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Conference Paper · October 2015

DOI: 10.1016/j.promfg.2015.07.378

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Evaluating the user experience of playful interactive learning interfaces with children

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Abstract

In this paper we present the experience and results aimed at evaluating the user experience (UX) of children when interacting with the educational and entertainment website. The goal was to explore and understand the usability issues in offering fun and enjoyment creative learning experiences for children, and to understand the efficiency of these evaluation approaches in uncovering general opportunities for design improvements. Sixty-four children (aged 7 to 12) were observed on how they interact with the Aseel Wa Raseel website (an Arabic website designed to provide creative games and activities that help exploit children's skills and hobbies). We designed a specific questionnaires together with the use of smileyometer in assessing the momentum emotion of the user while interacting with different sections of the website. Children were also provided with sticky notes to freely describe their experience, perceptions and opinions about the website. Overall, all children enjoyed the session. However, the results show distinction between the younger children and older ones in terms of their favourite website sections. We also found that younger children experienced difficulties and felt frustrated during the registration process, as they did not appreciate and realize its importance. This paper also reports the methodology design implications for conducting UX and usability evaluations for children.

Keywords: User experience; Usability; Playful learning website; Interaction design for children; Smileyometer

1. Introduction

For many years now, developers have designed and launched "Playful Learning" websites for children with the intention of providing them a joyful learning experience. To provide such experience, the focus shifts from the traditional usability measures to include all aspects of a good user experience. For a website to be successful and

doi:10.1016/j.promfg.2015.07.378

attractive to young users it must meet their growing expectations, not only by being functional but also desirable and emotionally appealing. Moreover, it is important to understand how the children, being the key users, feel and perceive these websites, especially with the recent emphasis on user-centered design.

Arab youngsters today have access to the world of the Internet and spend a significant amount of time exploring the web. More and more schools are now including computers and the Internet as part of their educational program. However, Arabic websites designed and aimed to educate and entertain these children are still in their infancy. Moreover, the few number of Arabic kid's websites available are not attractive and appealing enough for the children. Most of the children are turning their attention and time towards games websites that were not designed appropriately for them. This study was motivated by the lack of studies investigating the User Experience of the playful learning websites especially designed for Arabic interfaces. To contribute to this research gap, we present an initial study results on users' experiences with an Arabic playful learning website. More particularly, we will describe an explorative study in which the momentary UX of children is evaluated. Within this study, we try to explore how the children experience playful learning websites, how their experiences influence their desire to use it in their free time and the factors affecting children's experience of playful learning websites. In this paper, we present a review of related work and the details of the study in which children were observed while interacting with the website. The paper concludes by reporting several issues and suggestions from the user experience to improve the design of websites dedicated to children, and suggestions for future work.

2. Related work

In recent years, the importance of the user's experience and feeling about certain systems and products has shifted the focus from the traditional Usability study to UX field. This interest has risen because of the ability of UX to measure the engagement and joyful emotions effectively more than traditional usability [1]. Moreover, the user's expectations about the system and their anticipations are factors which affects their experience about the system itself [2]. Although UX is a field of study that had been researched heavily, yet a unified definition for the widely used term has not yet been reached. Effie Law et al. [11] state three causes for the variance of UX definitions. The first of these reasons is the fact that there are many involved attributes, mostly known for being vague and constantly changing, and the decision to take in or leave out an attribute from the UX definition depends on the author's interest and background. Another reason according to Effie Law et al. [11] is the measurability of the UX, whether to measure all the different aspects of the user's communication with a system or only one aspect of the user's communication. Finally, the diversity and complication of the theoretical framework, which supports the UX research field [11].

In our study, we employed Hassenzahl & Tractinsky's definition of UX "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, meaningfulness of the activity, voluntariness of use, etc.)" [14]. Their definition concentrates on the inner emotions of the user and their expectation of the designed system; as it clearly describes the factors influencing UX.

