ORIGINAL RESEARCH ARTICLE

Exploring children experience with educational mobile technology

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The purpose of this study is to explore and analyse the user experience (UX) of Arabic educational and entertainment applications designed for children aging 8–10 years. This paper reports the results of an experimental study conducted on a sample of 53 children in two elementary schools in Qalqilya and Nablus, Palestine. The context of the current study is different from previous studies that were conducted in a western environment in terms of knowledge, awareness, demographic changes and background variables. Qualitative methods captured the enjoyable and attractive parts of the software being used. The qualitative content analysis showed that participants' enjoyment using the system was quite different. During sessions, children showed much excitement and interest while working with the math app more than the science app. However, girls were less interested to use the math application compared with their use of the device itself. Following Hassenzahl's model, the descriptions of UXs were also categorised into two categories: pragmatic and hedonic; the functionality, technical and ease of use aspects of UX of both the tablet and the math application were categorised as pragmatic. Enjoyable, exciting, confusing and upsetting experiences were categorised as hedonic. Male participants were more familiar with the use of mobile devices than female participants. The results of the present study showed that gender, culture and religion are important factors that affect children's experience to use new technological devices since three female participants were reluctant to use the tablet especially due to cultural and religious factors.

Keywords: user experience; mobile technology; Hassenzahl's model; UX; qualitative study; Palestine

Introduction

Mobile devices are known as expensive devices amongst parents, but fortunately, the price has become cheaper with very fast technological development. Various types of tablets emerged in the market, such as iPad, Samsung tabs and others from different suppliers. Moreover, the number of sales is growing each day. Mobile devices are one of the leading innovative technological tools of communication which can be considered part of the lives of the young generation including students (Shaqour 2014). The development of mobile technology has been attracting children's attention to

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explore the affordable of this technology in different aspects of their life (Plowman and Stevenson 2012). Children's interactions with the tablet are increasingly popular, and they have a place in their hearts (Aziz 2013). Palestinian children gain access to the world of the Internet and spend a significant amount of time exploring websites and applications by using mobile technology. According to Utair (2015), 80% of Palestinian children use smartphones, 10% use tablets and the same percentage use iPad, while about 35% of these children use mobile devices from 3 to 4 h a day. More and more schools in Palestine are now including one-to-one technology initiatives and the Internet as part of their educational system (Khlaif 2018a). One-to-one technology refers to one computer/mobile technology for every student (Zucker and Light 2009). However, there is a lack of mobile devices applications in Arabic language (Wea'am and Alhussayen 2015). The main purpose of the Arabic applications is to educate and entertain children, and these applications are still in their early stages (Alhussayen, Alrashed, and Mansor 2015). Moreover, the few Arabic children's applications and websites available are not appealing for children (Wea'am and Alhussayen 2015).

The touch interface is the main feature of mobile technology devices. Such facilities are the main input instruments which users use to do tasks such as browsing the web, playing games, watching videos, reading e-books and communicating synchronously and asynchronously through text, voice or video (Shaqour 2014). Existing literature has not enough research on children's interaction methods for mobile technology (McKnight and Cassidy 2012). Many mobile applications are being designed for children and are becoming a growing field of research (Deng *et al*. 2015). Touch screens are prevalent in the domain of mobile computing. Page (2013) mentioned that the growing inclusion of touch screens in mobile technology including smartphones and tablets has led to the argument that touch screens are soon becoming the standard of the development of technology.

The development and design of learning environments including applications and websites for children to provide them with a joyful learning experience have taken place for many years (Alhussayen, Alrashed, and Mansor 2015; Wea'am and Alhussayen 2015). Since children are the key users of this technology, the design and development of applications as well as websites should meet children's growing expectations to be successful and attractive (Alhussayen, Alrashed, and Mansor 2015). The criteria for the success of applications are functionality as well as being desirable and emotionally appealing (Chau 2014).

The field of user experience (UX) has had an important impact on the development of different types of technological products (websites, applications, artefacts, etc.). Experience is a story emerging from the dialogue of a person with the world through action (Hassenzahl 2010). Practitioners and researchers see UX as an umbrella term that covers all perceptions and responses, regardless of being subjectively or objectively measured, of a user (ISO 2010).

