

Children's Preferences in Design of Multimedia Application

Normahdiah S. Said

Department of the Malay Language,
Faculty of Modern Languages and Communication, Universiti Putra Malaysia, 43400 Selangor, Malaysia

Abstract: Many companies have tried designing educational multimedia for children because they believe that multimedia has enormous potential. Despite having very good design features there are some that children like and some they do not. This paper is about children using multimedia. It is an account of children's preferences and was used as a scoping study to the development of a model on how to make multimedia successful. This research uses a grounded theory "discovery led by children" method. Twelve children aged 9-10, from a primary school in Loughborough, United Kingdom, were chosen to take part in this study over a period of three days using different sets of materials. Books were also included besides publicly available multimedia CDs to help children in articulating their preferences. The study was done in a natural settings slightly structured in nature. Findings from this study have revealed that not all multimedia designed for them is appealing to children and the criteria of successfulness is about engagement and being engaged. Unsuccessful design need an external motivation e.g. as instructed by teacher, parents, etc. for children to continue interacting with it. The preferences tended to be the driving force that influenced the children's behaviour with the multimedia applications given to them. Some children tended to be engrossed by some features and distracted by others. Basically a multimedia has to be interactive to engage children. Children must be able to do something with it to make them engaged by it. Therefore it could be concluded that passive design, like just looking at the information on a screen, bores children.

Key words: Children • Multimedia preferences • Grounded theory • Educational multimedia • Engagement

INTRODUCTION

Issues in multimedia applications are diverse and many. This paper will discuss about forms that affect children preferences. The researcher believes that the more the designer knows and understands users' needs and preferences the better will their products be. Children have 'wish lists' just as adults do. The best way to find out what they are is to ask the children. But this is not as easy a task as it sounds. Children are not necessarily articulate. Therefore a lot of preparation and effort has to be made before such a 'wish list' can be gathered and this paper will reveal what their reactions were and a list of children's 'wish list' that should be considered when designing educational multimedia for children.

This study identifies children's preferences by using a grounded theory 'a discovery led by children' research approach. The study was done in its natural settings in a school in Loughborough, United Kingdom and was slightly structured in nature. Children preferences are

gathered from their interactions with a collection of multimedia CD-ROMs and equivalent books. From it a list of preferences was identified. The purpose of this study was to fill the gap of knowing what design features do children really prefer in multimedia applications designed for them because [1] a cultural psychologist, has found out that educational CDs bought by parents were not fully exploited and favoured by their children. Kerawalla [1] found that entertainment games are much more popular than educational titles. In the 30-day study of naturalistic, uninterrupted computer use it was demonstrated that the children still opted for entertainment games even when six brand new, well-received, market leading, educational titles were made available to them. The findings showed that educational software is relatively unpopular and children find entertainment games far more attractive. This result has proven that much of the materials designed for children are retrofit of that of adults and therefore as it turn out never seems to attract them. Even though many people have tried to design for children,

designing multimedia for them is more challenging than one might anticipate. [2], a designer of new educational multimedia environments and technologies for children has one child's comments about the material designed for them... "It's too bad they don't let you be a kid. It would be much better than just being around them" [2].

Most designers claimed they had children in mind most of the time. If they were as great as they claim to be why are some companies facing serious closure because of it. Why do some multimedia really work but some a complete flop? When discussing these issues writers tend to look at them through the principles and disciplines they follow. However, there is no research that looked at what the children think about applications that had been circulating in the market for a number of years. What are their preferences after the applications have reached them? What are their favourites? What can others do to ensure that what they produce could reach this favourable level and how can they maintain that level?

The best method to find out what children like is to ask them. It was this analysis and conclusion that a study was later used as a basis to develop an engaging multimedia design model [3]renamed NEMD Model (Norma™ Engagement Multimedia Design Model) [4] after an extended research and will not be discussed in this paper. For reference purposes NORMA is an acronym of Natural Observation and Reflection of Multimedia Application and most study related papers are based on this form of study approach.

