Examining the Educational User Interface, Technology and Pedagogy for Arabic Speaking Children in Kuwait

Amandeep Dhir[1] and Asmaa Alsumait[2]

[1]Institute of Behavioral Science, Department of Psychology, University of Helsinki, Helsinki, Finland
[2]Computer Engineering Department, Kuwait University, Kuwait City, Kuwait

Abstract. Educational technology has revolutionized the traditional forms of classroom teaching and learning. Past few years have witnessed the emergence of the educational User Interface (UI) in the form of tablets, whiteboards, mobile and handheld devices for enhancing the classroom learning and instruction. Interaction design plays a pivotal role in improving the educational UI through a step-by-step approach. This process involves understanding needs and expectations of students, examining the fundamental theories governing potential implementations and performing design and evaluation. Existing literature on educational UI and technology has revealed that its present research agenda is overly dominated by studies conducted in developed world. This has resulted in the poor understanding on educational technology need of Arabic speaking students for example. The aim of this paper is to present the recent emergence of educational technology by performing a thorough review of existing work in this emerging domain. This work also complements our ongoing work on developing appropriate educational UI and technology for Arabic speaking students in Kuwait.

1 Introduction

The emergence of pervasive computing in form of mobile phones and handheld devices has transformed the daily routine and lifestyle of young children around the world. It will be correct to say that teddy bears and fiction magazines are no longer the sole companions of the children anymore [1,2,3,4]. Daily routine for young children consists of morning school, afternoon play, home, evening playtime and spending time with parents and doing homework. In all these phases, technology plays an important role i.e., in leisure, learning and play. These interacting physical and technological spaces have resulted in the need for developing new approaches for design and evaluation of products aimed at children [5, 6, 7]. Interaction design plays an important role in educational UI and technology. Interaction Design is governed by the discipline of Child-Computer Interaction (CCI) that focuses on child psychology, learning and play [8, 9]. The studies published on the design and evaluations of the educational UI in developing world such as Middle East are scarce. Similarly, the CCI research agenda is overly dominated by the studies planned and organized in western world. Therefore, keeping in mind the urgent nature of this subject, we are interested in understanding the design, use and evaluation of educational technology by Arabic

Dhir A. and Alsumait A..
Examining the Educational User Interface, Technology and Pedagogy for Arabic Speaking Children in Kuwait.
DOI: 10.5220/0004100700790089
In *Proceedings of the 1st International Workshop on Interaction Design in Educational Environments* (IDEE-2012), pages 79-89
ISBN: 978-989-8565-17-4

speaking children in Kuwait. In this paper, we have presented an outline of the design challenges and opportunities in educational UI, technology and pedagogy by performing a thorough review of the published work in CCI forums. At present, we are doing a pilot study at Kuwaiti high schools through an initiative of Kuwait University.

2 Child Computer Interaction

Last two decades have witnessed the emergence of the Child-Computer Interaction (CCI) research agenda. It is also correct to say that this emergence of CCI and educational technology has changed the access patterns of today's child [8, 9]. The role of CCI in educational technology and pedagogy becomes even more important because children are different from that of adults due to their developing cognitive, social and motor skills [10, 11]. This shows that children have different interaction needs from any educational UI and technology so the design and evaluation process should be different compared to adults. The increasing interest in CCI has lead to the emergence of various international conferences and workshops [12, 13, 14, 15]. CCI research agenda is defined to be focused on following broad themes namely the development of new research methods and adapting older ones so as to make them fit for working with children in design, evaluation and research; examining fundamental theories on the child psychology, development and technology design; and developing frameworks and models that can help product designers and practitioners in better understanding the notion of appropriate technology for children [16]. There are some well-known textbooks are published on evaluating interfaces and other interactive technology with children [17, 18, 19]. But, despite the presence of wide category of existing textbooks and research papers the notion of CCI is ill defined. There has been no consensus yet on the exact age of the children considered in CCI research [8, 9]. It is common to refer children from age 1 to 13 as the main user group. However, teenagers between 13-17 years who are considered important technology user are so far ignored from CCI research agenda.

