STIZ69920 Dissertation

Guidelines for digital storytelling for Arab children

Supervisor

Dr. Ariffin Abdul Mutalib

Ali Mohamed Husein Nasralla

809879

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ABSTRACT

Children are getting more exposed to various technologies in teaching-learning. Various types of teaching-learning have been designed, including interactive digital storytelling. In Malaysia, local children have been clear about story-based learning materials. However, the situation is a little bit different with Arab children. Because the number of Arab children migrating into Malaysia is increasing, for following their parents who are studying at higher levels, they have to also make themselves familiar with the local scenario. In accordance, this study is initiates, to identify their acceptance towards story-based learning materials, or specifically interactive digital storytelling.

Hence, this study reacts proactively, by approaching Arab children asking for their feedback on whether they have any desire for interactive digital storytelling. Through a series of interviews, this study found that they have a strong desire and tendency. Then, the following objectives have been stated: (1) to determine the components for the interactive digital storytelling for Arab children, (2) to design and develop a prototype of the interactive digital storytelling, and (3) to observe on how the Arab children experience the interactive digital storytelling.

User-centered design (UCD) approach has been gone through in ensuring that the objectives are achieved. The process of determining the components for the interactive digital storytelling was carried out by directly involving Arab children and their teachers from three preschools in Changlun and Sintok. It was similar with the efforts in determining the contents, and interface design until the prototype development. Having the prototype ready, user testing was carried out to explore the way Arab children experience the prototype. All the processes involved various techniques through observation, interviews, and noting.

Specifically, the user testing involved qualitative and empirical data. Qualitative data were gathered through observation, meanwhile the empirical data were gathered using Computer System Usability Questionnaire (CSUQ) tool. In the end, having data processed, the findings show that Arab children are highly satisfied with the prototype. Scientifically, the developed prototype is a mirror of the obtained guidelines, obtained through the UCD seminars. Hence, the positive acceptance on the prototype reflects positive acceptance on the guidelines, as the main contribution of this study.

Besides the guidelines as the main contribution of this study, the developed prototype is also a wonderful contribution to the Arab children and their teacher. They will be using it as part of their teaching and learning materials.

ABSTRAK

Kanak-kanak kian terdedah dengan pelbagai teknologi dalam aktiviti pembelajaran-pengajaran. Pelbagai jenis bahan pembelajaran telah direka bentuk, termasuk penceritaan digital interaktif. Di Malaysia, kanak-kanak tempatan begitu arif mengenai bahan pembelajaran berasaskan penceritaan. Namun, situasi adalah sedikit berbeza dengan kanak-kanak Arab. Oleh kerana ramai kanak-kanak Arab membanjiri Malaysia ekoran mengikuti ibubapa mereka atas urusan pendidikan tinggi, mereka juga perlu membiasakan diri dengan suasana setempat. Oleh itu, kajian ini mengenalpasti penerimaan mereka terhadap bahan pembelajaran berasaskan penceritaan, atau khususnya penceritaan digital interaktif.

Justeru, kajian ini mengambil langkah proaktif, dengan mendekati populasi kanak-kanak Arab dan mendapatkan maklumbalas sama ada mereka berkeinginan kepada penceritaan digital interaktif. MElalui temubual yang dijalankan, kajian ini mendapati mereka mempunyai keinginan dan kecenderungan yang nyata. Lantas, objektif berikut telah ditetapkan: (1) untuk mengenalpasti komponen-komponen yang perlu bagi penceritaan digital interaktif bagi kanak-kanak Arab, (2) membangunkan sebuah prototaip penceritaan digital interaktif, dan (3) memerhati pengalaman kanak-kanak Arab dalam menggunakan penceritaan digital interaktif.

Pendekatan reka bentuk berpusatkan pengguna (UCD) dilalui bagi mencapai objektif-objektif tersebut. Proses mengenalpasti komponen-komponen dalam penceritaan digital interaktif dilalui dengan penglibatan langsung kanak-kanak Arab beserta guru-guru mereka dari tiga tadika di Changlun dan Sintok. Begitu juga dengan usaha menentukan kandungan, dan reka bentuk antara muka sehinggalah pembangunan prototaip. Setelah prototaip disiapkan, ujian telah dilakukan bagi meneroka pengalaman pengguna. Kesemua proses tersebut melibatkan kaedah yang pelbagai melalui pemerhatian, temuduga, dan catatan.

Secara spesifik, ujian pengguna melibatkan amatan secara kualitatif dan empirical. Pengamatan kualitatif dilakukan melalui pemerhatian, manakala ukuran empirical dilakukan melalui alatan *Computer System Usability Questionnaire* (CSUQ). Di akhir sesi pengujian, setelah data diproses, dapatan menunjukkan kanak-kanak Arab amat berpuas hati dengan prototaip yang dibangunkan. Secara saintifik, prototaip tersebut adalah terjemahan kepada garis panduan yang dihasilkan melalui seminar-seminar UCD. Maka, penerimaan yang baik terhadap prototaip adalah penerimaan yang baik terhadap garis panduan yang terhasil, sebagai sumbangan utama kajian ini.

Selain garis panduan tersebut sebagai sumbangan utama kajian, prototaip yang dibangunkan juga adalah sumbangan yang amat dihargai oleh populasi kanak-kanak Arab serta guru-guru mereka kerana mereka akan terus menggunakan prototaip tersebut dalam aktiviti pembelajaran mereka.

Acknowledgement

Table of contents

List of Tables

List of Figures

CHAPTER ONE

INTRODUCTION

1.1   BACKGROUND

Story telling is famous in various cultures. It is a famous medium of communication. Mothers always tell stories to children about their past lifestyles, success stories, and steps in facing hurdles in their life. Meanwhile, children pay attention to the stories, which is narrative-based, utilizing hearing abilities with interest. It is a memorable time for a family. The storytelling is not just an activity, but it conveys lessons to learn. Children learn from the storyline to guide them in facing the coming days, take the good elements in the storyline as guidance, and avoid repeating the mistakes their mothers have gone through to prevent themselves. This is supported by Livo and Rietz (1986) who argue that a story is a restructured everyday experience through which people come to make sense of know, remember, and understand the surroundings. Through stories one explains interpret, and assess situations, experiences, and ideologies, leading in turn to the creation of new meanings and knowledge (Ohler, 2013).

Not only it conveys messages, but storytelling can make the messages clearer to the listener (Schafer, Valle, & Prinz, 2004). In fact, Gourlay (2013) discovered that the storytelling activity creates and establishes relationships among the listeners and between the narrator and the listeners. In a family in the above paragraph, the relationships between mothers and children will be much closed; containing the elements of caring, loving, appreciating (Johnson, 2009),

and leading to positive behaviors such as hardworking, co-operating, respecting, and motivating (DeMeo, 2010).

It was very interesting to listen to storytelling. But it is more interesting to have the storytelling supported with pictures. A story is much easier to get into correct representation with helps of pictures. In the past, people utilized printed pictures, kept in photo albums to represent the related pictures. Later, the pictures were made available in digital form. With the pictures, a narrator (for a storytelling) can reduce the amount of words to express (Janove, 2009). The benefits of pictures are wealth (Gallucci, 2013).

Then, not only the pictures digitalized, but also the narrations (Tyner, 2009). The narrators record their voice, and distribute the records to the listeners to play during free time or when necessary. Gradually, the storytelling becomes more sophisticated, growing together with the past formats in analog face-to-face environment. Currently, the storytelling can be found in fully digital which is not only including audio and pictures, but more precisely they are developed including navigation abilities (Widjajanto, lund, & Schelhowe, 2008; Gourlay, 2013). Users can interact with them, which are developed with special behaviors feeding back to user responses (Cooper, Reinmann, & Cronin, 2007).

The Digital Storytelling Association (2002) defines digital storytelling as "...the modern expression of the arts of storytelling...digital stories derive their power through weaving images, music, narrative and voice together, thereby giving deep dimension and vivid color to characters, situations, and insights...".

Based on the above discussions, digital storytelling can be understood as a type of material that incorporates audio and visual elements, with textual strength into an aesthetic presentation. It is like movies, but in the form of interactive application. As opposed to the conventional storytelling, it is composed of still and moving images, text, sounds, music, and voice narration to depict an important event, person, position, or condition. As a revolution (Meadow, 2003), digital storytelling integrates all elements properly so that it conveys contents from the heart (Meadow, 2003).

1.2 DIGITAL STORYTELLING IN TEACHING AND LEARNING

Electronic learning is expanding, and taking place in most educational premises from schools to HLI and training centers. Learning Objects (LO) are available in many formats such as text-only, audio-only, courseware, video, animation, virtual reality, and reality learning media (Ariffin & Norshuhada, 2009). Digital storytelling can be another famous format of LO in near future. Currently, many authors have proposed digital storytelling in education, such as can be seen in works by van Gils (2005); Alborzi et al. (2000); and Widjajanto, lund, and Schelhowe, (2008). In fact, the digital storytelling has been researched to be available on mobile platform (Frohlich et al., 2009).

On the other hand, Garzotto found that involving children in making digital storytelling for use in school is very promising. It is very user-centered, and in addition it reduces cost, and can be utilized not only by sophisticated schools but also schools with their technological setting,

budget, and competence is limited. This argument supports the project carried out by Alborzi et al. (2000).

The digital storytelling can also be utilized in educating the slow learner. The slow learners are a group of people with special problem. They should be treated specially. This is in line with one of virtues of digital media that "such individuals should be regarded as unique set of problems (and strengths) and as such no one education model or indeed one set of material s can cover all". Based on the above argument, Leishman (2004) carried out a study to find online territories for the slow learner. She concluded that elements in digital storytelling can be utilized to win the slow learners situation.

On the other hand, Churchill, Ping, Oakley, and Churchill (2008) developed digital storytelling as a classroom strategy for digital literacy learning. They deploy the digital storytelling in natural setting to enhance students' ability to absorb contents in documents on screen. Their arguments are in line with works by Kaplan et al. (2004) at International Children's Digital Library. It was found that the digital storytelling can help in absorbing the content and fosters social relationships with helps of various media elements. Moreover, the storyline creates relationships between the contents and the readers.

1.3   STATEMENT OF PROBLEM

Pre-school children are strongly influenced by electronic media. TV is very famous, and almost owned in all households. The children spend most of their time with TV, and imitate the contents on TV. This is because the contents on TV interest them. In terms of learning

activities, a study needs to be carried out to make learning interesting for the children. While the Malay children have been well-exposed to digital storytelling, the Arab children are gradually familiarizing themselves with such applications. Through a general observation, this study anticipates that the concepts on TV need to be translated for Arab children's learning materials. It is anticipated that when the learning materials are designed correctly, mapping to the concepts the Arab children are used to, they will be interested to spend more time and learn from the learning material.

Consequently, this study asked the Arab children regarding the possibility of utilizing digital storytelling in their learning activities. It was carried out through interviews, involving three preschools. Based on their feedbacks, all of them prefer to have digital storytelling in their learning activities. In such situation, teachers should be able to develop their own digital storytelling.

When this was asked to teachers, they were very excited to utilize digital storytelling in their teaching and learning. However, most of them do not know the most preferred digital storytelling concept for use in their preschools. They were worried that they come out with something that Arab children do not prefer. Then, this study asked whether they need any kind of guideline to guide them in making their own digital storytelling. Amazingly, all of them expect for guidelines that assist them in developing preferred digital storytelling.

Based on the feedbacks in the previous two paragraphs, this study deduces that teachers need certain kind of guidelines to assist them in developing digital storytelling, that incorporates

multi-sensory approach. Such digital storytelling is highly preferred by Arab children in their learning activities.

1.4   RESEARCH QUESTION

In regards to the problem discussed in the previous section, the requirement of digital storytelling for Arab children must be studied carefully. In short, this study needs to answer these questions:

- What are the most appropriate components of digital interactive storytelling for Arab children?
- Is digital interactive storytelling able to assist educators in delivering contents to Arab children?
- Is digital interactive storytelling well-accepted by the Arab children for learning purposes?

1.5   OBJECTIVE OF STUDY

The main aim of this study is to propose guidelines for digital interactive storytelling among Arab pre-school children. To achieve the aim, three objectives are outlined:

(1) To determine the components of digital interactive storytelling for Arab pre-school children that supports learning.

(2) To develop a prototype of digital storytelling.

(3) To observe the user experience when learning with the digital interactive storytelling.