MATERIALS AND METHOD

Twelve children aged 9-10 years old were involved in this study. No specific instruction was given to the teachers in the school about criteria of choice except that there must be of equal numbers in males and females. The research was done at a corner in the school library. The place was chosen because it was somewhere familiar and comfortable for the children so that they would feel at ease and could respond naturally. Video cameras and tapes were placed at strategic places as not to interfere with their interactivity sessions. The research involved three school days. Two different scenarios were conducted each day. Every session took one hour. During the sessions the children were given the time to look at materials both in print and multimedia CDs. There was no particular task or test given. The number of materials varied according to themes and numbers per day. The children were either paired up as mixed couples, a boy and a girl, or both boys and girls. The teacher chose them, whichever combination, at random and whomever she found suited her best on that day.

Subject Matter Identification: Preferences are better highlighted when materials are compared from amongst the same forms or other forms. Therefore a research procedure was designed in such a way that the children given a chance to express their likes and dislikes of one form of material to that of others. The reason for doing so is to enable the researcher to define its parameters of likes and dislikes clearly and precisely so that similarities, differences and reasons for preferences could be highlighted. Therefore in this study the researcher gave the children two different forms of material, a set of multimedia CD-ROMs and books from similar themes and a time to study them. The books were chosen as opposed to multimedia CDs on the basis that there are some similarities and differences on how information is being conveyed between them. Looking at both of them, the researcher hoped to find actions and reactions of children as they interact with these materials. Since some children find it difficult to express their likes and dislikes, giving them these two forms of materials will help them to express their experiences, which therefore helps us to understand more of their preferences.

Selecting the Themes: It is found that there are many multimedia CDs in the market to choose from. Just as information books for children, information multimedia CDs tend to have a variety of presentation forms of similar themes from many different publishers. For this study the researcher based the research on 3 main themes: The Human Body, The Way Things Work and Dinosaurs. The Human Body was chosen because the class was at that time doing this topic and in choosing this theme, the children would be on some familiar ground. The researcher also knew that the children had some experiences of looking at the topic on the Internet. The researcher wanted to find out the children's reactions to book form, multimedia and the Internet (this form was not formally conducted but referred to in the discussion with some children). The Way Things Work was chosen because during the researcher's previous study [5] the illustrations in this book were not liked very much by children particularly because they preferred simple shaded line drawings to complex shaded detailed drawings. The New Way Things Work was a new edition of the Way Things Work. The illustrations in them were still the same as in the old edition. The researcher choose this book and a multimedia of it to find out if the illustrations done in the multimedia application had a different impact on the children when compared to the illustrations in the books. The theme Dinosaurs was chosen because the topic has been one of the children's favourite topics. There are no real life issues here because most images are

“reproduced” whether it is in CDs or book form. Since the topic is interesting to children, the researcher wanted to find out their preferences when it is presented in different formats. This was a pilot study and the method of study was that of grounded theory “discovery led by children”. Using a diversity of materials for children to explore could help us to discover the full story of their preferences.

Matching Materials with Intended Target Audience

(Age-Group): It is difficult to identify the age group intended in multimedia CDs, just as it is difficult to identify them in information books for children. The age ranges for the target audience for information books are estimates of children’s reading age rather than literal age. Table 1 is a list of phrases used by publishers to describe their target audience in information books listed by [5] as compared to those found in information multimedia CDs. The chosen materials were therefore from an age range of 7 to 14 even though the children in this pilot study were within the range of 9 to 10 years old.

The Materials: There are 10 materials used in this study, 5 books and 5 multimedia CDs. The number of books or multimedia presented in each of the 3 days varies: Day 1 – 3 books and 1 multimedia CD; Day 2 – 1 Book and 1 multimedia CD; and Day 3 - 1 book and 3 multimedia CDs. Multimedia CDs come in many “shapes and sizes”. The problem is that the “shapes and sizes” do not come in physical state but in “virtual form”. The only physical form is the floppy circular silver disc commonly named Compact Disc. A survey was undertaken to list the multimedia forms designed for children. Some refer to multimedia forms as platforms whilst others as environments. This research was focused on children’s reaction to publicly available educational multimedia CDs. Over the years Dorling Kindersley Publication House has ventured into producing information multimedia CDs of its information books. They were very successful with information books and the potential of multimedia is maybe a reason they produce it in this form too. The researcher initially believed this was the case but literature has shown that educational CDs, particularly information or encyclopaedic ones, produced by DK and other publishers have not necessarily been successful in targeting children (Hughes, 2000). It is interesting to know the reactions of children to information or encyclopaedic multimedia