The existing work published in CCI forums is scattered without any initiative to organize it and present a clear research agenda and future goals. It lacks understanding on theories; frameworks and conceptual models for design and evaluation of educational UI and technology. There is an urgent need to address this emerging area by investigating the opportunities and challenges provided by CCI. This issue becomes even more important if we look at deprived communities for example Arabic speaking students who have been ignored so far by the CCI research agenda. This kind of information can prove highly useful for practitioners and researchers who are interested in educational technology and related products aiming at Arabic speaking students.

3 Educational UI and Technology

Educators are increasingly adopting different modes of digital technology for meeting the pedagogical needs of their learners (reference). New educational UI and technologies have enhanced the students' learning and considered better compared to tradi-

tional pedagogy and learning [20, 21, 22, 23]. Recent empirical evidences have scientifically proved that digital technologies such as multi-touch tables promote inquisitiveness among learners. Educational technologies tend to encourage students towards experimentation, trial and problem solving. They have the capability to provide real-time feedback to learners in a collaborative environment. This feedback is essential to reach at consensus in collaborative learning when learners do not agree. Furthermore this feedback is needed for constructive learning [24, 25]. Active involvement in different forms of learning is advocated in the new form of educational pedagogy [26, 27]. There are various digital technologies for example, augmented reality, multi-touch interfaces and other forms of multimodal interactions that also support this fundamental principle of active involvement. However, role of these digital technologies in the advanced educational pedagogy has been less studied so it requires scientific investigation.

Educational interfaces are intended for student learning and improving the quality of learning support so due consideration must be given to the student audience, navigation, cognitive cost, constructive support and learning value [28]. **Student audience:** Students differ according to their previous knowledge, social status, gender, economical position, information technology skills and learning capabilities. So students with different skills will make use of educational UI in different ways for example, certain interfaces might not be suitable for children below certain age due to the use of too much text and small widgets. **Constructive Functionality:** Educational interfaces that are heavily decorated often make the actual representation obscure and hidden. Student often find it difficult to focus on such interfaces and determine what is being built when they are using the interface. **Navigation Support:** Many time's learners find it too much confusing information space due to bad navigation support provided by the educational UI. Learners want easy tracking of their navigation history so that they can easily visit the information that is required by them. **Cognitive Cost:** Every educational UI is designed after keeping in mind the mechanical, representational and physical metaphors. Every student has to pay certain cognitive cost before he or she can becomes proficient in using that particular interface. **Added learning value:** Educational UI and technology is developed in order to support learning and educational pedagogy. Apart from the learning goal, educational UI must also consider added value or inclination learning value that might be supported by this technology. For example, if any educational UI supports visualizations and multiple representations of the same abstract concept then it will result in higher order learning skills.

Educational Pedagogy has witnessed a shift from teacher-centric approach to learner-centric pedagogy [29, 27, 30]. This very change in pedagogy has been clearly reflected in the technology too. For example, more and more technological solutions have been developed or are developing in order to support the learning of the individual and small group of students. In other words, less and less focus is now given on supporting the activities of a single teacher. This argument has been further strengthening by the student-student negotiation over student-teacher [31]. There is no doubt that technology support leaning and facets of educational initiatives but we believe that technological solutions provides key reflections that are must to create consensus among the group of students or class when learners do not agree on certain arguments.

Multi-media have the potential for enhancing the educational experience because grasping the attention of users is important characteristics of any educational software

[32]. In the past, there have been several real implementations for enhancing the learning experience of students through the means of videos (i.e., multimedia) and customization possibilities [33, 34, 35, 36]. Educational software must take note of learner's interest and deliver educational content in accordance so as to support essential learning. This goal can be achieved through educational UI and technology, which must be simple, passive, intuitive, consistent, meets user expectations, ergonomically and contextual aware, reduces cognitive load, makes use of appropriate color schemes and icons, easy in and easy out, user control and error recovery [32, 38, 39, 40, 41].