1.6 SCOPE

This study executes among pre-schools in Kedah. Particularly, only private pre-schools are considered for study for the purpose of convenient access, especially because most Arab children prefer Arab preschools only with Arab teachers. The public pre-schools are not considered because this study finds that the implementation in private and public pre-schools is homogeneous.

1.7 SIGNIFICANCE OF STUDY

This study contributes in making learning with digital storytelling fun among Arab children. With the various sensory supported in learning experience, the Arab children were found enjoying their experience, and hence it invokes positive perception towards learning.

Theoretically, the proposed guidelines complement the existing ones, making everyone able to refer to while developing their own digital storytelling. The guidelines in Chapter 4 have been formalized after going through a series of UCD seminars, involving a series of refinements. It is finally made very easy to understand, because this study carries out works to fulfill the needs of people with various backgrounds, especially those with low-level computer skills.

1.8 REPORT STRUCTURE

This chapter establishes the background of this study. In particular, it describes about the problem being solved, forms the research questions, states the objectives of the study, states the scope, and outlines the significance of the study. Next chapter elaborates the previous studies especially on topics related this study. Those studies are reviewed to determine the aspects they implicate this study. In Chapter 3, the methodologies for achieving every sub-objective of this study are elaborated at length. Next, Chapter 4 explains about the process of gathering the guidelines for the interactive digital storytelling for Arab children. Also, the design and development of the digital interactive storytelling as the prototype that incorporates the derived guidelines are explained. It is followed with Chapter 5, which explains about the results of the data collection and analysis. Finally, the conclusion of this study that contains some limitations and recommendations for future enhancement are discussed in Chapter 6.

CHAPTER TWO

REVIEWS ON RELATED TOPICS

2.1 MULTIMEDIA-ENHANCED TEACHING AND LEARNING

The way children absorb information in many cases are different than the adults. The differences are influenced by many factors including family background, existing knowledge, context encouragement (external support), and pulling factors (arousing, interesting, attracting elements (Haugland, 2000)). Besides, it is also important for teachers to understand that learning styles among children are different.

2.2 CHILDREN LEARNING

Research in the areas of learning styles has been carried out extensively. People have researched in various aspects of learning styles. Some early pioneers broke personality types down into 8 different types. These were based on four pairs of personality: judging versus perceiving, thinking versus feeling, sensing versus intuitive, and extrovert versus introvert. Further, the different personality types are linked to "learning". In general, learning styles refers to the characteristic ways in which one acquires, perceives, and processes information. It focuses on different types of information, process this information differently, and achieve understanding of information at different rates. Particularly, the judging/perceiving type looks more at life style and work habits that children prefer. In contrast, the thinking/feeling explains the ways in which children evaluate and come to conclusions about information. This is the biggest impact on how children learn. That requires learning to be arousing (Ariffin & Cut, 2010). Meanwhile, the sensing/intuitive shows how children take in information, how they are aware of things, people,

events, and ideas. It then helps the children make decisions. The extravert/introvert explains where children tend to focus their attention and get their energy.   In regards to that, Table 2.1 shows each type and their preferred learning style.

Table A

Table 2.1: Personality types and learning styles (*Source: Reading Master, n.d*)

Personality type	Learning styles	
Perceiving	Is spontaneous and do not like to be bound by deadlines or plans; likes to postpone action and seek more data; are flexible.	May start many tasks, and find it difficult to complete them; tend to follow impulses.
Judging	Likes to live in a planned, orderly way and try to manage and regulate their lives; like closure and moving on.	Plans their work and stick to the plan; want to know what they are accountable for and by what standards they will be graded.
Feeling	Considers what is important to them and to other involved; appreciate and support others; strive to create harmony; make decisions based on feelings, personal likes and dislikes.	Looks for a personal connection in classroom material, seeking to relate ideas and concepts to personal experiences; learn by helping others.
Thinking	Looks at logical consequences of a choice or action; make decisions based on logic, analysis and reason.	Uses logical analysis to understand material and analyze experiences and material to find logical principles underlying them; focus on tasks.
Intuitive	Seeks out patterns and relationships among the facts they have gathered; they trust hunches and look for the "big picture".	Learns best when presented with the theory before deciding that facts are important; focus on general concepts more than details and practical matters; find associations and meanings.
Sensing	Relies on five senses to take in information; look for information that is real and tangible; are practical and realistic.	Learns best when they start with the familiar, solid facts before moving toward abstract concepts and principles; ask who, what, when, where.
Introverts	Focuses on the inner world of reflection, thought and contemplation.	Learns best through quiet, mental reflection; attention flows inward to their own thoughts, ideas and impressions.
Extraverts	Focuses on outer world of people, things, and activities.	Learns best by talking and physically engaging the environment; attention will naturally flow towards external things and events.

While Table 2.1 list the eight learning styles that match the personality types, other researchers view the learning styles from a different perspective. As an example, Felder and Solomon (n.d.) categorize the learning styles into sequential and global, visual and verbal, sensing and intuitive, and active and reflective. This is closely related with the learning styles that Kolb (1984) outlined. In such classifications, active learners retain and understand information best by doing something active with it, such as discussing it, applying it or explaining it to others. They like group work as opposed to sitting through lectures without "doing" anything. Meanwhile, reflective learners like to think about information quietly first. They prefer working along and do better at sitting through lectures taking notes than active learners (Felder & Silverman, 1988; Felder, 1996; Felder & Brent; 2005).

As a contrast to active and reflective learners, sensing learners like learning facts. They are good at solving problems using well-established methods because they do not prefer something complicated and surprising. Sensors are good with details and good at memorizing facts and hands-on laboratory works. Hence, they do not like being tested on topics that they have not been explicitly taught in class. In short, they are practical and careful in their work and do not like courses that are not connected with the real world. Meanwhile, intuitive learners prefer to discover probabilities and relationships in the context being learned. This shows that they like innovation but not something that repeats without any invention. That is good for grasping new concepts. In conjunction, they are also comfortable with abstract concepts and mathematical modeling. With that, the intuitive learners do not like memorization and routine calculations.

On the other hand, similar with those in Table 2.1, the visual learners remember information best by seeing. They are inspired deeply with films, pictures, videos, flow charts, diagrams, time lines, and demonstrations. Obviously, verbal learners learn best from spoken and written explanations and words. On the other hand, sequential learners gain understanding in linear steps, with steps following a logical sequence. Because their motivation is a little low, they tend to follow logical stepwise paths in finding solutions to problems. Although they may not understand materials, but they can do something with them. Another characteristic is that they are different from the global learners who learn in large jumps, absorbing materials almost randomly without seeing any connection. They seem to suddenly gain something, by accident. In this sense, they solve complex problems quickly or put things together once they have the big picture, but they may not know how they actually got to the answer. They may have difficulties in solving problems until they get the big picture.

On top of that, other researchers categorize the learning styles into three: visual, auditory, and kinesthetic (VAK) (LDPride.net, n.d.; Reading Master, n.d). Particularly, people with deep visual learning style prefer to involve with materials containing visible or observable things such as films, pictures, demonstrations, diagrams, handouts, displays, and flip-chart. In contrast, people with auditory learning style prefer the transfer of information through listening: in either the form of spoken word, of self or others, of sounds, and noises. Meanwhile, people with kinesthetic learning involves desire learning through self-experience such as holding, touching, doing, feeling, and practical hands-on experiences. The word 'kinesthetic' describes the sense of using muscular movement making physical sense. Kinesthetic therefore describes a learning style which involves the stimulation of nerves in the body's muscles, joints and tendons.

The VAK learning styles assess people's preferred learning styles, and then most importantly, guides in designing learning methods and experiences that match people's preferences. It has significant consequences in the current environment, in which technologies drive the practices. In conjunction, different learning activities lead to different level they affect understanding rates as outlined by Norhayati (1999) in Table 2.2.

Table B

Table 2.2: Relationships of learning methods and their rates of understanding.

Learning methods	Rate of understanding (%)
Learning through involving in real projects	100
Learning through interactive multimedia	**90**
Learning through simulations	90
Learning through performing	90
Learning through delivering speech	70
Learning through active discussions	70
Learning through live performances	50
Learning through exhibitions	50
Learning through films	50
Learning through pictures	30
Learning through reading	20
Learning through listening	10

2.3 LEARNING IN DIGITAL AGE

In this digital age, learning and teaching activities take place with help of virtual tools. In fact, the environment is also virtual in some parts of the world. This gives merits to everyone, in which learning is just between willing and unwilling.

2.3.1 Electronic Learning

Electronic learning materials are the contents provided for the use in Computer-Aided Instruction (CAI), Computer-Assisted Learning (ACL), Computer-based Learning (CBL), Computer-based Training (CBT), and TV. Usual approaches of eLMs include tutorial, intensive assessment, simulation, and games (Sabri & Zainul Akramin, 2001; Norhashim, Mazenah, Rose Alinda, 1996).

Tutorial refers to applications where learners are provided with learning content and are required to accomplish assessments successfully. There are different levels of assessment for different levels of content. The objective of this approach is to ensure that learners are prepared with sufficient knowledge before proceeding to a higher level. Refer to works by Tutorialized (2008) and Sun Microsystem Inc. (2009).

Intensive assessment tends to evaluate learners understanding and knowledge on absorbed topics. Questions are provided for learners to answer based on topics for learners own initiatives. All answers are recorded while learners are performing the assessment. Total scores are only revealed after learners finished answering all questions. Works by Scalise and Giffordare (2006) and Masura and Madihah (2007) are examples of such assessment.

Simulation is used to visualize complex concepts, such as dental surgery. The objective is to ensure that learners can see and have exact understanding of complex concepts. In simulation, the real world situations are copied into computing object representations, using such as virtual reality technologies. Computing objects can react in real time to requests from human. Good examples can be found in Halimah (2007), and Nilsson and Johansson (2007).

Games are referred to a situation where learners learn through attempting to win contests. The games are physically entertaining, however there are rules to follow, some would limit sessions with time, and some would be subjected to error. The objective of this approach is to motivate learners to learn on their own, especially by trial and error. This develops their mental, logic, decision making and knowledge. Examples of this can be seen in Nabi and Krcmar (2004) and Bernhaupt, Schwaiger, Riegler, and Enthaler (2007). Recently, terms such as eLectronic Book, (eBook), Interactive Multimedia (IMM), courseware, educational TV programmes, and Reality Learning Media (RLM) have also been considered as popular eLMs.

eBook

There are many definitions of electronic book (eBook). It was started with various efforts in converting paper books into digital form (Carvajal, 1999), through digitization processes. In the digital form, the books are displayed and read on computers. Later, the eBook got matured, with various other forms have been derived, in-line with the technology advancement. In conjunction, recent definitions of eBook have been extended to include book titles that are available online, can be read as email, can be retrieved by a portable electronic reading device, or as a file that can be downloaded onto a computer (Carvajal, 1999), and with the current cloud computing eBooks are embedded with various media elements including videos. Previously, Landoni (1997) classified an eBook according to three different criteria:

- Portable eBook, which could be taken everywhere and whose main purpose was to reproduce the portability of paper books. These are normally used for referenced publications, dictionaries, and thesauri;

- Books those are more concerned with preserving the logical structure that is the organization of a book in chapters, sections, and subsections. These provide full-text indexing, links, navigation, and orientation through dynamic tables of contents and multi-window text displays;

- Books which support both the logical and physical aspects of a book.

The eBooks can be viewed and digested in two ways, either on hardware-based readers or software-based readers depending on the context (Norshuhada & Landoni, 2003). Hardware-based readers refers to machines designed specifically for reading downloaded electronic contents. They are lightweight devices, with utilities to duplicate the familiar experience of reading the paper book. In current practice, such devices are very advanced, equipped with utilities beyond just reading contents, but also incorporates features for communication and collaboration. On the other hand, software based-readers function in a similar way to the hardware-based readers but no special hardware is required. Microsoft Reader, Adobe Acrobat Reader, and Adobe Acrobat eBook Reader are examples of such software (Norshuhada, Landoni, Gibbs, & Shahizan, 2003). In the Internet, various tools are provided free for users to utilize. Besides, The International Children Digital Library has developed the software-based reader applications for reading their eBooks (Sobihatun-Nur, Asmidah, & Ariffin, 2006).

Interactive Multimedia

Oblinger (1993) defines multimedia as a combination of two or more media elements such as texts, images, graphics, video, animations, and audio with special characteristics to come out with illustrative contents. This supports rate of understanding classified by Norhayati in Table 2.2. Such definition is agreed by many other definitions (Halimah, 1996; Agnew & Kellerman, 1996; Peck, 1998; Hillman, 1998; Elsom-Cook, 2001; and Scala Inc., 2004). It fits various purposes including learning, entertainment, and business. In short, by referring to their definitions, this study deduces that multimedia is a combination of media elements that convey information and knowledge to learners efficiently.