produced by DK and other publishers. The researcher gathered lists through the web, from publisher’s brochures and those available in public libraries. Some were also obtained from parents and friends. One CD in a game format was included to see whether it could make a difference. Table 2 shows the lists chosen for this pilot study.

Information Books: The potentialities of multimedia could not be defined if there was no benchmark for comparison. From the researcher’s previous study, [5], children do like Dorling Kindersley’s illustrations in the “Eye Witness Series.” The popularity of this publication made the researcher chose some of these information books as a basis or benchmark along with other publications. The books chosen have a number of different characteristics. Some were chosen for illustration types found in them and some for their textual design layout. There was a set of books that displayed different illustration types: one, Dorling Kindersley’s illustrations type named “interactive illustrations”; and another “photographic illustration” type. The other sets are the ones that show different textual design: a pop-up book layout and an overlay type.

Interactive Illustrations are illustrations found in Dorling Kindersley’s information books. Two books were chosen for this study: The Ultimate Human Body [13] and The New Way Things Work. [14] Photographic Illustration shows very realistic images. BBC *The Walking Dinosaurs* [18] shows “reproduced” images of dinosaurs as though they are real. A Pop-up Textual Design Layout or mock-up or 3D book was chosen in this study to give children an experience of seeing books that could present the theme The Human Body in a different way than the conventional printed form. The purpose was to see whether such a layout got a reaction from children and if so to see whether it affected their preferences. An Overlay Textual Design Layout is another different textual design layout given to the children. An overlay is a book design that uses a number of layers of acetates to present given information. E.g. an overlay of a human body would start off with a frame of skeleton, then the muscle tissues over it, followed by the human skin, etc. This representation gives the children some sort of a build up phenomenon, a slightly different approach to the conventional printed form. The purpose of giving this form of textual design was also to see children’s reaction to it. A list of information books used in this study could be seen in Table 3.

Table 1: Target Audience for Children

Phrases used in Information Books for Children	Phrases used in Information Multimedia CDs for Children
Can be used by the entire family	Harnesses the power of technology to give users fantastic information adventure... [6]
For people of all ages	The virtual landscape lets kids discover... [7]
Entertaining reference book for readers of all ages	...Consolidate what kids learn in the classroom... [7]
An essential addition to every child's bookcase	...Travel back in time ...to search ...explore [8]
An essential guide to the working world	Featuring live-action video ...and a built-in connection to...the internet site for young inventors ...the ultimate guide to the world ...for curious young minds [6]
A readable scientific introduction to the subject	With amazing sights, sounds and movies, ...brings you face to face ...[9]
An excellent starting point for the reader to begin understanding some of the things that surround us	Utilises colourful three-dimensional graphics to create a 'virtual museum' through which pupils can wander and explore...[10]
Useful as a source of information, as well as making it a perfect place for anyone to begin learning about the human body	Step back through time ...where you can roar into a prehistoric land of fun, excitement and adventure.....[11]
A dramatically illustrated series for young readers [5]	

Table 2: List of Multimedia CDs Used in Pilot Study

Theme	Number Used	Format / Textual Design	Title
The Human Body	1 (Day 1)	Multimedia CD (MM1)	The Ultimate Human Body [13]
The Ways Things Work	1 (Day 2)	Multimedia CD (MM2)	The New Way Things Work [14]
Dinosaurs	3 (Day 3)	Multimedia CD(Encyclopaedic format) (MM E)	Dinosaurs [15]
		Multimedia CD (Exploratory –simulation format) (MMEX)	The Magic School Bus-Dinosaur [16]
		Multimedia CD (Game format) (MM G)	Disney Activity Centre- Dinosaur [17]
Total Number Used			5 Multimedia CDs