As for the evaluation of children experience, children nowadays are considered as main users of software; so the use of technology is no longer limited to adult users. Developers are attempting to design software that meets the children's abilities, interests and development needs [3]. As we all know, children do not have the knowledge and the experience that the adults have, therefore they perceive and experience the world differently. Additionally, the physical and cognitive abilities of children are different than those of the adults. Thus, their UX is measured in a different manner. Psychologist Jean Piaget divided children into different stages according to their cognitive and physical development. In the ages between seven and eleven, children are considered in the concrete operational stage [10]. In this stage, children are unable to formulate hypothesis and have difficulty understanding abstract concepts. However, they are able to classify similar items into groups, use the keyboard, control the mouse and use computer software. Also, children still admire and value software that incorporates playful activities [4]. Children have difficulty expressing their feelings and thoughts through words, but their actions and behaviours reflect their thoughts. Therefore, observers need to carefully read the behaviours and understand them within the context of

concrete experiences. Also, children respond truthfully about their opinion on the software they are interacting with [5].

Evaluation methods help in enhancing the quality of the design proposed, since it is being tested by the users themselves [6]. According to Alison Druin [5], children roles in the design process of technology are categorized into four main roles: *user, tester, informant and design partner.* With the child's role as a user, researchers observe and gather impression data that help them understand children better. Research methods should be designed or adjusted with respect to children's abilities and needs. Regarding research that focuses on the evaluation of interactive systems numerous tools and methods have been designed such as [7]. Observational methods where the researchers are in the room with users are useful in particular with children since their behaviour reflects their feelings. With this method, researchers stay with the users throughout the evaluation period to explain the software and respond to questions [5]. Several approaches are used to gather data regarding children's thoughts and feelings. Qualitative methods are capable of capturing the enjoyable and attractive parts of the software being evaluated. A more formal method is the use of quantitative surveys where questions are developed carefully so that they clear and unambiguous and answers are in a form of "Smilyometer" scale [8]. With children as users, it is important to measure the fun and enjoyment of interacting with playful learning websites as they have a significant effect on children's opinion on the website and whether they are willing to use it or not [12]. Read's study on measuring fun and usability [12] showed that usability and fun are correlated, as usability problems resulted in children having less fun with the product. Emotions last only for a short time (a few seconds), so the measurement has to be precise or retrospective [9]. Moreover, "Emocards" is a method used to assess the enjoyment and emotions of users and, based on previous work as [2] has proven to be an applicable method for conducting UX evaluation. Previous work on assessing children educational learning software, included the use of heuristic evaluations for assessing the usability [13]. This study showed that heuristic evaluations were suitable for uncovering general usability issues. However, problems related to boredom and dissatisfaction were only detected through observing children as users [13].

3. Study

The study was performed to understand on how children's experience with playful learning Arabic website. Data were collected observing children interact with the provided website. In particular, we focused on the analysis of their momentum emotion feeling via smileyometer scale.

3.1. Participants

A total of 64 female pupils aged between 7 to 12 years old (mean = 10.9 years, sd = 1.9 years) were randomly recruited from the female Altarbiah Primary School, in Riyadh (KSA). The sample consisted of 21 children aged 7 & 8 (grade 1 & 2); 10 children aged 9 (grade 3); 12 children aged 10 (grade 4); 14 children aged 11 (grade 5); and 7 children aged 12 (grade 6). The children were all native Arabic speakers and almost half speak English as their additional language. All children had experience working on desktop computers and browsing the Internet.

3.2. Materials

The Aseel Wa Raseel website was used for the purpose of the study. The Aseel Wa Raseel website is designed by Mawhiba Organization, an organization established to provide guidance and support to gifted and innovative children. Mawhiba designed the website in an attempt to provide creative games and activities that help exploit children's' skills and hobbies. The website comprised of seven sections including: (a) Registration and sign in – allow user account registration; (b) My skills - contains forms of multiple choice questions that urge the user to think about some topics that might interest them (scientific, environmental, literature, etc.) and evaluates their responses; (c) My stories - a group of good moral and educational stories both in cartoon video and written words; (d) My family – this section introduces the website's family members and allows children to chat with them; (e) My diary – provides a personal diary page for the children to write their memories and experiences and share their writings, if they wish, with others; (f). My games – selection of age appropriate games that focus on creative

thinking; and (g) My hobbies – presents a number of common problems in the community and asks the child to imagine and draw a solution for that problem using a drawing tool . Figure 1 shows selected screenshots of the website. Each of these sections has sound effects when hovering over their icons.

