. Child 4 and child 5 took only 3 minutes to recall the user interface on the next visit. The memorability principle is well applied to this website according to the feedback from the Down Syndrome Children care takers as they can easily recall the user interface and know how to use it on subsequent visits.

Finally, Figure 6 shows the error principle for the website.
The error principle was the lowest attempt compared to other principles which is good shown in Figure 6. Child 1, 2, 3 and 4 make only 2 attempts of error while child 5 make 3 attempts of error. This is because this website only takes few seconds to recover from errors and gives chances to the children with Down syndrome to re-correct their mistakes.

![Figure 7](image)

**Satisfaction Principle**

The satisfaction principle is well applied in this website as the care takers of Down Syndrome Children feels this website beneficial, satisfy the needs of Down Syndrome Children and has an attractive interface.

From the result above, it is understandable that each child of Down Syndrome is different. Some children take few minutes to learn how to use the computer and website while some does not know how to use the computer and the website no matter how long time be given to them. Each child has different capability. It takes time to make the children familiar with using computer and website.

6. **Discussion**

The website provides easy modules for Down Syndrome Children to learn and to motivate them to do more. It provides the colours, animations, images, music, font size, font style, font decoration and simplicity of words that will be comfortable for the children with Down Syndrome. This website contains simple interface that will not confuse the Down Syndrome Children. Specifically, this website contains bright colours as Down Syndrome Children likes bright colours such as green, red, blue, purple and etc. This website also encourages the Down Syndrome Children to not give up and keep trying by giving positive encouragement messages and audios. Other than that, this website provides animations for each questions. The website for Down Syndrome Children is a wide field and needs constant research with additional resource and time, enhancements should be possible to the website to make it more efficient for the Down Syndrome Children.

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