Table 3: List of Information Books Used in Pilot Study

Theme	Number Used	Format / Textual Design	Title
The Human Body	3 (Day 1)	Pop-Up Book (PB)	The Human Body (A three dimensional study)[19].
		Overlay (O)	Human Body (Inside Guides Series) [20]
		Interactive Illustrations (I1)	The Ultimate Human Body [13]
The Ways Things Work	1 (Day 2)	Interactive Illustrations (I2)	The Way Things Work [21]
Dinosaurs	1 (Day 3)	Photographic Illustrations (PI)	Walking with Dinosaurs [18]
Total Number Used			5 Information Books

Table 4: Total Positive and Negative Statements about Preferences to Books and Multimedia CDs

Day –Session		Books Reactions		Multimedia	
		Positive Reactions = B+		Positive Reactions = MM+	
		Negative Reactions = B-		Negative Reactions = MM-	
Day 1 (Session 1)		B+	B-	MM+	MM-
	Total for Girl 1	17	0	7	9
	Total for Boy 1	12	2	18	0
	Total Positive and Negative Statements	29	2	25	9
Day 1 (Session 2)		B +	B -	MM+	MM-
	Total for Girl 2	16	7	14	22
	Total for Boy 2	14	5	10	14
	Total Positive and Negative Statements	30	12	24	36
Day 2 (Session 1)		B +	B -	MM+	MM-
	Total for Girls	14	7	36	2
	Total Positive and Negative Statements	14	7	36	2
Day 2 (Session 2)		B +	B -	MM+	MM-
	Total for Boys	15	9	35	6
	Total Positive and Negative Statements	15	9	35	6
Day 3 (Session 1)		B +	B -	MM+	MM-
	Total for Girls	20	3	17	9
	Total Positive and Negative Statements	20	3	17	9
Day 3 (Session 2)		B +	B -	MM+	MM-
	Total for Boys	22	1	11	11
	Total Positive and Negative Statements	22	1	11	11
Total Score		+130	-34	+148	-72
Preferences-books Versus Multimedia		96		76	

Reflections on Methods: Reflecting on the methods used in this study it is very important to note that children are not necessarily articulate. The researcher had to find ways of helping children to articulate their reactions. The researcher used a laddering technique to overcome this limitation. The technique uses answers to questions with another question and will stop when the researcher feels that they have given enough to express what they mean.

DISCUSSION

In order to summarise the reactions of the children positive and negative reactions in the tape transcripts of interviews were counted. The total positive and negative statements given by the children about their preferences to books and multimedia are presented in Table 4. The results in Table 4 shows that the children have many positive views about multimedia. However, even though the scores for multimedia are higher than for books, there are many more negative statements about multimedia. In other words, children do realise the potential of multimedia especially when they are given very abstract and difficult information or content. Multimedia in some ways helps them to understand things like “electricity” better than in books. However, when the content and features are about the same the children felt that they are more comfortable if it is presented in books.

An analysis was also made of the video recordings to identify positive and negative gestures and statements expressed when the children looked at the materials. The reactions portrayed seemed to demonstrate the children’s sense of engagement or disengagement to the materials presented to them. Some of the positive reactions when they interacted with the multimedia gave evidence of being engaged particularly when looking at an event that seemed to attract the child at the moment. The reactions were: smiles, amazement and amusement gestures e.g. hearing the introductory music, etc.; laughing and giggling together e.g. when looking at the dinosaurs they created; body Language – facial expressions, put hands over the face, moving heads with the rhythm, etc. e.g. when creating a driving license certificate, etc.. They also reveal their reactions by expressing positive statements like: “Cool!” e.g. when looking at the introductory clip of the dinosaur multimedia game CD; “I like that” e.g. when choosing the characters for the driving license certificate of The Magic School Bus; “That’s good!” e.g. when looking at the video clips of the encyclopaedic multimedia CD; “Interesting” e.g. when looking at how the arteries work in the Human Body; “Wow, you can really see how

it looks like here” e.g. when looking at the electric circuit animation ; “Much simpler in here than the book...” e.g. when looking at the electric circuit animation ; “The lines are finer too, you can see better here” e.g. when looking at the illustrations in the CD compared to book ; “Looks like fun, let’s try it” e.g. when trying to create a dinosaur in one of the section in the game CD.