There is an agreement among researchers about the definition of UX in terms of how users interact with a new product. Experiences are varying from person to person and it could be positive or negative (Kim, Kim, and Moon 2013). For example, Sharp, Rogers, and Preece (2007) consider UX as central to the interaction design and concern with '…how people feel about a product and their pleasure and satisfaction when using it, looking at it, opening it or closing it' (p. 15).

Hassenzahl (2010) defines UX from a psychological perspective as 'emerging from the integration of perception, action, motivation, and cognition into the inseparable,

meaningful whole' (p. 6). Furthermore, Hassenzahl (2010) believes that emotions and fulfilment of physiological needs have a crucial role in UX. Emotions provide an intrinsic evaluation, namely pleasure or pain, which yet again will provide the user with either a positive or negative UX. Hassenzahl (2010) sees UX as a sub-category of experiences, where the focus is on interactive products.

Moreover, Roto and Kaasinen (2008) define UX as 'a term that describes the user's feelings towards a specific product, system or object during and after interacting with it. Various aspects influence the feelings, such as user's expectations, the conditions in which the interaction takes place and the system's ability to serve user's current needs' (p. 572). Researchers employed Hassenzahl and Tractinsky's definition of UX because it is easy to follow and helps to achieve the purpose of this study. According to Hassenzahl and Tractinsky (2006), UX is '(A) consequence of a user's internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and the context (or the environment) within which the interaction occurs (e.g. organizational/social setting, the meaningfulness of the activity, the voluntaries of use, etc.)' (p. 95). Their definition concentrates on the inner emotions of users and their expectation of the designed system; it clearly describes the factors influencing UX. Hassenzahl (2010) emphasises that experience is a complex construct, which emerges through interacting with the world.

In this article, the researchers present a literature review and the details of the study in which children were observed while interacting with the devices and the focus group discussion sessions for a short time. The article concludes by reporting several issues and giving suggestions to improve the design of applications dedicated to children as well as recommendations for future research.

Statement of the problem

The Ministry of Education (MoE) in Palestine provided schools with tablets to use in the educational system. The fact that students, mainly children, are using these devices for the first time, might affect their overall experience. Chang (2008) studied the errors that occur while using new products and whether they have an impact on user's experience or not. In light of earlier research, this research aims to investigate the first-time use of new technology by children. There are important issues related to first-time users including their initial impressions, their pleasure and fun/frustration to assess their experience to accept and adopt new technology (Rahman, Ali, and Mohd 2013). The use of technology is no longer limited to adult users (Wea'am and Alhussayen 2015). Therefore, developers are trying to design and develop software that fits children's abilities, interests and development needs (Alhussayen, Alrashed, and Mansor 2015). The experience and knowledge of children are different from those of adults. Indeed, children experience to perceive the world differently from adults, which motivated this study to explore the experience of children with new technology for the first time. It is equally important to explore and understand what children perceive and feel when using tablets and applications on it (Roto, Obrist, and Väänänen-Vainio-Mattila 2009).

Previous studies mentioned that most children devoted more time and focus their attention on games applications designed for adults (Alhussayen, Alrashed, and Mansor 2015; Han, Dieck, and Jung 2017). Based on the literature review, the present study seeks to study children's first experience of new technology in a conflict zone

with mobility restrictions. The motivation of this study is the lack of studies investigating the UX of using educational applications (math and science application) in Palestine. In the current research, the study focuses on UX because of its ability to explore engagement and joyful emotions more effectively than traditional usability (Kujala *et al.* 2011). Moreover, users' expectations about the system and their anticipations are important factors that affect their experience about the system itself (Roto, Obrist, and Väänänen-Vainio-Mattila 2009). This study focused on a short-term evaluation and consequently on aspects relating to the initial use of a new product in the Palestinian educational system.