Existing empirical studies have argued the need for situating the use of any educational interface based on the constraints in learning for example, different learning style, cognitive abilities, gender, culture, personal knowledge about information technology and motivation [28, 42]. This will enable the proper utilizing of the pedagogic needs of any educational interface. We also agree with this conclusion because learning and other cognitive difficulties should be consider while developing any advanced educational UI that aims to support learning and development among young children. The existing literature on educational UI and technologies lacks understanding on theories; frameworks and conceptual models that can explain how digital technology can contribute towards educational pedagogy. Furthermore, there is a need to examine the contemporary paradigms of educational pedagogy because these paradigms will also govern the fate of digital technologies likewise, any digital technology may prove failure if it does not comply with the educational pedagogy paradigms.

4 Design Challenges in Educational UI and Technology

4.1 Designing Educational UI for Children

Children are different from their adult counterparts because of their underdeveloped cognitive and social skills [10, 11, 43, 44], limited reach and exposure to real world, activity and personality [11], developing motor and level of maturity towards society and individuals [10]. This fundamental difference between children and adults has resulted in the need for new HCI research methods for CCI practitioners and researchers. Furthermore, new HCI techniques must take into account the physical and cognitive handicaps faced by the children during their development age [45]. For example, comprehensive set of heuristics for child e-learning (HECE) were proposed along with a detailed explanation for the usability experts on how to apply them [46].

Designing for children is both challenging and complex subject because it involves several difficult opens issues into account. Some of the complex issues are ensuring personal space and privacy in the educational technology design, potential online security and privacy risks involved in the use of technology and giving due consideration to the ethical requirements in any user research [47]. All these potential risks and challenges becomes more alarming in case of young children because they are always at disadvantage compared to their adult counterpart when any technology use comes into picture. The possible reasons are lack of awareness about privacy, security and safe use of educational technology, age and underdeveloped cognition and thinking [47, 48, 49].

Developmental cognitive skills i.e., memory load and physical motor skills of children between 4-12 years are having design considerations for new HCI techniques [45]. For example, memory load will vary from very young to older children so the response time against any interactive educational technology will also vary. Similarly child's motor skills are under development phase so young children might face problems in the precise object positioning. This fact results in a design consideration for interaction designers who should include easy drag and drop functionalities, easy target selection facility and making use of large widgets for easy recognition [45]. Thus CCI practitioners and researchers should take such parameters into account and device appropriate interaction times. Educational UI and technology aimed at children must also possess similar characteristics as that for their adult i.e., intuitiveness, simple, makes use of appropriate icons and less cognitive load [45]. Additionally the educational interfaces for young children should support and develop literacy skills through the use of appropriate icons and less use of text [45].

Social media and social relationships can play an important role at any educational UI and technology because this support collaboration and collective learning among group of students [50]. The role of social relations in mobile and pervasive computing has been widely studied [51] but its role in educational UI and technology is less studied. We argue that educational UI and technology can help students facing challenges in their daily routine due to their underdeveloped social skills. Such students often face the condition of distress and embarrassment, which is also a matter of concern of their parents and educators. To best of our knowledge, there has been no initiative for developing such educational UI and technology that can help Arabic speaking children with social skill disadvantage. In our intended research, we aim to examine and investigate this potential use of educational UI by involving children and educators in Kuwait.

4.2 Designing Educational UI for All

All children are not the same when compared against their learning, cognitive and social skills. Some children possess learning difficulties i.e., cognitive disabilities that they inherit since their biological birth [52]. Children that suffers from learning difficulties often face problems such as clue seeking, poor verbal memory, lack of confidence, reduced academic, social and cognitive performance, underdeveloped logical and critical reasoning due to weak motor skills [53, 54]. Lately, there has been focus on developing appropriate educational UI and technology for children that suffer from learning or other cognitive disabilities. On average, about 8-9% students in every class that suffer from learning difficulties of different severity levels. These statistics shows that there is an urgent need for addressing educational UI needs of the children with learning difficulties. The situation is even further challenging for Arabic speaking children where educational UI and technology for children having learning difficulties is scarce.