On the other hand, Oxford advanced learner's dictionary (2000) defines interactivity as a feature that allows the transfer of knowledge in two directions continuously between human and computer. Carter and Burgess (2004), Hillman (1998), and Kruse (2004) agree with that definition. This study also agree with that, in which interactivity is a characteristic of a program that allows users to do something for supporting computer applications and systems to understand users intervention and provide feedbacks accordingly. It is important to note that different users require different interaction styles (Nurulnadwan, Ariffin, Siti Mahfuzah, & Mohd Saifullizam, 2013; Abdul Sheikh & Ariffin, 2014; Ariffin, Syarifah Nadia, Sobihatun Nur, Mazida, & Massudi, 2014). With interactivity, the rate of understanding by Norhayati in Table 2.2 is supported.

Interactivity could be designed at various levels. This implicates the cognitive, affective, and psychomotor aspects of a person in performing tasks. This is because people do works

effectively when the interactivity is provided appropriately. In accordance, Norhayati (1999) classifies interactivity into three levels; low, intermediate, and high. Similarly, Rhodes and Azbell (1985) also classify the interactivity into three levels; reactive, coactive, and proactive, but they term the levels differently. Table 2.3 includes the levels by Norhayati and Rhodes and Azbell.

Table C

Table 2.3: Levels of interactivity

	Level of interactivity	**Description**
Norhayati	Low (navigation)	This level of interactivity can be seen in video. It focuses on navigating through the application. User needs to do minimum tasks to retrieve the intended information.
	Intermediate (functionality)	There are certain goals to achieve, and users are required to control the application. Some form filling applications are examples of this, in which users go linearly. There are also next and back buttons to help the users. Also, ad-hoc links are provided for advanced access.
	High (adaptive)	Users are allowed to control the application creatively. They could tailor the application to meet their preferences. In this level, users could do complex navigations, in performing their tasks. This could be seen in various simulations and complex online shopping and banking systems.
Rhodes and Azbell	Reactive	Users have little control over the applications, and the feedbacks from application are extremely direct. In this level, users do interactions only when the system asks for, such as in installing a tool.
	Coactive	In this style, users have some levels of opportunities to determine sequences, style, and steps to perform. They are provided with options to select, and they work together with the system as the system is consistent.

Proactive	This level allows users to control application's content and structure actively, meeting their preferences. The interactivity is highly dynamic, enabling users to dictate the system to work for them. This can be seen is systems like those in the hospital or engineering that involves collaboration and communication.

In addition, interactivity has its own characteristics. As a consequence, Borsook and Higginbotham-Wheat (1991) identify the common characteristics of interactivity. The characteristics are listed in the following:

- *Instant and quick feedback* – feedback could be retrieved with a single mouse-click, or a press on a button. Users are also expecting for ways to overcome error if it happens.

- *Non-sequence information retrieval* – users could access information as they desire.

- *Adaptable preferences* – applications need to be customizable to support user's preferences.

- *Options* – users feel honored to choose from provided options; so application needs to provide options.

- *User control* – users need to control the application, such as navigation, so avoiding application making control over the users is important.

- *Appropriate grain-size* – the duration required for application to be disturbed. Users do not like to wait for many minutes, so the grain-size needs to be short.

Courseware

Coursewares are developed for access through the web, or for use on CD. For instance, Baloian, Berges, Buschmann, Gaßner, Hardings, Hoppe, and Luther (2002) use courseware in their computer-integrated classroom as the content repositories. Among the advantages of courseware, in which hypertexts are utilized, is the ability for learners to read in different orders. Every page contains links to a number of different pages which can be read next. Basically in courseware, the 'browse and click' is the main interaction approach. With that, Ariffin (2013) managed to get good attention from indigenous students, and successfully switched their attitude towards learning activities. Regan and Sheppard (1996) classify the purposes of courseware as follows:

- to illustrate some design, development, and/or failure of devices/structures/systems; and to show relationships among design issues and devices.

- to contain exercises aimed at helping learners to better understand concepts through visual thinking.

- to serves as a guide, stepping learners through the various aspects (e.g. theory, physical setting) of performing physical experiments.

- as resources and references to complete assignment homework.

TV Programme

Meanwhile, electronic learning material for TV or popularly known as educational TV programmes (ETP) are reported to begin more than 40 years ago (Kodaira, 2005). By definition, ETP are specially programmed for learning, to disseminate various contents in various formats. Previously, ETP were broadcasted during schooling hours and viewed in school (Aufenanger,

2005). However, sophistication in broadcasting technologies has been initiated. In Malaysia, ASTRO[1] provides more than five channels containing ETP.

Currently, ETP are integrated with interdisciplinary curricula such as environmental and life education that transcendent conventional school subject[2] (Kodaira, 2005). As mentioned above, there are channels on TV allocated specifically for ETV, so that audiences can always view at any time. Besides, formats of ETV are also changed, combining both entertainment and intellectual contents. Regardless of the type of eLMs, the roles of learners and instructors are important.

Reality Learning Media

RLM extends the ideas of courseware, video, and TV programmes. So, most ideas in the electronic learning material could be used as the basis. However, contents in RLM applications are not cut and not edited. In addition, the focus of RLM is to ensure that the applications are not only usable, but also entertaining. These two factors lead to the development of new ideas for RLM (Ariffin & Norshuhada, 2008).

RLM believes that design does not invoke fun merely because it incorporates colors and animations, sound and music, or graphical fantasy contents. Also, distractions may surprise audiences, may capture attention, but are annoying and not fun. It is believed that the possibility

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[1] ASTRO is a broadcasting and telecommunication company which provides channel on demand services in Malaysia. International channels such as CNN, BBC, ESPN, and Star Movie are included in subscription packages. Programmes are broadcasted 24 hours a day.

[2] There are many more that broadcasted on many channels today such as National Geographic, Discovery, rather than special channels provided for educational TV programmes.

of fun arises when one is both aroused and intrigued, and at the same time recognized an intention to communicate through a design. Therefore, the RLM gives particular attention to delivering contents which serves to entertain learners when learning. Hence, mistakes, feedbacks, and interference are included as part of the contents as seen in Figure 2.1 (Elaborated further in Ariffin (2009) and Ariffin and Norshuhada (2009a). It is inspired by reality TV shows.
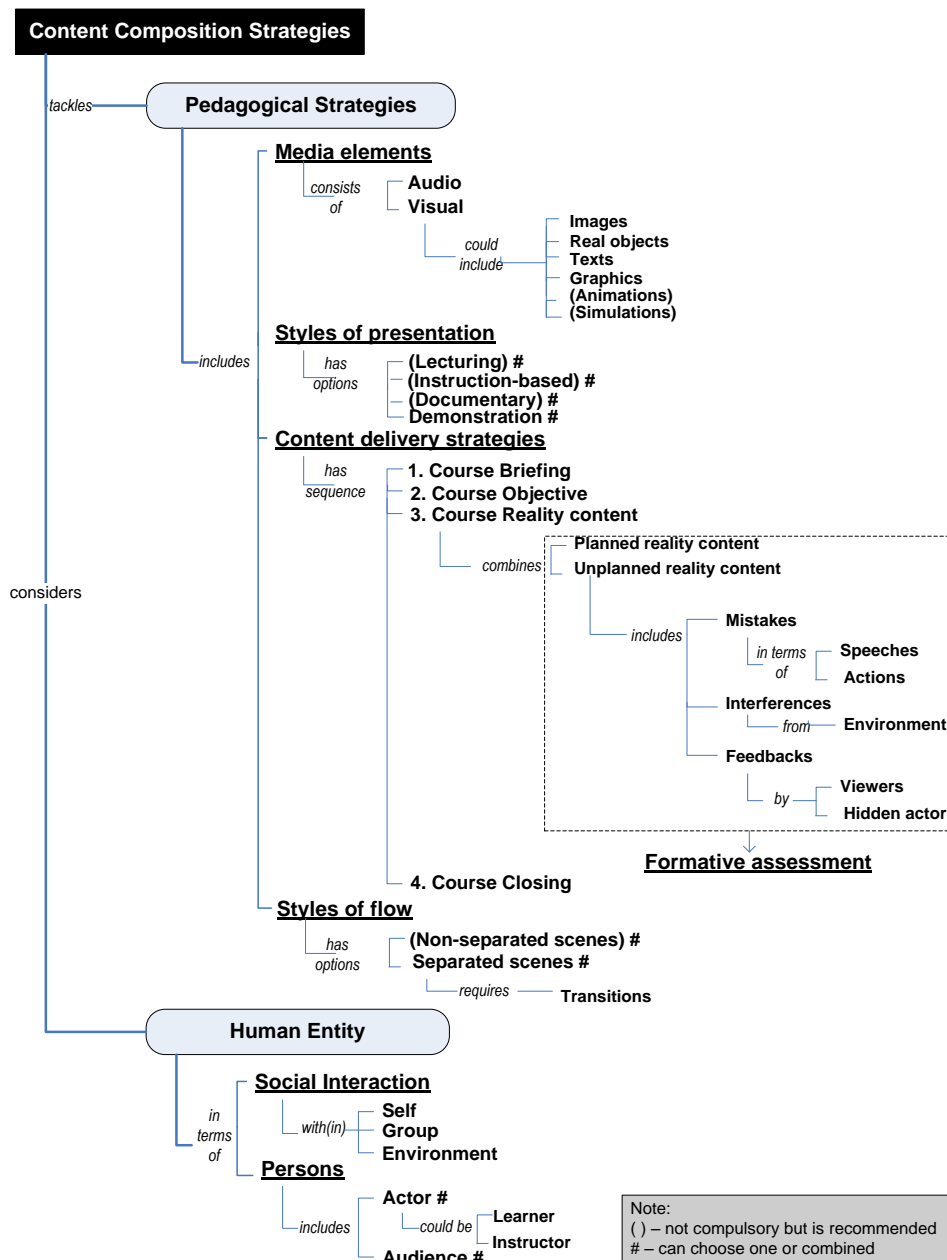
a

Figure 2.1: The concept of RLM

2.4   TEACHING MATERIALS

In contrast to learning materials, teaching materials are designed for use by teachers in their teaching activities. There have been many tools designed, such as books, flash cards, blocks, and audio tape. However, those are non-electronic materials.

Not as many as the learning materials, literatures do not show much works on electronic teaching materials. Fincher, Kolling, Utting, Brown, and Stevens (2010) provide online repositories for their students as teaching materials. Students could do more than just uploading/downloading materials in the repository. Hence, the communication is made richer among the community.

Other communication media that could be considered as teaching materials include BonzoBox[3], Classroom 2.0[4], Diigo[5], ePals[6], and Wimba[7]. They are all designed for collaboration. Besides, there are also materials that provide contents such as GeoGebra[8], Mango Languages[9],

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[3] http://bonzobox.com/
[4] http://www.classroom20.com
[5] http://www.diigo.com/
[6] http://www.epals.com/
[7] http://www.uen.org/wcs/
[8] http://www.alice.org/
[9] http://www.mangolanguages.com/

Mathway[10], and Stellarium[11]. They are all available and for use in the virtual environment. However, not all children are able to access the Internet.

Hence, some tools are also developed, made available in the Internet for creating multimedia learning contents. With this, teachers could create electronic teaching materials with less technical skills required. Some of the tools include Animoto[12], Comic Life[13], Dumpr[14], GoAnimate[15], and Jing[16].

Those tools are for producing small learning contents, which do not have ability to invoke children's intervention (as suggested for high rate of understanding – Table 2.2). They are not able to assist teachers who need assistance from technologies in controlling classrooms. In another study, Sylla, Branco, Coutinho, and Coquet (2011) compare tangible user interface with graphical user interface. They found that children prefer the tangible user interface more than the graphical in computers. They believe that was so because children are more on physical, hence teaching materials should be designed with inclusion of various physical elements.

Having discussed about learning materials and teaching materials, it could be understood that there are various approaches possibly used for the purpose of educating children. In fact, they could be used together, blended nicely to make-up a meaningful digital storytelling (Yusuf & Ariffin, 2014).