The contribution of the study

McKnight and Cassidy (2012) argued that most of the previous studies have investigated issues related to performance and task efficiency more than users' experience and their attitudes towards it. In addition, the context of the current study is completely different from previous studies that were conducted in a western environment. To the best of our knowledge, the current study is considered as a contribution to the field of UX research because of the new context. The potential of the significance of the Palestinian context is due to its unique case as a conflict zone with an unstable situation and mobility restriction which has a negative influence on the learning system outcomes. Violence and mobility restriction have negative impact on the outcomes of using new technology (Khlaif and Farid 2018). Moreover, religion and culture have some impact on children life because of the socio-cultural environment affected by the conflict in the country. To narrow the research gap in the Palestinian context, the researchers present the results of this study on UX with math and science applications in the Arabic language. This study tries to explore how children experience the educational apps by using the tablet for the first time, how their experiences influence their desire to use it in their free time and their impression while using the playful learning applications. The outcome of the study might be beneficial for decision-makers in the MoE in Palestine to adopt new learning software in children schools.

Theoretical framework

Models of UX have described the experience of using interactive products, the consequences of those experiences and the ways experiences were connected (Hornbæk and Hertzum 2017). Hassenzahl's UX model was the framework of the study. This prominent UX model, according to Hornbæk and Hertzum (2017), posits that interface quality encompasses both hedonic and pragmatic aspects. According to the model, individual users assign some attributes to the system or the product when using it.

Hassenzahl assumes that users construct product attributes by combining the product's features, for example, the presentation, content, functionality and interaction with personal expectations or standards. The attributes of any product can be grouped into four main categories including manipulation, identification, stimulation and evocation. These categories can be grouped on a higher level into hedonic and pragmatic which can describe a product's characteristics. Using a product with a particular characteristic in a given situation will lead to certain consequences, such

as experiencing emotions (e.g. satisfaction or pleasure), forming explicit evaluations (e.g. judgements of appeal, beauty and goodness) or the creation of overt behaviour (e.g. approach or avoidance).

There is a general agreement among researchers that UX is shaped by a combination of pragmatic and hedonic qualities of a product (Hassenzahl and Tractinsky 2006; Thüring and Mahlke 2007). The pragmatic qualities refer to the perceived usefulness, efficiency and ease of use (so-called utility and usability aspects). In other words, it relates to the practical usage and functions of the product. On the other hand, the hedonic qualities take into account the 'joy of use' and emphasise stimulation, identification and evocation generated by the use of a system or a product. It relates to the user's psychological well-being (Bevan, 2009). Good UX is the consequence of fulfilling the human needs for autonomy, competence and stimulation (self-oriented) through interacting with the product or service (Knijnenburg *et al*. 2012). Moreover, Walsh *et al*. (2014) mentioned that the combination of pragmatic and hedonic qualities leads to positive or negative emotions and consequently guides the acceptance of the product.

Hassenzahl's UX model (Figure 1) consists of four product features identifying its character including both pragmatic attributes and hedonic attributes leading to certain consequences, namely appeal, pleasure and satisfaction.

Manipulation

Manipulation described as the pragmatic attributes which are essentially related to the functionalities of the software and the ways to use these functions in the current research. Hassenzahl (2004) states that satisfaction is a consequence of the pragmatic qualities. Satisfaction appears if a user uses the software to achieve specific goals and the software helps to meet those goals. The attributes that are assigned to the software under investigation are useful, easy to use, supporting and controllable. Manipulation is an important attribute that contributes to the user's experience.

Identification

With the development of social media websites, it is essential to include an additional important function, which is identification. This function allows users to express themselves and help them to communicate their identity with others. In the current research, the designer of the software used Facebook and Twitter as online services
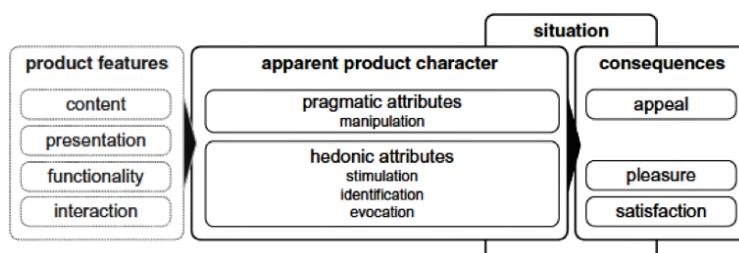

Figure 1. The key elements in Hassenzahl's user experience model. Adapted from Hassenzahl 2006.

to provide the users with more information about the company and users can connect their profiles with the Facebook page of the company. The identification function is related to the hedonic attributes.