A set questionnaire contained 18 questions was designed including their experience after the registration process, what they thought after hearing the sounds in each page and after exploring each section of the website, and what their favorite section and whether they would like to visit the website during their free time. We used the Smileyometer scale at the end of each section in order to assess the momentum of participant's emotion and enjoyment when interacting with the website. The smilyometer scale had six primary emotional states to choose from (Figure 2): From the left: (a) Angry; (b) Scared; (c) Sad; (d) Excited; (e) Happy; and (f) Indifference.

3.3. Procedure

The study was conducted in the school's computer lab during the school time. Two researchers involved and monitored the study. During the evaluation session, each child was invited to interact with the website individually during their free time. The study was conducted in 5 sessions (separate session for each grade level from 1st to 6th) over 2 days, in order to maintain and ensure the similarity in the grade's level without mixing different grades together and to avoid affecting the judgment of the children of different ages.

At the beginning of the session, the children were asked to sit at the computer desk. They were briefed on the purpose of the study and the tasks to be completed. They were assured that the questions they were to answer were not exam questions. We also made it clear that we were not the designers of the website, so they were encouraged to express their thoughts on different sections of the website. Then, the session started by asking the children to register the website. Whether the registration steps were completed or not; they were required to share how they feel. Then, they were asked to explore each section of the website and also listening to the sounds produced when hovering over an icon in order to select a webpage. At the end of each task/section, the children were requested to share their experience by selecting one face/emotion from the Smileyometer scale before they move to other section.

At the end of the session, the children were also provided with a sticky notes to report their experiences and perceptions about the website including which pages they liked the most and their opinion about the website in general. Finally, a question about the possibility of exploring the website in the free time was included to measure the satisfaction and enjoyment of the website.

(a) (b) (c)

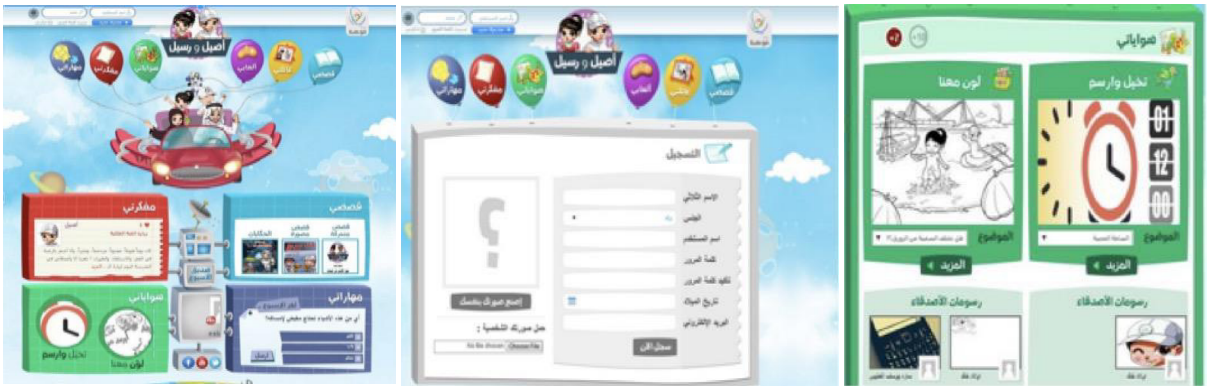

Fig. 1. Screenshots of the *Aseel Wa Raseel* website: (a) The main page; (b) The registration form; (c) The hobbies page.