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[10] http://www.mathway.com/
[11] http://www.stellarium.org/
[12] http://www.animoto.com
[13] http://plasq.com/comiclife/
[14] http://www.dumpr.net/
[15] http://www.goanimate.com
[16] http://www.jingproject.com/

2.5 DIGITAL STORYTELLING

Children are much closed with imagination and stories (Lambert, 2002). In fact they could learn through storytelling (Meadows, 2003). In current advancement, interactive digital storytelling could be enhanced with more than just text and pictures, as available in those the conventional ones. In fact, they could be made available online, pervasively, to be accessed at children's convenience.

When compared to the conventional interactive storybook, the digital versions are much better (Régules, 2014). As an illustration, while the conventional ones are not able to read for the children, the digital ones can narrate the contents for the users. Besides, there are many other advantages of digital storytelling over the conventional ones as has been commonly understood (Ariffin, 2010). When children are much closed with interactive digital storytelling or digital storybook, designing the applications or products to suit their needs is necessary. It is important to ensure that the children are engaged with the contents (Yussof, Abas, & Paris, 2012). Besides, properly designed digital storybook will arouse the children while interacting with (Régules, 2014). However, traversing the literatures reveals that the guidelines for making arousing digital storybook are not formulated. This makes designers or teachers design based on their own preferences, which eventually make the digital storybook forces children to adapt their cognitive states (Ohler, 2013). As a consequent, children refuse to interact with interactive digital storybook (Marshall,2011).

2.6   LEARNING THEORIES AND CONCEPTS

Among the many learning theories including Aptitude Treatment Instruction, Cognitive Flexibility, Cognitive Load, Constructivist, Anchored Instruction, Experiential, Minimalism, Situated Learning, Multiple Intelligence, Symbol Learning, and others, this study tends to discuss about Symbol System, Anchored Instruction, and Multiple Intelligences because they relate closely with the learning and teaching in the digital age.

2.6.1   Symbol System

Symbol system theory intends to explain the effects of media on learning. The theory stresses that each medium is capable of conveying content via certain inherent symbol system. Salomon (1979) states that symbol system partly determines different learners will get different percentage of knowledge from different kinds of media. This is due to the number of ways symbol system affects knowledge acquisition including:

- they highlight different aspects of content

- they vary with respect to case of recording

- specific coding elements can save learners from difficult mental elaborations by overtly supplanting or short-circuiting specific elaborations

- symbol systems differ with respect to how much processing they demand or allow

- symbol systems differ with respect to the kinds of mental processes they call on for recording and elaboration.

For example, Salomon (1979) suggests that television requires less mental processing than reading and that the meanings secured from viewing television tend to be less elaborating than those secured from reading (i.e., different levels of processing are involved).

The meaning extracted from a given medium depends upon the learner. Thus, a person may acquire information about a subject they are familiar with equally well from different media but be significantly influenced by different media for novel information. This theory is supported primarily by research conducted with film and television. More recent work has extended the framework to computers.

The principles of symbol systems are (1) the symbolic coding elements of particular media require different mental transformations and hence affect the mastery of specific skills, (2) the level of knowledge and skill that an individual possesses will affect the impact of specific media sequences, (3) the nature of the learning/information processing tasks can affect the impact of specific media sequences, (4) the social context of media presentations can influence what message is perceived, and (5) there is a reciprocal relationship between media and learner; each can influence the other (Salomon, 1981; Salomon, Perkins, & Globerson, 1991).

2.6.2 Anchored Instruction

Anchored Instruction is a major paradigm for technology-based learning that has been developed by the Cognition and Technology Group at Vanderbilt (CTGV) under the leadership of John Bransford (CTGV, 1992). The initial focus of the work was on the development of interactive videodisc tools that encouraged students and teachers to pose and solve complex, realistic

problems. The video materials serve as "anchors" (macro-contexts) for all subsequent learning and instructions. CTGV also explained:

"The design of these anchors was quite different from the design of videos that were typically used in education...our goal was to create interesting, realistic contexts that encouraged the active construct ion of knowledge by learners. Our anchors were stories rather than lectures and were designed to be explored by students and teachers."

(1993, p.52)

Anchored Instruction also recommends that the use of interactive videodisc technology makes it possible for students to easily explore the content. According to Bransford and Stein (1993), Anchored Instruction is a theory that is applied in elementary reading, language arts, and mathematics skills. However, the Anchored Instruction paradigm is based upon a general model of problem-solving. There are two principles of Anchored Instruction; (1) learning and teaching activities should be designed around an "anchor" which should be some sort of case-study or problem situation, and (2) curriculum materials should allow exploration by the learner.

2.6.3   Multiple Intelligences

The theory of multiple intelligences suggests that there are a number of distinct forms of intelligence that each individual possesses in varying degrees. Gardner in 1983 adds cultural intelligence to the existing of his multiple intelligence consists of linguistic, musical, logical mathematical, spatial, body-kinesthetic, intrapersonal (e.g., insight, metacognition) and

interpersonal (e.g., social skills). Gardner (1983) also says that the implication is that learning/teaching should focus on the particular intelligences of each person. Another implication is that the assessment of abilities should measure all forms of intelligence. There are three principles of the theory of multiple intelligences (Gardner, 1993): (1) individuals should be encouraged to use their preferred intelligences in learning, (2) instructional activities should appeal to different forms of intelligence, and (3) assessment of learning should measure multiple forms of intelligence. With such recommendations, Ariffin (2012) has successfully applied the theory in approaching children.

2.7   CONCLUSION

In conclusion, this chapter reviews the literatures involved in the progress of this study. A clear understanding of the concepts and approaches is vital since they are included in designing the digital storytelling. The following chapter discusses the methods involved in carrying out the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1   INTRODUCTION

In ensuring the objectives stated in Chapter 1 are achieved successfully, systematic tasks have been planned for achieving the objectives. Accordingly, the research is divided into three phases as outlined illustratively in Figure 3.1. Each phase which is associated with achieving respected objective is described in the following paragraphs.
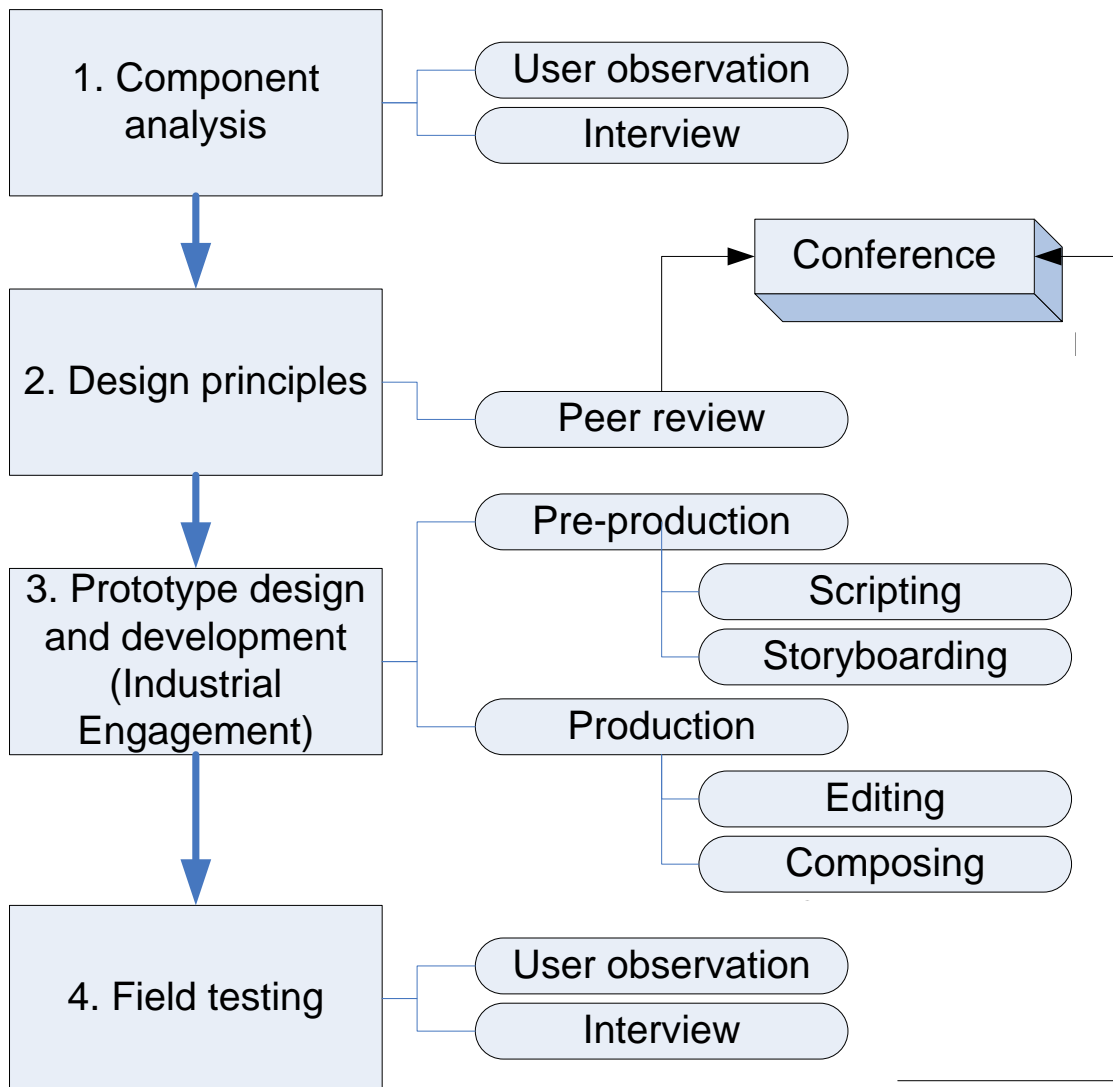
Figure 3.1: Flowchart of activities

b

Figure 3.1 visualizes that this research involves four major activities i.e. component analysis, identification of design principles for digital books for children, prototype design and development, and field testing.

3.2 COMPONENT ANALYSIS

This involves user observation, which is intended at understanding the nature of digital storytelling that Arab children prefer. In addition, observations on favorite TV programmes have been carried out, to identify the preferred elements in the programmes. The outcomes of the observations are the components of digital storytelling. This was asked to Arab children to get their feedback, so that the lists of components meet their interest. Also, the observations focus on gathering strategies for making information accessible by the pre-school children, particularly which supports multi-sensory.

3.2.1 Observation

This study observed the activities in Arab pre-schools to understand their nature. Selected schools in Kedah were visited. The selection of schools was made based on the criteria in the list below:

- Involving pre-schools with different nature and facilities
- Involving pre-schools with students of different family background

Based on the criteria, this study through social network managed to visit three Arab pre-schools in Kedah. It is more than sufficient for observing the teaching and learning activities, because the findings are similar after observing 20 to 25 children. Then, the remaining observations were confirming the gathered findings. Among the purpose of the visits was to understand the gap that this study could help eliminating (this is explained in Chapter 1). Another is to detail the possible solutions for overcoming the identified problem (this is explained in detail in

consequent chapters). In short, Figures 3.2 and 3.3 depict two most common activities in pre-schools i.e. learning with books and computers. This is a good input to this study, which gives a clue that pre-schools prefer to make use of computer applications and books in delivering their contents.

Figure 3.2: Children learn with computer c

Figure 3.3: Children in an activity with books

d

e

3.2.2 Interviews

The observations were coupled with interviews at the end of each observation session. Teachers were asked questions on the components or elements to be incorporated in a digital interactive storytelling so that it is entertaining to the Arab children. Among the questions asked include (provided in Appendix A):

- The most common preferred elements in books among Arab children.

- What makes Arab children interact well with books.

- The way they approach their students (Arab children).

- The differences among the Arab children.

- The ability of Arab children to participate in learning sessions.

- (questions on classroom activities)

The interviews were intended to clarify and further detail the findings of observations in understanding the factors attracting the Arab children to get into flow with digital interactive storytelling. Also, it was intended to gather teachers' suggestions on how this study could do to assist them in their jobs. As a result, the problems were well-understood as explained in Chapter 1. From the findings of the interviews and observation, this study proposes to introduce a concept of digital interactive storytelling that entertains Arab children.

Understanding the scenario, this study has to formulate a set of elements of multi-sensory digital storytelling. All the tasks in formulating the guidelines are described in the following section.

3.3   DESIGN PRINCIPLES

The design principles refer to the components of digital storytelling for Arab preschool children. It is very important to determine that the digital storytelling is able to invoke interests among Arab children in learning. Peer review is a way the principles can be assessed, especially by the researchers who have also researched in topics related with Arab children. This ensures that the guidelines are validated.