Stimulation

Rarely used functions can fill hedonic function. These functions can stimulate the user and satisfy the human urge for personal development and more skills. Products should have unused functions and should not be dropped from any software. In this case, the software does not have unused functions. I will consider providing users with feedback and instruction to finish certain tasks as a stimulation function.

Evocation

According to Hassenzahl's model, the fourth function a product has is evocation about recalling the previous memory/experience. Most of the teaching applications/software depend on recalling previous knowledge or skills to achieve specific goals. Hassenzahl (2005) mentioned that pragmatic attributes should not be neglected as they help users to achieve hedonic goals, whereas the hedonic attributes are the main contributor to accept the new product. Minge (2008) confirmed this conclusion in his experimental study.

With the development of UX, Hassenzahl (2010) gives experience of various attributes including being subjective, situated, holistic, dynamic and positive. Subjectivity is defined as the creation of experience and it remains in the experimenter's head. It is possible to shape experiences by knowing and using these rules.

Hassenzahl (2010) develops a form of categorisation based on needs which he calls experience patterns. Hassenzahl (2010) pointed out that the needs of users are relatively independent of each other and positive experiences are often marked by a particular need. Partala and Saari (2015) identified two potential UX-related concepts, emotions, user needs and user values. All of these have been already applied successfully in practical **UX** studies based on well-established theories from psychological research, and experienced well-being impact of technology, which can be assumed to be especially important when studying technologies used daily or frequently such as different work systems and equipment.

Harbich and Hassenzahl (2017) argued that while effective and efficient goal achievement (execute) is certainly the core of UX at the workplace, there are other goal-achievement-related aspects to be considered such as the persistence at a task (engage).

Experiences change over time; it is like a story. It is packaged, interpreted and labelled and is a construction, but not an objective account of the experience. However, Hassenzahl (2008) views the actual construction as only happening once and then being remembered unaltered. Silvennoinen, Vogel, and Kujala (2014) mentioned that functionality is more important when people accomplish tasks, while pleasure aspects are important to have fun.

Additional factors influence user experience

There are other factors besides product features in the formation of UX such as the characteristics of the user, the context of using the product and use overtime

(Bargas-Avila and Hornbæk 2011). Karapanos (2013) indicated that UX develops and changes over time. On the other hand, Van der Heijden (2004) observed that the factors that most affect the UX differ based on the purpose of the system and suggests that the perceived usefulness loses its power over time.

According to Karapanos, Hassenzahl, and Martens (2008), a positive UX is influenced by the time of using the product, the product itself, the context of use and the user. Roto *et al*. (2011) indicate that there are three factors that affect UX including the context of use, the individual and the system.

Hassenzahl's model in previous studies

In human–computer interaction research, Hassenzahl's model has widely been used as a theoretical framework in various studies. Furthermore, some researchers have extended Hassenzahl's model by merging factors such as overall quality and aesthetics. Hassenzahl (2004) extended his model to include new factors to investigate the relationship between pragmatic, hedonic and goodness.

Hassenzahl's model has been applied in different contexts, such as mobile learning, e-learning, systems, etc. For example, Ozok, Fan and Norcio (2010) used Hassenzahl's model to study UX regarding the usage of a recommendation system. The findings of their study revealed that perceived interactivity and interface affected users' attitudes and behaviour to use the system. Schaik and Ling (2008) explored the characteristics of Web pages that affect UX and how the characteristics of the Web pages influenced UX. Other studies explored the impact of aesthetics and the website interface practically on UX (e.g. De Angeli, Sutcliffe, and Hartmann 2006; Tuch *et al*. 2012).

The cognitive and physical capabilities of children are different from those of adults. Therefore, children's experience is measured in a different way. Piaget (1970) divided children into different stages according to their cognitive and physical development. In the ages of 7 and 11, children are considered to be in the concrete operational stage (Piaget 1970). In this stage, children are unable to formulate a hypothesis and have difficulty understanding abstract concepts. However, they can use a keyboard, use computer software, control the mouse and organise similar items together. Also, children still admire and value software that incorporates playful activities (Bruckman, Bandlow, and Forte 2002). Children's actions and behaviours reflect their thoughts because children have difficulty to express their feelings and thoughts with words (Wea'am and Alhussayen 2015). Therefore, observers need to carefully read the behaviours and understand them within the context of concrete experiences. In addition, children respond truthfully about their opinion on the software they are interacting with (Druin 2002).