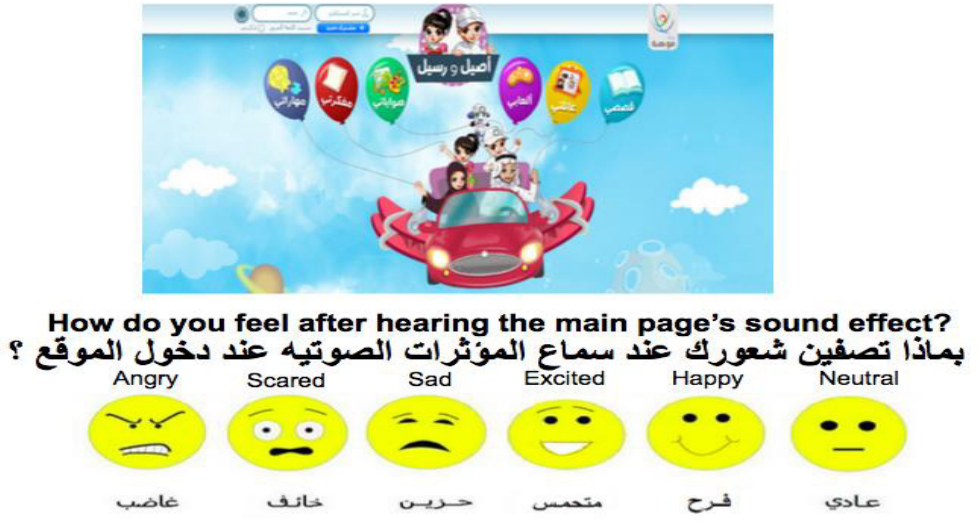

Fig. 2. A sample of the survey question with the smilyometer.

4. Data analysis

Before we proceed with the data analysis, all children's names were replaced with a code. The Smileyometer was scored from 1 to 6 (1=Angry (Extremely unlikely); 2=Scared (Very unlikely); 3=Sad (Unlikely); 4=Indifference (Neutral); 5=Happy (Likely); 6=Excited (Extremely likely)). We grouped the Smileyometer feedbacks into two: (a) *Positive feedbacks* (excited, happy and indifference); and (b) *Negative feedbacks* (angry, scared and sad). The feedbacks and suggestions from the sticky notes were also gathered and grouped the feedbacks into two categories: (a) *Positive experience* – comment that describe enjoyment such as "*I like*" ,"*Happy*", "*Thank you*" etc.; and (b) *Negative experience* – comment that describe disappointment such as "*Boring*", "*Upset*" etc.

5. Results and discussion

The duration of the sessions with younger children (grades 1 - 4) lasted between an hour and an hour and a half as for the 5th and 6th grade children the sessions lasted for half an hour to 45 minutes. All the children appeared excited and enjoyed while interacting with the website. However, they were less excited with the website's registration page and were frustrated and confused since it was difficult for them to complete the registration step. Analyzing the data gathered from the surveys also indicated the registration difficulty experienced, results show that none of the younger children (aged 7-9) were able to register and only 13 (39%) of the older children (aged 10 - 12) were able to complete the registration. Although none of the younger children were able to register, only 5 children ticked the *sad* face in the Smilyometer indicating that the majority did not realize and understand the importance of the registration process.

Table 1 show the average score for the positive and negative feedbacks based on children's experience for each section of the website via the Smileyometer scores. Overall, the results revealed that positive feedbacks scored higher than negative feedbacks for both young and older children. The gathered survey data also showed a variation between the two age groups in terms of the favourite website sections. The majority of the younger children (%77) were more attracted to *My stories* section but only 16 (48%) of the older children found *My stories* section interesting. Moreover, 23 (70%) of the older children were attracted to *My hobbies* section while it only attracted 15 (48%) of the younger children.

Table 1. The average score for Smileyometer positive and negative feedbacks gathered after exploring the website sections.

	Younger children (N=31)				Older children (N=33)					
	7 & 8 years (N=21)		9 years (N=10)		10 years (N=12)		11 years (N=14)		12 years (N=7)	
	'+'	'-'	'+'	'-'	'+'	'-'	'+'	'-'	'+'	'-'
My skills	5.04	0.00	2.61	0.00	3.04	0.05	3.65	0.05	1.70	0.00
My stories	5.57	0.00	3.17	0.00	3.78	0.00	3.78	0.00	1.65	0.00
My family	5.04	0.00	2.61	0.00	3.04	0.05	3.65	0.05	1.70	0.00
My diary	4.65	0.10	2.35	0.00	2.83	0.14	3.13	0.05	1.48	0.00
My games	5.04	0.05	2.09	0.14	2.74	0.00	3.13	0.10	1.43	0.05
My hobbies	3.35	0.05	2.57	0.00	3.09	0.00	2.74	0.14	1.74	0.00

* Positive feedbacks = '+'; Negative feedbacks = '-'

Feedbacks from the sticky notes show that 53 (73%) of the comments were positive indicating an enjoyable experience and a visit for the website will be repeated in their free time. While 17 (24%) of the comments expressed negative experiences. Some of the children stated that they didn't like the website and found it to be boring. Others felt that the colours of the websites and some of its voices were annoying. Moreover, some suggested that the website needs enhancements in some points as some of them recommend that it would be great if more games were added.