The findings in terms of clue and information gathered in Phase 1 were used in proposing the guidelines for the digital interactive storytelling. Users' feedbacks on the guidelines are very important. Hence, they were involved closely in this study in formulating the guidelines. This technique is called User-Centered Design (UCD) approach (Jesse, 2000).

In particular, in the UCD, users became part of this study. A series of meetings were conducted. The same three Arab pre-schools involved in the component analysis phase were involved in the UCD seminars in this phase. The meetings were held in Changlun and Sintok, where the Arab preschools are located, on different dates. There were six one-day workshops organized in each location, on three different dates, with the following aims:

- Workshop 1 – was aimed at gathering the instructional and multiple intelligence elements for interesting digital storytelling.
- Workshop 2 – was aimed at detailing the content dimension.
- Workshop 3 – was aimed at enriching the media elements dimension.
- Workshop 4 – was aimed at detailing the interactivity dimension.
- Workshop 5 – was aimed at detailing the language dimension.

- Workshop 6 – was aimed at detailing the method dimension.

Each workshop started with a briefing session, introducing the aim of the workshop respectively. Also, the findings from earlier workshop were addressed and discussed. It was followed with brainstorming and prompting and chunking activities, in which they contained actual activities in gathering the intended information. Nevertheless, the luncheons were provided for the participants, together with an hour break. The workshops ended with a debriefing session, in which the gathered information was discussed in the group and the expected next workshop.

In addition, after each workshop, the findings were analyzed and possible questions were discussed and confirmed with the workshop participants. They were well-documented for reference. On top of that, in each workshop, examples of existing applications were brought to the workshop. Users experienced the applications and fed back their experience. Generally they addressed the good and the bad elements they experienced while using the applications. The scenario in the workshops was very lively and under control.

3.4   PROTOTYPE DESIGN AND DEVELOPMENT

The prototype of digital storytelling was designed incorporating the principles. The works were divided into pre-production and production stages, involving industrial collaborations. UCD approach was utilized in designing and developing the prototype. The whole process started with scripting; short stories (for play within 6 to 8 minutes). The short stories in this study are referred to as working script to mean that the scripts can always be edited to make the storyline more engaging (Rey-Lopez, Diaz-Redondo, Fernandez-Vilas, & Pazos-Arias, 2007). The scripts

were crafted (available in Appendix A) by providing answers to several inspiring questions such as: Is the topic educational, informative, or significant? What is the stories' purpose (such as advocacy or instruction)? Does the story have a central point of view (argument)? What characters, events (what, how, where, when), settings, and plots are involved with the story? Does the story raise other issues? Are other issues related to the story? The stories were also ensured to be user-focused[17]. Such questions have also been used by Nurulnadwan, Ariffin, Siti Mahfuzah, and Mohd Saifullizam (2013) in their study.

Then, the storyboards were crafted. The storyboard was used to visualize how the digital storytelling looks (Hart, 2007). In this study, the storyboard acted as the blueprint of the digital stories production. A storyboard is a sketch of how to organize a story and a list of its contents. It helps to define the parameters of a story within available resources and time; organize and focus a story; and figure out what medium to use for each part of the story (Stevens, 2007). These reflect that digital story creators should keep the design focus within certain parameters such as time duration, image transitions, special effects, and planning out of types of music, imagery, audio, and video to be used. More importantly, the storyboard acted as the place to tentatively state media to be used and how they might best work together to depict important, engaging, and informative story.

Having got the storyboards available, the next step is to do editing; which requires computer hardware and software. It is necessary to edit the media elements to ensure they are pleasing. Tools for image editing and page composing such as Photoshop and Illustrator were utilized.

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[17] User-focused refers to the focus of material which is on the user, by understanding the users' characteristics and behavior.

37

Minimal editing was required at this stage, in which the outputs were elements to be edited and ready for composition.

Multimedia-enabled, internet-ready computers equipped with speakers and microphones were utilized in composing. Based on the storyboard, all audio were created; either taken from the Internet or self-recorded. Narration and voiceover recorded originally at this step. All audio files were created and edited in SoundForge.

Besides imagery and audio, slide transitions were also created. Some of the transitions involve text. Texts also appear in the scenes, to make the dialog explicit. This is important to cater for the different kinds of information literacy preferences as suggested by Gardner (1993). So the texts were provided on every imagery that is necessary, to complement the narration and voiceover.

3.5   FIELD TESTING

The digital storytelling prototype was tested with Arab pre-school children and teachers in their natural setting. Having let them experienced the prototype, they were issued with a questionnaire that asks about usability and quality of the prototype called Computer Software Usability and Quality (CSUQ) (Available in Appendix C) to gather their feedback. Their behaviours were observed, in which eventually rich data about acceptance and experience were gathered. The Arab children and teachers were interviewed for obtaining exact data, to confirm the observations (available in Appendix A).

3.6   CONCLUSION

This chapter explains the methods used in this study which aims at achieving its three sub objectives stated in Chapter 1. Next chapter elaborates about the construction of the guidelines for digital storytelling that invokes interest among Arab children. It also elaborates on the digital storytelling itself, the prototype that incorporates the model.

CHAPTER FOUR

THE MODEL AND PROTOTYPE

4.1   INTRODUCTION

This chapter elaborates on the guidelines for developing multimodal digital storytelling. They are gathered in activities described in Chapter 3, including document studies, observations, and interviews. The guidelines have been incorporated in a prototype for evaluation, in which the prototype is elaborated at length at the end of this chapter and the results of evaluation are discussed in Chapter 5.

4.2   OUTCOMES OF THE FIRST CYCLE

In the early observations and interviews (Seminar 1) with teachers and children, the objective was to identify the dimensions of instructional and Multiple Intelligences suitable for the digital storytelling. Hence, the observation and interviews were focused only for that. As a result, it was found that (1) contents, (2) media elements (specifically text, audio, and visual), (3) interactivity, and (4) language are important aspects that support for instructional purposes to be emphasized in the digital storytelling. Meanwhile, the methods of addressing contents support the various competencies for supporting the Multiple Intelligences. Hence, this study deduced that they (contents, media elements, interactivity, language, and methods) should be specially considered for the users, particularly pre-school teachers and children, who are mostly not technology-educated.

4.3   OUTCOMES OF THE REFINING CYCLES

When further analyzed in consequent cycles of UCD seminar, each aspect was further analyzed. Each dimension identified in the first cycle was detailed out in separated seminar.

In **Seminar 2**, this study detailed the content dimension. Subjects of study were provided with a few books with different contents, some follow the syllabus and some were not. Additionally, some have long stories and some chunk the contents into smaller parts. On top of the books, digital storybooks (four samples are provided in Figure 4.1) were also provided, also in different formats of content representations.
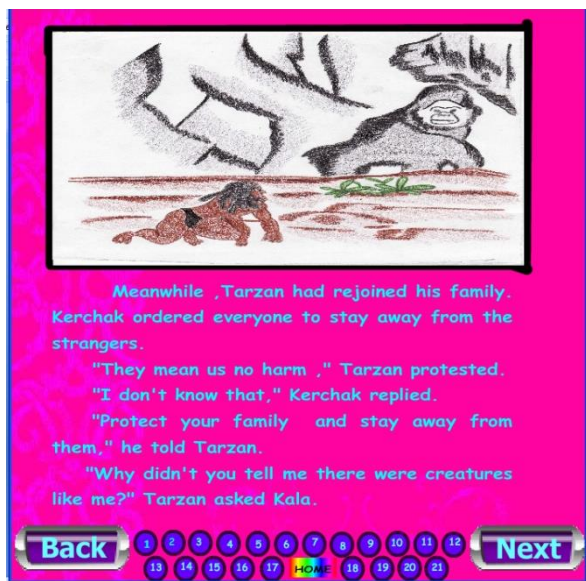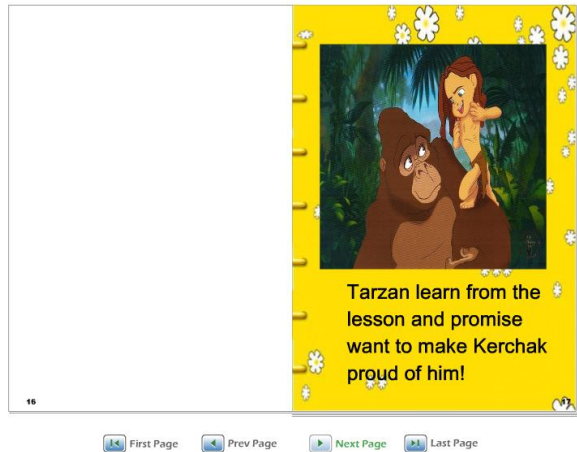
Figure 4.1: Samples of digital storybook used to observe feedback

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Further, **Seminar 3** took place with the objective to enrich the media elements dimension. In this exercise, only digital storybooks were used as the tools for gathering feedback. Hence, the same digital storybooks were used again. Each digital storybook contains various media elements, but there are certain media elements (such as audio, video, and animation) not available in certain digital storybooks. It is purposely designed to identify the effects of different media elements.

During the observation, it was found that children were not really interested if the storybooks do not speak to them. Besides, storybooks that do not have any animated characters are also not preferred. Not only that, font is also playing roles in tackling children's interest. It was found that the fonts must be large enough, at least 18-point, the difference between the background and foreground is obvious, are clear, use sans serif, simple, use wide character-fonts such as *Bookman Old Style*, and there is no mistake. For the audio, the pronunciation must be clear, slowly, and right with emphasis, tone, and stress, the difference between the background audio, audio alert, and the content must be obvious, the important note should be repeating, and always under user control such as to listen or not. Meanwhile for graphics, animations should only be used when appropriate (avoid putting too much animation), involving multiple colors. On top of that, the visual elements must always be standard, and clear, involving multiple different characters, and are in proper metaphors.

It was followed with **Seminar 4**, which aimed at detailing the interactivity dimension. Using the same digital storybooks, the children with their teachers were invited to experience the interactivity. This study observed the way they experience the digital interactive storytelling by focusing on the interactivity part. Obviously each digital storybook has different styles of interactivity. This gives rich feedbacks to this study.

At the end, it was gathered that maintaining the standard is very important. This reflects that every page in similar topic should be standard. All characters should be similar, in contextually similar metaphor, similar layout, and maintained theme. The sign post really helps users to be aware of their current location in the digital storytelling. On top of that, audio alert is very

important. It notifies the users about their action. Further, it should be helped with visual alerts. The combination of audio and visual alerts ensures that users always know the differences of clickable and non-clickable items. However, the demand for user intervention has to be minimal. It is important to note that users tend to be tired if they have to continuously click the mouse. This eventually leads to rejection. The use of mouse or touch screen is necessary for digital storytelling. In the application, buttons must be obvious. Users are not happy if they have to guess between buttons and other elements. Additionally, the buttons must also be standard. Without instruction, users are not confident to operate the digital storytelling. Hence, the digital storytelling must be provided with clear instructions. Most importantly, users must have freedom in navigating through the digital storytelling. Hence, it should avoid hierarchy. This allows users to move from a point to any point at their convenience.

Then **Seminar 5** followed. It was aimed at detailing the language dimension. In approaching children, using proper language is necessary, because children will imitate from their environment. Hence, this study believes that language influences the children greatly. Accordingly, the languages in the digital storybooks were used as the base to gather rich data from the children. It was found that the language affects their pleasure in interacting with the digital storybook. When in certain cases, they have to refer to their teacher, it slows them down. Meanwhile, it was also seen that they enjoy interacting with the storybook.

In short, this study found that digital storytelling should use simple sentence structure. It was found that long structure makes children confused. Besides that, it should contain short sentences in conveying the contents. If the sentences are too long, children tend to feel bored,

and lost in the reading. When there are purposeful and meaningful content, it is good to repeat. During the observation, it was found that when repeating the contents, the children learn more quickly, and memorize endlessly. Additionally, the digital storytelling should convey the contents in written and audio forms, which means the sentences are narrated accordingly. When both are provided, children could grasp the contents correctly and confidently.

Finally, **Seminar 6** detailed the method dimension. It is important in supporting children with various learning intelligences. Based on the observation over the way the children interact with the provided digital storybook in earlier seminars, they focus more through hearing. It was obviously seen that they got the contents even though they were under the table playing with peers or playing with toys at the back of the classrooms through what they listened. Besides, other children read the contents together, and then chat with peers on the contents. Those who were not able to read fluently asked assistance from their peers. Sometimes, they refer to their teachers. Nevertheless, children also move around with the contents in the digital storybook. The environment was very healthy with help of the digital storybook.