Justification for using Hassenzahl's model in this study

The researchers believe that Hassenzahl's model is an appropriate theoretical framework for addressing the research questions for two reasons. Firstly, many studies in the field of human–computer interaction used the model (e.g. Knijnenburg *et al*. 2012; Ozok, Fan, and Norcio 2010). Secondly, Hassenzahl's model could be used to study the factors that affect users experience in their interaction with the product, which fits the purpose of the study.

Research questions

What is the first impression of children while using the tablet and educational applications for the first time?

How do children interact with educational applications on tablets?

How do children experience interaction with educational Arabic applications on tablets?

Research design

A qualitative approach was used for data collection such as three instruments observations, focus group discussion and sticky notes of the children to capture their first-time experience with math and science applications as well as using tablets.

Two focus group discussion sessions were held after two sessions of observing children. The two focus-group discussions were on Thursday, September 31 and October 5, in the school for 1 h each session. Focus-group discussion sessions enable students to talk about their own experience with both the device (tablet) and math and science applications. The researchers used open-ended questions to lead the focus group discussion and to be on track to achieve the purpose of the study and to obtain more details and insights on participants' perceptions towards using the applications on tablets.

In addition, we observed the kids while working on the application for around 3 h at different times. Observational methods mean that the researchers stay in the room with users to observe their behaviour which reflects their feelings. Druin (2002) stated that observation enables researchers to stay with the users throughout the evaluation period to explain the software and respond to questions. At the focus-group sessions, the researchers asked the students to talk about their experience with the device and the application.

Participants of the study

The participants of the study were 53 children ageing from 8 to 10 years from different schools in different districts for 6 months. The study conducted in two schools in different districts. The main criteria to recruit the participants were: (1) school is within the electronic learning project (e-learning) and located in a marginalised area; (2) school had tablets to use for academic purposes; (3) math and science teachers are using different Arabic applications in classrooms for academic purposes; (4) parents are willing to allow their children to participate in the study; (5) children are using the tablet and applications for the first time.

Description of the context

Palestine is a conflict zone and an unstable country with restrictions on the movement of people. Many researchers mentioned some of this movement restrictions and its impact on the educational system in Palestine (Itmazi and Tmeizeh 2008; Khlaif 2018a; Khlaif, Gok, and Kouraïchi 2019; Shraim and Khlaif 2010). The educational system influenced negatively by this conflict (Shraim and Khlaif 2010). The **MoE** in Palestine has adapted technological programmes with international funds to implement in the Palestinian schools including one-to-one technology (Khlaif 2018a, 2018b).

In addition, the MoE is implementing the smart learning project and the National Project of Digitalization of Education (Khlaif and Farid 2018) in many schools across the country. The MoE distributes tablets in schools located in rural areas to improve the quality of education in four subjects such as math, science, English and Arabic. After getting a permission from the Directorate of Education in both Qalqilia and Nablus (North of Palestine), the researchers contacted the administration of a rural school to schedule a meeting with the principal and the math teacher to inform them about the purpose of the study. In the meeting between the researcher, the principal and the math teacher, the researchers chose third-grade students to be the subject of the study to achieve the purpose of the study. The criteria for choosing the students to participate in the study were that students have no previous experience with using the tablet and this is the first time they use the applications and the tablet. This criterion enabled the researchers to explore how students interact with the device for the first time.

The researchers visited the classrooms after getting permission from the principal and the classroom teachers to inform them about the purpose of the study and invite them to participate in the study. The researchers sent a consent form to the parents of third grade to get their permission to involve their children in the study. Fifty-three parents out of 60 agreed to allow their kids to participate in the study. Therefore, the participants of the study were 53 students including 27 males and 26 females, aged 9 and 10 years old. They were all native Arabic speakers and have basic English language skills. All students were from marginalised areas. Some of them are relatives. Most of the students came from limited-income families.