The children were also observed to show some negative reactions, which in some ways tended to be more towards a sign of disengagement. Amongst the negative reactions were: looking restless and bored e.g. after clicking on a number of parts of the Human Body; looking at other places instead of the multimedia after sometime into it e.g. clicking at the bold words to get meanings or words, clicking on other words, etc.; looks confused. Kept on clicking to get the information faster e.g. information slow to download from the Magic School Bus CD; twisting and turning the chair around, playing with a pen, etc. e.g. after sometime interacting with the Human Body CD. The children show signs of dislike by expressing negative statements like: “Too much information” e.g. when looking at the Human Body CD; “Can’t see the picture really...what was that? ... Too fast! ” e.g. when looking at the video clip in the encyclopaedic multimedia format “Too fast ... did you hear that? Could not make out what they are saying ... what actually happens...” e.g. hearing the narration of the history of dinosaur; “Can’t you control it and make it a bit slower... e.g. the speed of the movie clip of the dinosaur CD; “Too noisy...” e.g. the narration and sound effects in the dinosaur CD was too loud for the child.

It appears to be that, whilst they like the idea of the multimedia, there are many features of these particular applications that they did not like. The books also had positive features and were familiar to children so there were fewer negative comments. Some reasons they liked the books were: they preferred to read rather than be read to; they could flip through the pages and feel the books; they were more in control of what they wanted to see; and they could look at the information at their own pace. They felt it was much easier for them to engage with books and to manipulate them than it was with the multimedia. If they had to find information in multimedia CDs, they often felt overloaded “too much there” or “too constraining”.

Implication of Study: What implication does this lead to about the use of multimedia applications by children? Should we continue designing multimedia applications for children or is it too early to tell? The evolution of multimedia is still quite young. It has existed for about 15

to 20 years, which is very short compared to the evolution of the printing press. However, the news of companies closing down their production of multimedia applications does make this question important - should we stop designing them? Do they add nothing for children compared with books? Alternatively, should we analyse which features of multimedia designs they responded positively to and which ones they did not? The children do have many positive views of multimedia and it may be a question of designing for these aspects and avoiding the features the children were negative about.

The children were positive if the CDs were "Game-like things" and when they had more control of it. The findings also show that there is evidence of differences in reactions between genders. E.g. boys find getting information from multimedia much more fun and faster as compared to reading it from books whilst girls preferred to read it from a book because they could be more in control. There are also differences in reactions between the novice and expert users - the ones who are familiar with computers and the ones who are not E.g., the expert users tended to get impatient much faster when the information takes a long time to download.

Some of the reasons why they do not like the multimedia CDs were that there is often too much information that was given on a page. E.g., when the children were looking at The Ultimate Human Body CD, the design feature gave the children too many options to look at; the x-rays form, the skeletal form and the muscles and flesh form, etc. The children looked confused and seemed lost and did not know where to start. Their comments were "Too much information in one page... sort of confuse you... Don't know where to look at first". The children liked "game-like things". Children found this feature fun. The children were engrossed playing the jigsaw puzzle of the dinosaur even though both the boys and the girls preferred more challenging games than the CD given to them. Children believed that if well designed, they too could learn from games. They expressed that learning from games would be more up-to-date than learning from conventional methods.

The children liked animations in multimedia. Seeing the electric circuit at work helped them understand the concepts more easily. Even though they do like the movie in the CDs, cartoons were still the preferred option. They also expressed their liking for multimedia that allows them to create and be in control. The children seemed very engrossed when they were creating their "looks" on a driving license certificate to ride "The Magic School Bus".