Based on the scenario described in the above paragraph, this study deduces that the digital storytelling should be incorporating elements that support children learning intelligences. Hence, the written contents should be narrated nicely, using appropriate language and voice for the ultimate target audience, which in this study are children aged between five and six. Besides, the written contents should be designed in a way that children could read together. Hence, this study prefers to highlight the syllable being narrated, so that weak children could read together. The children would also map the contents with the behaviors of characters they see on the

screen. This needs to be designed appropriately so that they learn through their observation. This could be very efficient in describing about abstract concepts. On top of that, many children learn well when they speak. Hence, the characters in the digital storytelling should invite children to speak with them. This could be by answering questions or repeating contents. Also, the digital storytelling should be utilized by the teachers to motivate the children to imitate the conversations, practicing among themselves, and consequently with their family members, neighbours, and the society when they are not in schools. In the digital storytelling, elements that invite the children to move together must exist. This could be through clapping hands, imitating the characters dancing, and shifting from a point to another.

In short, the multiple intelligence part must involve in the methods for learning, particularly listen (verbal – linguistic – intrapersonal), read (verbal – linguistic), speak (interpersonal), witness (intrapersonal – spatial), and move (interpersonal – musical – bodily-kinaesthetic). This aspect should be incorporated in digital storytelling in response to the various styles of learning among children. This allows every child learns as found by. The use of various media elements is important. This reflects the multiple intelligences, in which some children tend towards learning with text, some with animation, and some with movement. Hence, the digital storytelling has to be developed very creatively. The differences between the contents and other elements such as audio and visual alerts, and background music or song must be clear so that the children are not confused. On top of that, the language and interactivity must be simple, because children have little experience in both. Their vocabularies and experience in interaction are limited. Hence, everything should be obvious and within their existing knowledge. Having analyzed the requirements for digital storytelling, this study forms a set of guidelines for the

46

digital storytelling. The guidelines are recommended for designing digital storytelling for pre-school. In accordance, Table 4.1 lists the guidelines, containing very straight-forward practical tips.

Table D

Table 4.1: Guidelines for digital interactive storytelling

Content	• Consist of a few chunks of topics, including exercise or quiz. • Simple and map children's existing knowledge. • Each topic is short. • Arranged according to thematic, increasing level of complexity, sequences of process, and the like. • Include elements within children's mental model.
Media elements a. **Text**	• Use large fonts – such as 18-points. • Make sure the difference between the background and foreground is obvious. • Make sure the fonts are clear, use sans serif. • The fonts must be simple, use wide character-fonts such as Bookman Old Style. • Make sure there is no mistake.
b. **Audio**	• Pronunciation must be clear, slowly, and right with emphasis, tone, and stress. • Obvious difference between the background audio, audio alert, and the content. • Good to be repetitive. • User can control the audio.
c. **Visual (graphic, animation, images, video, etc..)**	• Use of multiple colors. • Use only appropriate animation. • Make sure the visual elements are standard. • All graphics must be clear. • Provide multiple different characters. • Use suitable metaphors for children.
Interactivity	• Maintain the standard. • Provide sign post. • Provide audio alert. • Provide visual alert. • It has to be minimal. • Encourage the use of mouse or touch screen. • Buttons must be obvious. • Use clear instructions. • Avoid hierarchy.
Language	• Use simple sentence structure.

	• Use short sentences. • Good to repeat. • Provided in written and audio forms.
Methods	• Listen – allow children to listen to narration. • Read – encourage children to read the texts on screen. • Witness / observe – Invite children to witness the characters in the learning material. • Speak – invite children to speak-together, such as singing and count. • Move – encourage children to move their body, such as clap their hands, and nod their heads.

It is important to note that the guidelines in Table 4.1 guide on the usability aspects, making the digital storytelling usable in its context. They do not deal with aesthetical values. This study believes that designers when designing interactive electronic applications including digital storytelling are good at aesthetical values already. In addition, the guidelines are made not complicated, ensuring that everyone could understand and incorporate them in the teaching material they develop.

In this study, having gathered the guidelines (as outlined in Table 4.1), through a series of seminars involving actual users including teachers and children, with helps of some printed books and digital storybooks (sampled in Figure 4.1), the guidelines were transformed into a working prototype. Hence, the work on designing the interactive digital storytelling took place.

4.4   THE PROTOTYPE

4.4.1 Design

In the designing part, storyboard was used to convey ideas of how the interactive digital storytelling looks. In the digital storytelling, the content, behavior, layout, navigation and structure are emphasized. The storyboards, as sampled in Figure 4.1 (available in Appendix B) were presented to the users in the UCD seminars. Their feedbacks were considered for improvement.
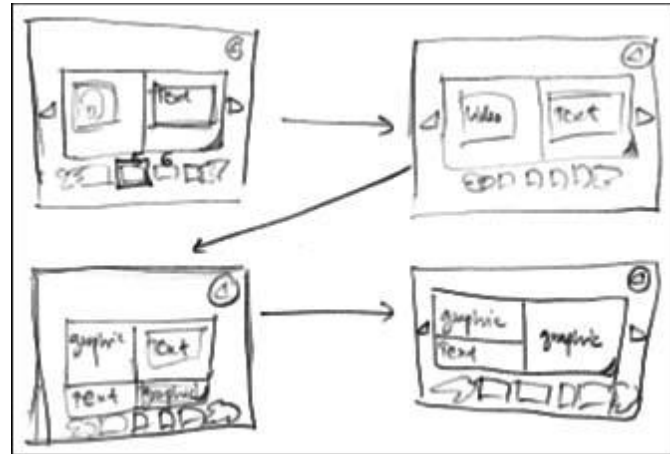
Figure 4.1. Samples of storyboard

g

In terms of contents, the available and famous stories were considered. Among the various stories, users prefer Tarzan (in the UCD seminar), hence this study accepts to fulfill their wish.

4.4.2 Development

Having designed, the works on developing the digital interactive storytelling commenced. Similarly, it involved a series of UCD seminar. In the seminar, users were presented with the prototypes on progress basis. It enabled them to feed back on the design. Most feedbacks were on colors, graphical elements, and navigation.

The main platform for the development is Flash. Besides, audio recording were accomplished using SoundForge. Meanwhile, image editing was done in Photoshop. To make the digital interactive storytelling function as intended, some lingo programming was incorporated. Having finished developing, the digital interactive storytelling was made executable and distributed in CD.

Generally, the digital interactive storytelling makes use of jungle as the metaphor, suitable with Tarzan, a man who lives in the jungle. This supports and enhances reading activity, in which it maps the context of the content being delivered.

4.5   THE MULTI-MODAL DIGITAL INTERACTIVE STORYBOOK

The digital interactive storytelling was designed and developed with "making users aroused through multi-modalities" in mind. Hence, for that purpose, users were closely involved throughout the study.

Having gone through a series of five development seminars, this study managed to finish the prototype, in which the front cover is illustrated in Figure 4.2. It contains pictures with harmonious colors and audio, supporting seeing and listening modalities.

Structure and Layout

In terms of layout and structure, the digital interactive storytelling is ensured consistent. This is seen through the provided figures. The display is plain, avoiding massive interface; at the same time keeping the navigation elements close at hand.

The page number is notified when the mouse rolls over

Hybrid navigation

Button to slide the thumbnails
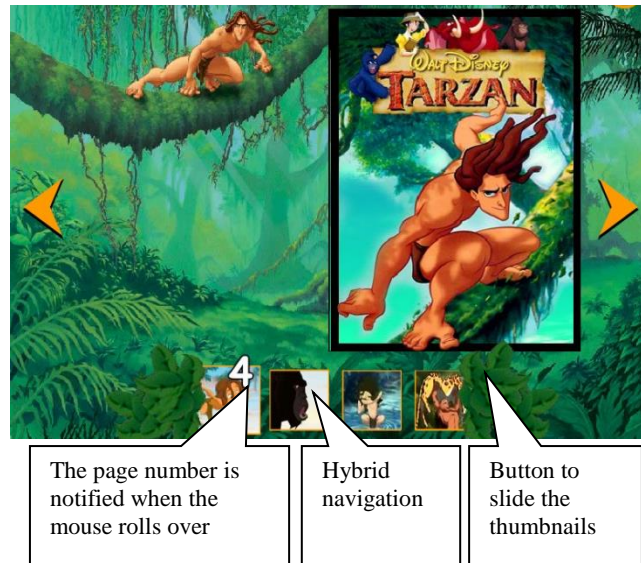
Figure 4.2: Front cover

h

Navigation

In terms of navigation, Figure 4.3 illustrates that the page contains buttons (in page miniature) for hybrid navigation, which allows users to move to different pages with a single click. This is applicable especially for users who have read the book. If the miniature page they want to go to is invisible, they can place the mouse pointer on the leaves on the left or right of the miniatures. This makes the miniatures slide either to the left or right accordingly. They do not have any problem to identify the page because every time they roll the mouse over, besides the miniature expands, they also notify the page to jump to. In contrast, if the users want to move between pages linearly (such as the first time reading), they could use the linear navigation button as indicated in Figure 4.3.
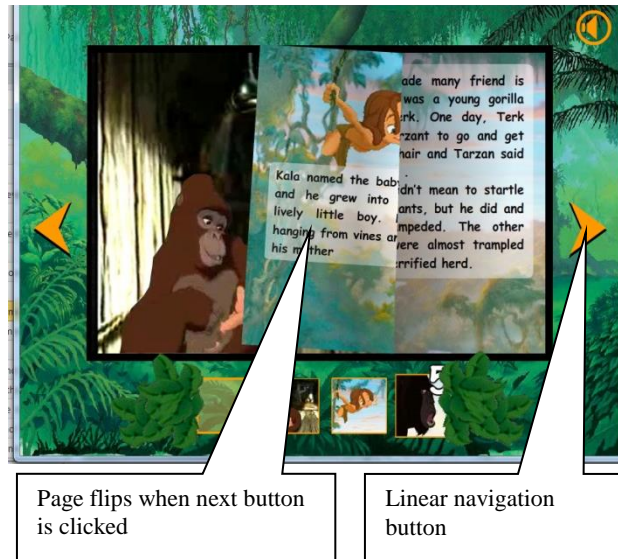
Figure 4.3: Page flipping

i

Not only navigating using the provided buttons, users could also manually flip the page. When they drag the page from the right-bottom vertex, they could play with the page flipping as shown in Figure 4.4, which is very arousing (touching modality).

Manually flip the page from the vertex
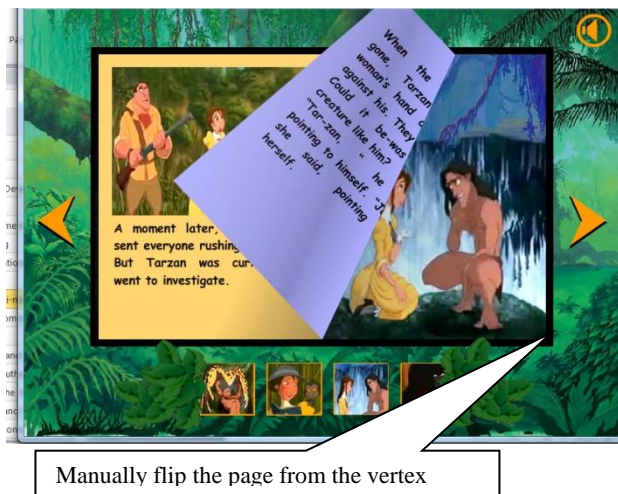
Figure 4.4: Manual flipping

j

Also, users could move the pages in reverse order, if they want to. Similarly, both linear and hybrid navigation are provided for them, that gives similar page flipping effect as seen in Figure 4.5.
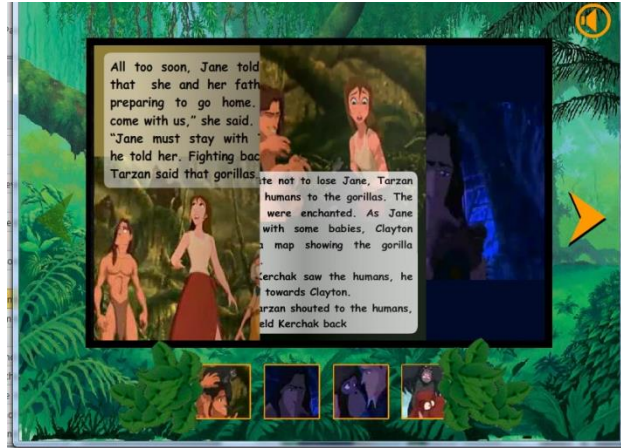
Figure 4.5: Reversing page