The study took place in a room in each school where each child interacted with the tablet individually. The researchers chose the room to be comfortable for the students. The study was conducted in six sessions over 2 weeks. At the start of each session, the children were briefed on the purpose of the study and the tasks to be completed in the session. The children were given time to explore the application to complete the tasks.

Data collection

Several approaches were used to gather data regarding children's thoughts and feelings. Qualitative methods can capture the enjoyable and attractive parts of the software being used. Observing children while interacting with the provided device and the applications (math and science) was the primary source of data. Students' comments on the sticky notes were another source of data together with the focus-group discussions of the participants' experience.

Materials

In the study, the researchers use tablets (Galaxy Tab3), third-grade math games application and science applications to achieve the purpose of the study

Procedures

The study was conducted in a classroom for 25–30 min between 7:30 am and 8:00 am. At the beginning of the first session, the researchers informed the children purpose of the study and the tasks to be completed by using the apps. The teacher distributed the

tablets to the students and assigned a number for each tablet for each student to use it in each session. In the first session of the meeting with the participants, the teacher introduced the tablets to the students and briefly instructed them about how to launch the device by pressing on the power button. Then, she gave them brief instructions about the interface (Figures 2 and 3) and the apps on it. The researchers talked briefly about the purpose of the study. After that, each student was invited to interact with the tablet individually to explore the device to be familiar with it. The teacher asked them to play with the device. The length of this activity was 25 min.

At the end of each session, children were provided with sticky notes (Figure 4) to report their experiences and perceptions about the tablet and the math app and express their opinion about the application in general. In the second part of the activity, the teacher gave the students an introduction about the math application and the software that they will use in their activities.

Figure 2. The desktop of the tablet and the educational applications on it.

Figure 3. The interface of the math application.
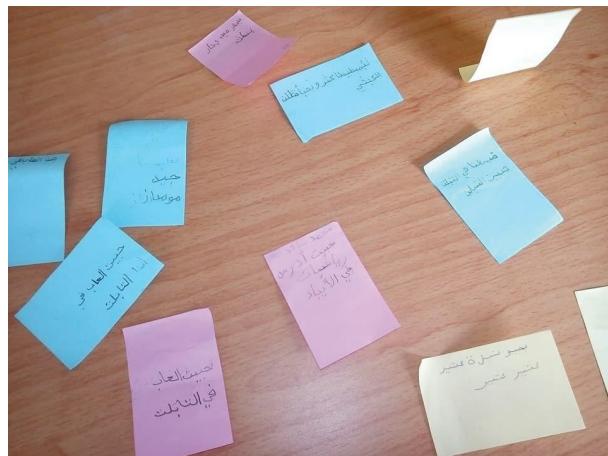
Figure 4. Students' sticky notes.

Figure 5. Children are playing with the device and the math application in and out of the classroom (a permission was taken from parents to get their kids pictures and share them).

There was an agreement between the researcher, the school's principal and the teacher to allow students to use tablets during their free time in school time to work on whatever they want. There are 45 min free time for children for eating and playing in the school (Figure 5).

Usually, this time is in the middle of the school day. The researchers observed students while they were working on the tablets. The study was conducted in six sessions over 2 weeks.

While students were working on the devices, three students asked about how to connect the devices to the Internet.

Data analysis

The researchers analysed the data by following the procedures suggested by Marshall and Rossman (2011). The researchers used the thematic analysis which is defined as a qualitative analytic method for categorising, analysing and reporting patterns (themes) within data (Braun and Clarke 2006). A grounded theory approach was used in our data analysis stage based on Boschman *et al*.'s (2015) study which helped us to build the sub- and main themes.

The six sessions were video-recorded and transcribed for data analysis. The researchers wrote down notes in the observation sessions. Hassenzahl's model was used in this study as a guideline for the data analysis process. The researchers coded the sticky notes into a positive and negative experience. Furthermore, the researchers coded the focus group discussion based on Hassenzah's model.