6. Conclusions

This study offers evidence on the children's performance when interacting with the playful learning Arabic website. Overall, the Smileyometer scale is easy to adapt and encourage participant to answer all questions completely. However, we noticed that kids were eager to complement instead of criticize, although they were having some difficulty with the website. Furthermore, all participants of this study were girls, we believe involving boys would uncover additional issues. Since, the website has a lot of sections and content, conducting the study for longer period (several sessions instead of one) so the kids get to know each section better may uncover additional findings.

In addition, our findings highlighted several issues regarding to the design of the website which may benefit to designers for future work: (a) the children experienced problem with the registration section and some of the children expressed their distress feelings towards the task. This finding suggests that the registration process is not appreciated by children (especially for young children age 9 and below). Therefore, less complicated sign up forms may help them to overcome this issue. (b) Variation of website sections, it is recommended to put in mind the age differences when designing such websites and allow for content variation depending on the child's age; (c) Including voice instructions and feedback to the activities would be very useful to get the kids engaged; (d) Since the website is designed to enhance children's education, we believe that its useful to include an indicator (a record) of how well the kid is responding to questions and games and adjust the level of difficulty accordingly.

Acknowledgements

This research was supported by [the Software and Knowledge Engineering Research Group, KSU]. We would like to show our gratitude to Dr. Areej Alwabil who provided insight and expertise that greatly assisted the research. We also thank the female Altarbiah Primary School and all the children who participated in the study.

References

[1] Kujala, S., Roto, V., Väänänen-Vainio-Mattila, K., Karapanos, E., & Sinnelä, A. (2011). UX Curve: A method for evaluating long-term user experience.Interacting with Computers, 23(5), 473-483.
[2] Roto, V., Obrist, M., & Väänänen-Vainio-Mattila, K. (2009, August). User experience evaluation methods in academic and industrial contexts. In Interact 2009 conference, User Experience Evaluation Methods in Product Development (UXEM'09), Uppsala, Sweden.
[3] Yarosh, S., & Markopoulos, P. (2010, June). Design of an instrument for the evaluation of communication technologies with children. In Proceedings of the 9th International Conference on Interaction Design and Children (pp. 266-269). ACM.
[4] Bruckman, A., Bandlow, A., & Forte, A. (2002). HCI for kids.
[5] Druin, A. (2002). The role of children in the design of new technology. Behaviour and information technology, 21(1), 1-25.
[6] Vermeeren, A. P., Law, E. L. C., Roto, V., Obrist, M., Hoonhout, J., & Väänänen-Vainio-Mattila, K. (2010, October). User experience evaluation methods: current state and development needs. In Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries (pp. 521-530). ACM.
[7] Jensen, J. J., & Skov, M. B. (2005, June). A review of research methods in children's technology design. In Proceedings of the 2005 conference on Interaction design and children (pp. 80-87). ACM.
[8] Van der Sluis, F., Van Dijk, E. M. A. G., & Perloy, L. M. (2012). Measuring fun and enjoyment of children in a museum: Evaluating the Smileyometer.
[9] Zimmermann, P. G. (2008). Beyond Usability–Measuring Aspects of User Experience (Doctoral dissertation, Swiss Federal Institute Of Technology Zurich).
[10] Piaget, J. (1970). Science of education and the psychology of the child. Trans. D. Coltman.
[11] Law, E. L. C., Roto, V., Hassenzahl, M., Vermeeren, A. P., & Kort, J. (2009, April). Understanding, scoping and defining user experience: a survey approach. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 719-728). ACM.
[12] Sim, G., MacFarlane, S., & Read, J. (2006). All Work and No Play: Measuring Fun, Usability, and Learning in Software for Children. Comput. Educ., 46(3), 235–248. doi:10.1016/j.compedu.2005.11.021
[13] Alsumait, A., & Al-Osaimi, A. (2009). Usability Heuristics Evaluation for Child e-Learning Applications. In Proceedings of the 11th International Conference on Information Integration and Web-based Applications &Amp; Services (pp. 425–430). New York, NY, USA: ACM. doi:10.1145/1806338.1806417
[14] Hassenzahl, M., & Tractinsky, N. (2006). User experience-a research agenda.Behaviour & information technology, 25(2), 91-97.