k

Media Elements

Figure 4.6 displays a button to turn the audio ON and OFF. Users are provided with the button because some people expect for the audio while there are also some who do not. In this interactive storytelling, the contents (text) are read aloud for the users. It supports users in two ways, (1) for users (children) who are not able to read yet, and (3) for users (children) who can read, this trains them to read quickly. Not only that, in some pages, appropriate audio cue and sound effects are incorporated, such as Tarzan screaming, water splashing, elephant, tiger, and such the like. It is important to enhance the reading interest [12,13,14,19] through the supports for seeing and listening modalities.
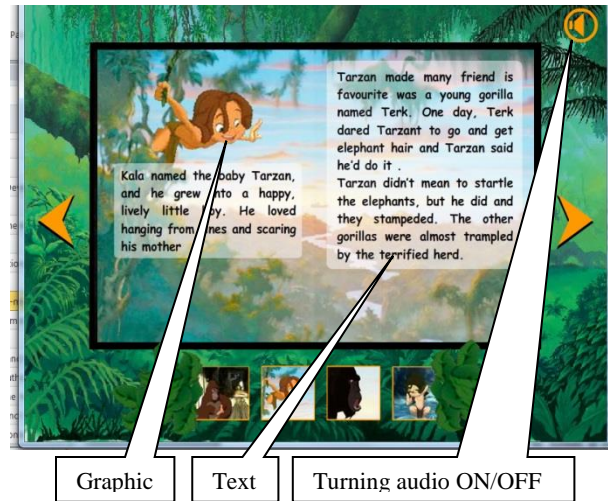
Figure 4.6: Text and graphics

l

Figure 4.6 also visualizes the text and graphic elements. As outlined in the guideline (Table 1),
they are tailored for the children.
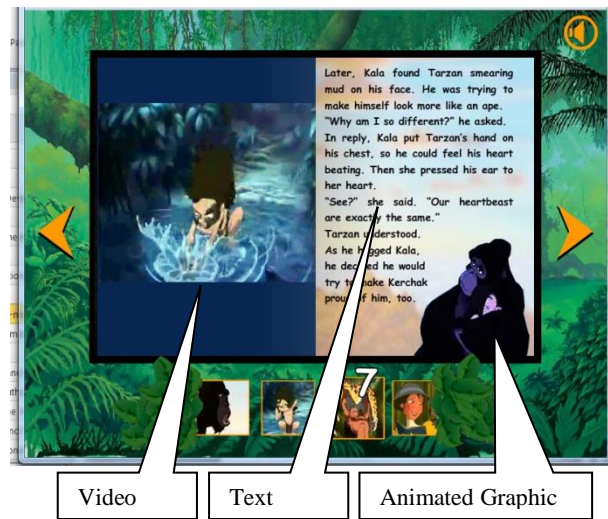
Figure 4.7: Text, animated graphic, and video

m

Figure 4.7 illustrates a combination of text, animated graphic, and video on the pages. In the
pages, the video enhances the text content [18,21,22]. The video is also incorporated with sound

effect. In the developed digital storytelling, the dialogues are addressed by respected actors. This intensifies the audio effect to the readers.

Meanwhile, Figure 4.8 illustrates a page that combines text, graphics, and video in a different layout. This is an element that this study calls 'sparkling cognition'. It refers to the tuning of attention, from one representation to another representation.

Figure 4.8: Text, graphics, and video

n

Others

Besides those tangible elements, the developed interactive storytelling also emphasizes on the orchestration among the elements. It is seen that all elements are nicely blended together; making every page up as a single canvas that conveys meanings to the readers. Referring to the navigation, it is noticed that users do not have to do unnecessary mouse click to get to the content. In most cases, they just perform a single click for certain content. On top of that, the terminologies used in the storybook are commonly experience by the users. This study avoids anything that is not within children's locus of knowledge. Nevertheless, when there is an intention to encourage children to learn new thing, it is included in the developed storybook.

4.6 CONCLUSION

The previous section displays some snapshots of the interactive digital storytelling, with the elements in the model described in the earlier section. Before that, the process of gathering the elements for the interactive digital storytelling are explained systematically, in which UCD approach was utilized. Hence, the outcome of this chapter are three; the elements for the interactive digital storytelling, the model containing the gathered elements, and the prototype of the interactive digital storytelling that incorporates the constructed elements. Further, Chapter 5 explains about the user experience testing, and how much the users appreciate the interactive digital storytelling.

CHAPTER FIVE

USER EVALUATION AND DISCUSSION

5.1   INTRODUCTION

As outlined in Chapter 3, the emperical and qualitative techniques are used in evaluating the guidelines for digital interactive storytelling. It was carried out to achieve the third objective stated in Chapter 1. Hence, this chapter begins with describing the qualitative techniques first, followed with the empirical stuffs.

5.2   Qualitative Measurement

In qualitative approach, data were gathered through observation and interviews. The pre-schools were visited with special purposes for evaluating the digital interactive storytelling. During the visit, the digital interactive storytelling was distributed in CD and let the users (children and their teachers) experience it. This study observed their interaction with the prototype. Before the exit meeting, the children and their teachers were also interviewed on the experience while interactiog with the digital interactive storytelling.

5.2.1 Techniques

During the observation, users were encouraged to experience the digital interactive storytelling as part of their class activity. The teachers were explained about the evaluation purposes in

advance, so the schools were prepared for the session. However, the children were not mentioned about the session, to ensure thay behave naturally during the observation. Besides, the meetings in the previous seminars (during UCD sessions) have ensured that the children are familiar with the personnel involve in this study. Hence, this ensures further eliminates possible bias in users' behavior during the observation.

This study took a period (30 minutes), as scheduled (for English subject), for observing the interaction with the digital interactive storytelling. It is a normal teaching period at the pre-schools. It is very important, so that both teachers and children are not affected by any time-related factor. During the observation, this study noted the facts regarding the guidelines in Chapter 4 down. Samples of observations are depicted in Figure 5.1.

Having observed the teaching practice with helps of the digital interactive storytelling, this study asked the teachers some questions for confirming the notes taken. It was ultimately unstructured, in which open questions regarding the notes taken were addressed. In short, the questions were asked to clerify the data gathered through the observation, hence there was no specific questioned outlined in advance.

Figure 5.1: Observation activity

o

5.2.2 Findings

Having observed and interviewed, significant findings have been gathered. The data are rich, because they were collected from 2 pre-schools. Regarding the observation activities, the trend was clear that observing five to seven users are sufficient because the observing more users only repeats the findings.

Although there were wealth aspects to be noted, this study focused on the guidelines set in Chapter 4 for the purpose of this study. Accordingly, this section has no intention to elaborate in detail, in contrast it summarizes the findings mapping with the guidelines in Chapter 4. Hence, the findings are listed in Table 5.1.

Table E

Table 5.1: Summary of qualitative findings

Instructional / Multiple Intelligence		Findings
Content	• Consist of a few chunks of topics, including exercise or quiz. • Simple and map children's existing knowledge. • Each topic is short. • Arranged according to thematic, increasing level of complexity, sequences of process, and the like. • Include elements within children's mental model.	The teachers agree with the depth and breadth of the contents. The idea of chunking the contents into topics maps the current practice. Teachers and children follow the themes in the digital interactive storytelling happily. Children can associate the contents well with their existing knowledge. **Note**: The use of animated characters in appropriate metaphor in digital interactive storytelling makes learning fun for the children.
Media elements **d. Text**	• Use large fonts – such as 18-points. • Make sure the difference between the background and foreground is obvious. • Make sure the fonts are clear, use sans serif. • The fonts must be simple, use wide character-fonts such as Bookman Old Style. • Make sure there is no mistake. ――――――――――――――――――	The font size is important, in terms of colors, size, style, and matching with the background. ―――――――――――――――――――――
e. Audio	• Pronunciation must be clear, slowly, and right with emphasis, tone, and stress. • Obvious difference between the background audio, audio alert, and the content. • Good to be repetitive. • User can control the audio.	In terms of the audio, it is also important. Normal children expect for the audio, but it should allow the children to control their volume. During the observation, it was found that all children enjoyed the song, because digital interactive storytelling constructs its own song, mapping the content. This study calls them content songs. When it could be repeated, children like it even more. They ask their teacher to repeat (when applicable) until each of them involve. With that, they get the

		contents quickly.
f. Visual (graphic, animation, images, video, etc..)	_____ • Use of multiple colors. • Use only appropriate animation. • Make sure the visual elements are standard. • All graphics must be clear. • Provide multiple different characters. • Use suitable metaphors for children.	_____ The various colors (mainly red, blue, yellow, and green) attract children at their first sight. This captures their attention to the teaching material. The standardization is important. No user was found confused with the visual elements in digital interactive storytelling. The minimized animations, available only when necessary ensure that children focus on the learning content. Partly, because it does not overload their cognitive. On top of that, the metaphors in digital interactive storytelling do not confuse the children in their learning flow. None of them asked any question, which explains that the metaphors influence their learning engagement positively.
Interactivity	• Maintain the standard. • Provide sign post. • Provide audio alert. • Provide visual alert. • It has to be minimal. • Encourage the use of mouse or touch screen. • Buttons must be obvious. • Use clear instructions. • Avoid hierarchy.	Standardization in digital interactive storytelling avoids users from lost. It was found that the teachers never navigate wrongly after they have learned from the first or second mistakes. This supports children interest and confidence also. Signpost, audio, and visual alerts are also very significant in notifying users about their actions. Although teachers use the digital interactive storytelling for the first time, they were not confused between clickable and non-clickable items, and felt very confident in interacting. They mentioned that the signpost, audio alert, and visual alert make them confident. On top of that, the obvious buttons also make them confident. Additionally, they have freedom in digital interactive storytelling to

		navigate through without being forced in a linear step. This allows them to plan their teaching according with special reflection to the current situation. It is important because they have to tailor their teaching appropriate to the children, who always trigger behavior change.
Language	• Use simple sentence structure. • Use short sentences. • Good to repeat. • Provided in written and audio forms.	The children were seen happily participating in the learning activities. Short sentences enable them to imitate the contents. They were help a lot by the narration, especially with proper pronunciations, emphasis, and stress. Nevertheless, they got clearer when the ambiguous parts are repeated. In the end, the children could make-up simple dialogues nicely and confidently. Hence, this study deduces that for all applications for children, the sentence structure must be simple with short sentences. Repetition is also good to support children learning, with the spoken words are written.
Method	• Listen – allow children to listen to narration. **(A)** • Read – encourage children to read the texts on screen. • Witness / observe – Invite children to witness the characters in the learning material. **(V)** • Speak – invite children to speak-together, such as singing and count. • Move – encourage children to move their body, such as clap their hands, and nod their heads. **(K)**	The children enjoyed the listening part a lot. It is supported with written text. This develops their confidence significantly. It results in their ability to grab new vocabularies and sentence structures. It is especially meaningful because digital interactive storytelling highlights the word being pronounced with different color, so the children follow the contents exactly. Besides, the characters also describe certain concepts through their behavior and body languages. Children were observed imitating their body languages when practicing the sentences. They not only speak with their peers, but also with their teachers and answering questions

		together when the digital interactive storytelling asks questions. They move physically along with the digital interactive storytelling, especially when singing songs and demonstrating body languages.
		In short, all users enjoy the activities: listen, read, witness /observe, speak, and move. They clap their hands, twist their body, sing together, smile, read the text, listen to the audio, and speak to others.

The findings in Table 5.1 explains that the guidelines assist a lot in designing the digital interactive storytelling. Further, the digital interactive storytelling invokes interest among the users in their learning through digital storytelling. It was observed that both teachers and children enjoyed the sessions. In short, teachers were observed active in handling the session, and children were observed enjoyed learning with helps of the digital interactive storytelling.

Although this study is happy with the findings, some emperical data were also obtained to further confirm that the digital interactive storytelling is usable in ensuring users experience positively while interacting with the digital interactive storytelling. Hence, an empirical study was carried out, and is explained in the next section.

5.3   Empirical Measurement

The empirical data were collected to determine the usability of the digital interactive storytelling. The findings of the study proves the ability of the proposed guidelines in ensuring that digital interactive storytelling is usable in making interaction with digital interactive storytelling interesting. Hence, appropriate data were gathered from the actual users. In this emperical testing, only children are considered because they are the ultimate intended users.