Results

The data collection methods help the researchers to answer the three research questions. For example, observations help to answer these research questions. In addition, students answered the questions when they describe their experience in the focus group discussions. The qualitative content analysis showed that participants' enjoyment using the devices and the apps was quite different. During the sessions, children appeared excited and interested while interacting with math and science apps. However, girls were less excited to use the math application compared with their usage of the device itself. The girls were trying to explore other features of the device and to access the Internet. Following Hassenzahl's model, the descriptions of UXs were also categorised into two categories including pragmatic and hedonic. Functionality, technicality and user-friendly aspects of UX of both the tablet and the applications were categorised as pragmatic. Enjoyable, exciting, confusing and upsetting experiences were categorised as hedonic. Males were more familiar to play with the devices than girls. Some of the males mentioned that the tablet is like a smartphone (Jawwal). Two females did not explore the devices because of their fears to use it due to religious and cultural factors. These two girls mentioned that their families also talk about the disadvantages of using technology and how it tends to facilitate accessing bad websites on the Internet. For that, these females hesitated to use the devices. As researchers, we consider this experience as a hedonic category.

Females expressed their excitement to use the devices because of the application on it. Males opened the race competitions application, whereas females opened drawing applications.

The researchers asked the students in the focus group sessions about their feelings while working on the device especially working on the applications and using the Internet. Students responded that they like the device, prefer to use the device in other subjects and want to take it home. Students connected the devices to the Internet and played online games in out-class activities.

Pragmatic features

Through analysing the observation notes and the sticky notes, it seems that students were happy while they were playing with the device. The researchers asked the children about the device and whether it was difficult to work on it or not. The majority

of students did not feel angry or upset while they were working on it. They were happy and laughing. 'Wow, it is easy to use' (Lina, female). A male told me his experience with it, *he said* 'I thought it is difficult to use, … the interface is beautiful... I like its touch screen... I like to use it in my school…I wish I had one' (Ahmed, male)

During the focus-group discussion, three participants (two females: Rahaf and Wesam, and one male: Hamada) reported technical issues with the math application: 'In the beginning, I couldn't open the application, I tried to access to the Internet, but I couldn't… other students are working and I am not… I was frustrated' (Hamada, male). 'It was difficult for me to do drag and drop to finish the task, I did not know why. I was confused…It is difficult to learn math by using a tablet' (Rahaf, female). From the observation notes, those students' experience changed over time and they did not face the existed technical issues.

Apart from the technical issues, participants also stated that they perceived the tablet as well as the math app as user-friendly. 'I can describe the tablet as well as the math app as "user-friendly" for me as a kid. This is the first time to use it, l learned how to use new technology' (Sama, female).

'The interface was so friendly and it is easy to pick-up the application you want to use' (Seraj, male).

However, two participants (one female and one male) noted that using the tablet and the math app were too difficult without the help of the teacher: 'However, when I was left alone to use it in my free time, I understood that I cannot connect it to the Internet and change the language of the Interface from the English Language into the Arabic language. I asked my teacher to help me' (Manal, female).

Hedonic features

Students were excited and happy to use the device in their classroom as well as in their free time. Others expressed their fears about using the device they were afraid to break it. 'I do not like to play with it because I have to pay if I broke it…we do not have money' (Omer, male).

On the other hand, two students (males) found that using math application to do some tasks becomes boring over time. 'Honestly, I didn't enjoy solving math problems by using the app after some time. It just repeats using drag and drop over and over and gets a little boring then' (Aws, male).

The majority of the participants were excited to use the math application and the tablet. Learning math by using tablets and software made learning math easy and fun (as mentioned by nine participants). 'Coloring parts of the circle with my hand helps me to understand the fraction in math…it is fun to play with the application…I enjoy learning math by tablet…I hope to use it in other topics' (Sereen, female).

Some participants enjoyed playing the games: 'Overall I enjoyed the games on the tablet, I like to take it home to play with it with my sister' (Lina, female).

Two females were upset to use the math app because they did not finish the task. At the beginning of exploring the devices, the girls were hesitating to use the device, and they were uncomfortable to use it. The teacher intervened and told them it is like a toy; do not hesitate.