4.3 Challenges in Evaluating of UI under Educational Settings

As noted before, children have different cognitive and social skills due to their devel-

oping memory and motor skills. This very difference has resulted in few open research questions namely, how should we evaluate interactive products such as educational UI with children? ; What kind of evaluation techniques are fit for testing with young children? ; What are the important or essential information to be considered before evaluating any educational UI with young children? ; What are the challenges and complexities in evaluating educational UI under classroom environment? Since children have different needs and requirements compared to adults so traditional evaluation techniques require some adaptation so as evaluation is more appropriate with children [55]. They found several interesting findings related to evaluating interfaces with children's, for example organizing in-situ observations in classrooms, adjusting fit's law so as to make it more engaging, usability evaluation with stations and activity pairs.

The evaluation of e learning should address aspects of pedagogy and learning from educational domains, as well as usability factors such as the efficiency, effectiveness and satisfaction of interfaces. Various usability evaluation methods (UEMs) exist, e.g. expert heuristic evaluation, survey, and observational and experimental methods. In literature numerous studies have compared UEMs for adults [56, 57, 58]. However, fewer studies have compared the effectiveness of UEMs with children [59, 60]. Therefore, researchers must give consideration to several minor but essential things that should be considered while evaluating interactive educational technologies with children. For example, children might find it difficult to understand the common written and spoken vocabulary of adult researchers [61]; children often feel shy to express their genuine opinions in front of adult researchers [61]; evaluation of educational UI and technology in classroom environment by external adults i.e., researchers might make children uncomfortable. One recent study has examined the effectiveness of five survey techniques in evaluating the usability of e-learning program dictated to five- and six-years old children [62]. Results indicated that “Smileyometer”, “Best/Worst Activity Table” and “Again/Again Table” survey techniques were more reliable than “Word Box” and the “Remembering”.

E-learning can also help disable children to learn new vocabulary, mathematics and literacy skills at any time that suites them. Such programs can also increase disable children independence, confidence, motivation and social contact. However, it is important that their e-learning programs be as “disable”-friendly as possible. To do so, the developers of those programs need to understand disable users’ capabilities and needs. One way to achieve this is by involving disable children in both of the design process and the test process of the e-learning program. There are many testing methods that are developed to test interfaces with children [56, 57, 58, 59]. In context to Arabic speaking students, set of guidelines for designing e-learning programs for deaf children were recently studied [63]. These guidelines are suitable for designing e-learning programs for deaf children in elementary schools.

5 Opportunities in Educational UI and Technology

Educational UI and technology aimed at young children is an interesting market for product making companies due to their increasing headcount and large existing user base. In July 2011, 26.3% of the total world population was below 15 years of age

[64]. India and China accounts for world's largest adolescent population i.e. 243 million and 207 million [65]. Furthermore it has been predicted that world's adolescent population will remain 1.2 billion till the end of 2050 [66]]. The wide scale popularity of educational UI and related technology and its affordable reach to mass users has created new opportunities for HCI and CCI researchers and practitioners, educators and education related policy makers. There is no doubt that educational UI, technology and pedagogy is a hot topic at present in both academic and industrial circles and its dominance can also be anticipated in the near future. However, this research domain requires urgent attention of the world's research community especially towards the deprived Arabic speaking students who are so far been ignored from the CCI and educational technology research agenda.

The current literature available in the domain of CCI lacks the basic foundations of psychological and sociological theories. At the moment, there are several such interested studies that have been published in the inter-disciplinary areas such as technology, psychology and sociology on educational UI and technology. However, there has been no initiative to study these existing theories, guidelines and framework. These theories might prove useful in preparing common guidelines for developing enhanced educational UI, aiming at researchers, design practitioners, educationalists and policy makers for government.

6 Conclusions and Future Work

In this paper, we have presented a detailed review of the educational UI, technology and pedagogy research agenda by reviewing literature from CCI and empirical studies on educational UI implementations. Based on our review, design challenges and opportunities in educational UI were outlined. We found that Arabic speaking students are currently not in focus in any educational UI and technology design and evaluation. This has resulted in poor understanding of their educational needs and requirements.