They liked the fact that they could personalise things that they could create despising the Internet because the Web sites seemed to "not know where they are aiming at". One of them expressed his liking of the idea of "allowing you to choose and be in control of the trip you want to explore" as in "The Magic School Bus". The child was allowed to be the driver of the bus. The simulation effect was good because the children felt that they were more in control of the situation than the multimedia. Having a role to play gave the power the child needed to decide what suited them best. Having it all laid out on the screen and being narrated to actually restricted their control of the situation.

The children also expressed their liking for immediate feedback. Surprisingly these children were positive about quizzes in the multimedia. They especially liked the instant answers to quizzes. Some of their comments were that they could get the correct answer right away and the multimedia could explain if they got it books could be tedious and sometimes distracting. When CDs were considered better than books, their comments were: the words used were simpler word; the illustrations have finer lines, therefore could be seen more clearly; the multimedia gave more information because more information could be got from words in bold; the multimedia showed how things work step by step and therefore helped them to understand much better.

The examination of other issues also demonstrated some important features and uses for multimedia. When asked about its use in teaching, some children said a teacher should place multimedia at the beginning in order to introduce, others said at the end after we have understood and want to know more, while some others do not mind for according to them it all depends on how much time is available. Most of the children however agree that a teacher should use a variety of materials. Some of their comments were: "That would be interesting... but depends on how much time we have really... if there is no time the multimedia is much faster..."

When asked about the Internet they expressed their dislike (even though this sample is too small) because they feel they were not in control. They do not know whom the Internet is aiming at. They felt that they could not interact with it and therefore felt a bit bored. A boy said games are interesting on the Internet, while one of the girls said she liked emailing. It is however important for us to recognize that the Internet nowadays do offer multimedia experiences similar to CDs if the child is directed to the appropriate websites.

When asked about gender issues on what do they think of the opinion that boys like computers more than girls they said they have not heard of it but have heard that boys love to play computer games more than girls. When an opinion was asked one of the boys had this to say: "I guess because boys want to get information faster so that they can get to play football...computer gives information faster than reading...Girls tend to be more serious...look at details...wants to get things right... so girls might prefer to read books "We just want to get the information and want it fast...so computer is a good idea".

CONCLUSION

Multimedia has great promise. The diversity of multimedia applications in the market shows that there are many ways of approaching the design of multimedia applications. But at the moment nobody is quite sure what works and what does not. It is just like producing a book; some people are producing it in a number of pages while others are approaching it entirely differently. The few examples that were found so far have led us to see such vast differences of characteristics from one to another. It looks as though there are promises of doing things better but the issues are not very clearly defined. The follow-up research (not discussed in this paper) has looked at these issues systematically to define what is actually meant by successful multimedia. The children were not given any task to do in this pilot study. The researcher wanted to see whether the design features in the multimedia could give some kind of force or drive to influence the children's behaviour with the application. From the findings in the pilot study, the researcher hypothesises that, for children, the level of interaction and control in multimedia applications (especially educational applications) is very important. These factors tended to be the driving force that influenced the children's behaviour with the multimedia applications given to them. Some children tended to be engrossed by some features and distracted by others. The findings in this study seemed to exemplify the fact that this behaviour is about the issue of engagement and being engaged. Basically a multimedia has to be interactive to engage children. Children must be able to do something with it to make them engaged by it. Passive design, like just looking at the information on a screen, bores children. The children were bored looking at the movie clips. Therefore, the multimedia must have a feature that allows some form of interactive activity. However, the pilot also demonstrated that it is not enough

just having interactive features to make children engaged. Children do not like the idea of not being able to interact with it at all but also do not like having too many varieties of interactive features in the application which overloaded and confused them. There was something more about interactivity and interactive design features that needed to be explored. Studies that follow this pilot study were based on issues of interactivity and the children's response to it. This paper is an account of a Pilot Study conducted to identify issues of children using multimedia. The study was an early investigation on children using multimedia CDs. The aim was to identify the issues that lead to a multimedia CD being successful or not successful. It is from this study that generates to the formation of further experimental studies [22] to develop "an Engaging Multimedia Design Model [3] renamed Norma™ Engagement Multimedia Design Model [4] and The ME (Measuring Engagement) Tool [23].

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