Analysing the notes on the sticky notes were categorised into positive and negative experience. Most of the statements were positive, indicating positive exciting experience, happiness, enjoyment, wishing to use the tablet in other subjects, easy to finish

math task by using math app, touch screen, and colouring by hand is easy. On the other hand, minor statements expressed negative feedback, indicating that it was upsetting, frustrating and boring because of using the math app to do tasks in the classroom. Most of these negative experiences were related to technical issues and absence of technical support.

Children mentioned that using the tablet and the math application was helpful for them to understand math (mentioned by nine students: four females and five males).

The researchers observed the students while they were working on the devices in their free time.

Gender differences

From the observation notes and students' sticky notes, it is clear that girls prefer to play with girls' games such as colouring, weddings and dressing games. Three students felt upset while using some features of the application such as the drag and drop feature. It was difficult to distinguish between the experience of children based on their gender due to the limited time as well as the sample size. It is a good idea to explore this factor (gender) on **UX** by including more males and females. However, gender differences were found with two girls that they were unsatisfied with the experience than their colleagues and other males.

Working on tablets in the free time

The observation of children while working on the tablets in their free time revealed that students prefer to work on different applications rather than only on the math app. Data from observing students while working on tablets in their free time revealed that students were happy and excited. They were working on whatever they wanted. The researchers observed the student who was complaining about the device and the application. 'I got assistance from my teacher to access to the Internet, I am happy to use it now…I enjoy playing with it because I need to explore it and I do not have a specific task to finish…Now I do not feel bored' (Rahaf, female).

Two male students connect their happiness of using the tablet in their study to their financial situation. One *said* '…I am so happy to use the tablet and math app in my school… I cannot imagine that one day I will use it because it is difficult for my parents to buy one for me or for my brother because of our financial situation' (Sameer, male). Children were happier when working on the math app in the classroom. Children did not report any issues related to the functionality of the application they worked on or the device. They were comfortable while using the device.

Discussion

Based on data analysis of different data sources in this study, it could be concluded that the participants enjoyed using the tablet and the applications for the first time.

The findings of the study do not show any important differences in the enjoyment of using the tablet and the application. However, the focus group discussion revealed that there seems to be a gender difference regarding the enjoyment of using the tablet and the applications that participants want to use in their free time. The interface of the tablet as well as the application were easy to use and had a positive impact on kids'

experience. **UX** depends on different factors such as the environment (in-class or out-of-class), whether using new technology is mandatory or voluntary. In this study, students were more excited and are happier when they worked on the tablets in their free time. Technical support is important in **UX** especially if the users are kids and it could change their experience in a positive or a negative way. It depends on the context.

According to the observation notes, the **UX** of using the tablet and the math application changed over a short time. However, some participants felt bored of using the math app for a long time. **UX** depends on the context of using the product, as well as whether it is optional or mandatory. These findings are congruent with the findings of previous studies (e.g. Hassenzahl and Tractinsky 2006; Roto and Kaasinen 2008). In this case, students were happier when they used the tablet without any restrictions compared with using the device with the math application. Using tablets in their free time was not mandatory like implementing the tasks in the classroom and students could choose whatever they wanted to use. Therefore, children chose the application which would help them to enjoy using the tablet. Congruent with the findings of Hassenzahl (2005) and Minge (2008), children were eager to use the math application and the tablet because they were happy and they enjoyed using them, which has a positive impact on their experience.

Children knew the value of the device while they were working on it in their class to finish the assigned tasks. They considered it as a useful tool to understand math. Many of them preferred to use it in other subjects and to take it home. The researchers did not explore the cultural and religious factors; and whether they influence the overall experience because it is out of the study scope. It could be examined in a different study in the future. Based on the results of this study, children's experience was influenced by many factors including ease of use of the application, technical issues, the context of using the tablet or the math application (whether mandatory or optional), the usefulness of the application and the device.

Conclusion and future research

The purpose of the present research was to explore children's first experience with tablets and the math app. Most of the participants were excited and enjoyed learning with the tablet. However, some of them felt frustrated and bored using the tablets. UX is indeed affected by the environment where they are using it and whether it is mandatory or voluntary. Technical issues have a negative impact on children experience.

This study does not focus on the role of gender and the factor on the **UX**. So, a similar study can be conducted with another learning application that is generally used by a higher grade or the same grade but including more students and design the research to be a mixed-method research.

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