5.3.1 Techniques

Chapter 3 mentions that CSUQ (Lewis, 1995) is utilized in this study (Available in Appendix C). Apart from justifications addressed in Chapter 3, other reasons of selecting the CSUQ into this study are: (1) it is very simple, suitable to obtain desired feedback and at the same time keeping the subjects' interest in responding to the questionnaires, (Freed, 1964; Huffman, 1948; Payne, 1951); (2) it has a non-threatening manner, so as to encourage the subjects in answering the questions (Erdos, 1957; Robinson, 1952), and (3) it has a clear format and specific topics (Freed, 1964; Levine & Gordon, 1958; Robinson, 1952; Seitz, 1944). Hence, the CSUQ was perfectly adopted, consisting eighteen items which are divided into four dimensions, namely:

Section A: Usefulness

Section B: Content Quality

Section C: Interface Quality

Section D: Overall Satisfaction

Since subjects are of low proficiency level, simplicity in response is given due importance (Lewis & Porter, 2004; Terrell, 1958) furthermore, it has been proven that children evaluate some statement as part of the whole statement (Smith, 1980). Therefore, the items are measured

by responding whether they agree or disagree with the statement in each dimension. The results of the evaluation are shown in Tables 5.2, 5.3, 5.4, and 5.5.

Earlier part explains that this study involves 14 pre-schools. For the purpose of analyzing empirical data, the number of gathered answered CSUQ was determined. While the number of participants of each school is different, they are detailed as follows, totaling 39 participants:

- School 1 – 10 participants

- School 2 – 15 participants

- School 3 – 14 participants

5.3.2 Findings

Each dimension is discussed separately. In regards to the background of the users, who are not highly motivated in answering questionairre, only agree and disagree options are provided for them to choose. Hence, percentages could already explain about the usability.

Usefulness

From the responses in Table 5.2, it is found that 100% of the users were satisfied with the usefulness of the digital interactive storytelling which enables them to complete the activity effectively and comfortably. All users agreed that it was easy to navigate the digital interactive storytelling and it helps them to improve their vocabulary. Additionally, 76.92% found that digital interactive storytelling is simple, whereby only 23.08% disagreed with it. 82.05% of the users agreed that they could finish reading the digital interactive storytelling in a short time, while another 17.91% was unable to do so.

Table 5.2: Usefulness

Item	Description	Agree		Disagree	
1	I am satisfied with the activity in digital interactive storytelling because it is easy to use.	39	100%	0	0%
2	I can learn making sentences with help of digital interactive storytelling effectively.	39	100%	0	0%
3	I find the digital interactive storytelling is simple.	30	76.92%	9	23.08%
4	I can complete the activities in digital interactive storytelling quickly.	32	82.05%	7	17.91%
5	I feel comfortable with the digital interactive storytelling.	39	100%	0	0%
6	It was easy to navigate the digital interactive storytelling.	39	100%	0	0%
7	I believe I can improve my vocabulary using digital interactive storytelling.	39	100%	0	0%

From the findings in the above paragraph, this study believes that the digital interactive storytelling has been a good learning apparatus for pre-school children. They found that the digital interactive storytelling is very useful in assisting their learning experience.

Content Quality

Table 5.3 describes the elements on the content quality of the digital interactive storytelling. All users agreed that they were able to correct errors and find information needed easily, that the information supplied is effective in assisting the task completion, the organization of information is clear and the music used is appealing to them. As for the clarity in instruction given, 66.67% agreed, while a small sum of 33.33% disagreed. 61.54% of the subjects claimed that the information the digital interactive storytelling was effective in completing the activity, however, another 38.46% opposed to this.

Table 5.3: Content Quality

Item	Description	Agree		Disagree	
8	The instructions in digital interactive storytelling are clear.	26	66.67 %	1 3	33.33 %
9	I can correct my errors easily.	39	100%	0	0%
10	It is easy to find the information I need.	39	100%	0	0%
11	The information provided in the digital interactive storytelling is easy to understand.	24	61.54 %	1 5	38.46 %
12	The information given is effective in helping me using the digital interactive storytelling.	39	100%	0	0%
13	The organization of information in the digital interactive storytelling is clear.	39	100%	0	0%
14	The music is appealing.	39	100%	0	0%

The findings in Table 5.3 as described in the above paragraph explain that the content quality in digital interactive storytelling is clear. They explain that the information in digital interactive storytelling for pre-school children must be very minimal, and requires less mental efforts (Duggan, 2009). This is important in efforts to start engaging them into learning activities (Shahrier, Anton, & Hamamah, 2010; Warren & Devrics, 2009).

Interface Quality

With reference to Table 5.4, on the part of interface quality of the digital interactive storytelling, all subjects agreed that the interface is pleasant and they liked using icons and clues provided in the digital interactive storytelling as they have user-friendly functions.

Table 5.4: Interface Quality

Item	Description	Agree		Disagree	
15	The interface is pleasant.	39	100%	0	0%
16	I like using the interface of the digital interactive storytelling.	39	100%	0	0%
17	The functions in the digital interactive storytelling are user friendly.	39	100%	0	0%

Accordingly, this study strongly recommends that digital interactive storytelling for pre-school children should be very pleasing (Bourke, Rigby, & Burden, 2000). It was found that the digital interactive storytelling was highly preferred by the teachers and children. In addition to that, Chen, Mashadi, Ang, and Harkrider (1999) also emphasize that cultural inclusivity is one of the fundamental foundations in creating learning environment as it will enable children to retrieve learning resources in a manner that is congruent with their styles of learning, beliefs, and values.

Overall Satisfaction

On the whole, the digital interactive storytelling received an overwhelming acceptance from the 2 pre-school children as 100% fully agreed that it can be accepted as a tool for them in their learning activities in pre-school. The responses are listed in Table 5.5.

Table I

Table 5.5: Overall Satisfaction

Item	Description	Agree		Disagree	
18	Overall, I can accept the digital interactive storytelling as a tool to teach.	39	100%	0	0%

5.4   CONCLUSION

The evaluation involves qualitative and quantitative approaches, that supports each other in strengthening the findings. This chapter elaborates in detail about both techniques. The findings reveal that the guidelines proposed in Chapter 4 is potential in assisting designers to design digital interactive storytelling suitable for pre-school children. Thus, the objective as stated in Chapter 1 is achieved. Further, the following chapter concludes the study and suggests some recommendations for future research based on responses gathered from the participating subjects.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1   INTRODUCTION

In this study, Chapter 1 introduces the background of the study, which is aimed at proposing a set of guidelines for information accessibility that supports multi-sensory learning in digital interactive storytelling among Arab pre-school children. In conjunction, to ensure that the aim is accomplished, five sub-objectives were outlined; (1) to determine the components of digital interactive storytelling for pre-school children that supports learning, (2) to determine the strategies for supporting multi-sensory learning among pre-school children, (3) to propose the guidelines for information accessibility that supports multi-sensory learning in digital interactive storytelling among pre-school children, (4) to develop a prototype of digital storytelling, and (5) to observe the user experience when learning with the digital interactive storytelling.

Further, reviews of literatures are rationalized in Chapter 2, hence leading to details of the operational framework of the study (Chapter 3) which involves information gathering, prototype development, data collection and analysis. Next, in Chapter 4 the design and development of digital storytelling is proposed and discussed. Subsequent to this, Chapter 5 discusses the results through observation, interview, and questionnaires.

Finally, this chapter describes limitations of the study, recommendations for future work, contribution and the overall conclusion of the study.

6.2   SUMMARY OF FINDINGS

Chapter 1 mentions that there are five objectives to be achieved: (1) to determine the components of digital interactive storytelling for pre-school children that supports learning, (2) to determine the strategies for supporting multi-sensory learning among pre-school children, (3) to propose the guidelines for information accessibility that supports multi-sensory learning in digital interactive storytelling among pre-school children, (4) to develop a prototype of digital storytelling, and (5) to observe the user experience when learning with the digital interactive storytelling.

Throughout the activities explained in Chapter 3, in three phases, all objectives have been achieved. In particular, objectives 1 through 4 have been achieved as explained in Chapter 4. The components of the proposed guidelines were obtained through the interviews and observations involving teachers and students. Most of the determined components were decided to support the pre-schools children's level of cognitive and psychomotor abilities, which are not similar to adults. The testing of developed digital storytelling with the subjects has led to results that serve objective 5. There are theories suggesting that technology plays as the anchor in teaching activities such as Anchored Instruction (Bransford & Stein, 1993) and Symbol System (Salomon, 1979).

In a nutshell, the works carried out have proven the hypotheses and answered the question stated in Chapter 1 through achieving the objectives. All users were enjoying the digital storytelling, because they feel the digital storytelling is useful and easy to use. The clear information also supports their tasks a lot.

6.3   LIMITATIONS AND RECOMMENDATION FOR FUTURE ENHANCEMENT

This study focuses on proposing guidelines for digital storytelling that combines various sensory. It involves teachers and children in the field. In the evaluation, data were gathered through qualitative and quantitative techniques. Although all processes as outlined in Chapter 3 and are detailed in subsequent chapters were carried out smoothly, there are still some rooms for improvements to consider for future enhancement. Thus, the following paragraphs discuss on the limitations and potential studies related to this for enhancement.

The guidelines were developed involving Arab pre-schools in Kedah only. It is anticipated that the findings will be richer and more interesting if all states in Malaysia involve in the study. In fact, involving pre-schools in the developed countries could shed lights on their practice that Malaysia could adopt. Hence, collaborating with similar context in the UK, USA, and Australia is highly potential. When it is carried out in a large scale, implementing the guidelines universally is also possible.

Besides, the guidelines assist designers and developers in terms of usability only, not on aesthetical aspect. It is because this study anticipates that all designers are already good at making interactive teaching materials attractive. However, in the matter of fact, not all designers and developers are like so. Hence, complementing guidelines for usability and aesthetical aspects would be more comprehensive. In that case, the three-axis design paradigm (content, form, behaviour) (Dix, Finlay, Abowd, & Beale, 2004) is supported for the teaching material. Thus, this really guides all designers to design usable attractive teaching materials.

On the other hand, the proposed guidelines are suitable for normal children. However, children with special needs such as visually-impaired and hearing-impaired require special features. This study anticipates that similar characteristics go with their teachers. Hence, guidelines for the community with special needs require additional study. Thus, studies in the future should detail the needs of teaching material for them, as a preparation for the ultimate change into technology-enhanced education.

On top of that, the guidelines in this study consider offline teaching environment only, it does not consider networked teaching environment. This study recommends that a study for networked teaching environment is carried out, as an initiative that accelerates online teaching and learning starting in the pre-schools. It is feasible because the environment for networked environment is different. It connects people, which could foster collaboration among children and teachers.

6.4   CONTRIBUTION

There are three aspects in which this study has brought influence into; namely the body of knowledge, the teachers, and the children.

To the body of knowledge, the guidelines complement the existing guidelines tailored for learning materials. The proposed set of guidelines is simple, easy for designers (teachers) to understand and further use as guidance in developing their own digital storytelling for their lessons in teaching Arab children.

On top of that, the findings prove that teachers could make use of the digital storytelling in assisting them in teaching at Arab pre-schools. Through the observation, they were found enjoying teaching their children. When further asked, they fed back that the digital storytelling

is potential in reducing stress in controlling their children, especially with its capability to capture attention. Nevertheless, it attracts children with different preferred learning styles.

Meanwhile, on children's part, the guidelines address various approaches for various learning intelligences. It is obvious that digital storytelling provides various media elements in listening, reading, speaking, and movement activities. This ensures that every child follows the learning contents even though they are on certain other physical activities. In Arab children nature, active movements are too common, and it is hard to have them stay in a proper manner for ten minutes. Thus, when digital storytelling is able to demolish the barrier between Arab children active nature with learning activities, this study takes it as a huge achievement.

6.5 THE OVERALL CONCLUSION OF THE STUDY

On the whole, the guidelines for multi-sensory digital storytelling which have been developed with predetermined scope, has been successfully utilized and accepted in the teaching and learning process among Arab children in pre-schools. This study has observed that the Arab children take pleasure in performing the teaching and learning activities. It is without a doubt that teaching and learning can bring more values and be more meaningful when subjects are given the opportunity to engage in activities that require them to explore and experience a variety of exhilarating and stimulating exercises. This is proven by the responses on the questionnaire adapted from CSUQ, whereby 100% of the subjects agreed to accept the digital storytelling into their teaching and learning activities. Nonetheless, the digital storytelling is not meant to entirely replace the teaching and learning process that is carried out at present. In effect, it can be used to provide enrichment and exuberance to the existing learning environment of the children.

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