In order to bridge this gap, we are doing users studies in Kuwait from April – June 2012. Our research is mainly focused on the Arabic-speaking children for whom we intend to examine, understand and develop educational UI and pedagogy. We will examine and investigate the issue of providing appropriate educational technology and UI services to Kuwaiti students based on their needs and expectation. The results of this research could serve as a reference for designing educational UI for Arabic students. Our goal is to prepare a framework that will act as a guiding source for educationalists, teachers and policy makers for developing better educational technology and pedagogy services aiming young children. This potential framework will not only provide necessary guidelines to design educational UI but it will also provide methods to and evaluate these technologies in classroom environment. Our research is also linked with the Kuwait's foremost strategic goal, i.e., to increase the competitiveness and attractiveness of Kuwaiti education. Furthermore this research is highly relevant to Kuwait society, keeping in mind the current focus of Kuwaiti state on improving education, ICT infrastructure, learning and educational pedagogy. The research questions behind this study will be achieved through a multi method research methodology that consists of series of large-scale questionnaire surveys, face-to-face interviews, focus discussions and participatory design workshops involving students and teachers.

References

1. Druin, A. (2009). Introduction: Mobile Technologies, Children, and Learning. In A. Druin (Ed.) Mobile Technology for Children: Designing for Interaction and Learning (pp. xvii-xxi). San Francisco, CA: Morgan Kaufmann.
2. Lenhart, A., Ling, R., Campbell, S., Purcell, K., Teens and mobile phones, Pew Internet, http://www.pewinternet.org/Reports/2010/Teens-andMobile-Phones/Summary-of-findings.aspx (Last Accessed on March 3rd, 2012)
3. Shuler, C. (2009). Pockets of Potential: Using Mobile Technologies to Promote Children's Learning. New York: Joan Ganz Cooney Center at Sesame Workshop. http://www.joanganzcooneycenter.org/publications/index.html (Last accessed on March 3rd, 2012)
4. Druin, G. Knell, E. Soloway, D. Russell, E. Mynatt, and Y. Rogers. 2011. The future of child-computer interaction. Proceedings of the 2011 annual conference extended abstracts on Human factors in computing systems CHI , ACM, NY, USA, 693-696.
5. Van Grove, J. (2009, March 13). Whrrl Brings Collective Location-Based Storytelling to Your iPhone. Mashable: The Social Media Guide. (Last accessed, March 18th, 2012)
6. Shuler, C. (2009). Pockets of Potential: Using Mobile Technologies to Promote Children's Learning. New York: Joan Ganz Cooney Center at Sesame Workshop. Retrieved March 23, 2012 from http://www.joanganzcooneycenter.org/publications/index.html
7. Hesse, M. Keeping up with social networking sites, Washington Post (October 19, 2010). http://www.washingtonpost.com/wpdyn/content/article/2010/10/18/AR2010101805548.html (Last Accessed, March 3rd, 2012)
8. Allison Druin, Gary Knell, Elliot Soloway, Daniel Russell, Elizabeth Mynatt, and Yvonne Rogers. 2011. The future of child-computer interaction. Proceedings of the 2011 annual conference extended abstracts on Human factors in computing systems (CHI EA '11). ACM, New York, NY, USA, 693-696.
9. Janet C. Read, Panos Markopoulos, Narcis Parés, Juan Pablo Hourcade, and Alissa N. Antle. 2008. Child computer interaction. In CHI '08 extended abstracts on Human factors in computing systems(CHI EA '08). ACM, New York, NY, USA, 2419-2422.
10. Piaget, J. (1970) Science of Education and the Psychology of the Child. (D. Coltman, Trans.). New York : Orion Press.
11. Leontjev, A. N. (1978) Activity, Consciousness, and Personality. Englewood Cliffs, NJ, Prentice-Hall
12. The 11th International Conference on Interaction Design and Children, http://dimeb.informatik.uni-bremen.de/idc2012/submissions.htm (Last accessed 2nd April, 2012
13. Designing for Children, http://www.designingforchildren.net/paper-selected.html (Last accessed 21 March, 2012
14. Workshop on UI Technologies and Educational Pedagogy, CHI 2011, http://www.dfki.de/EducationCHI2011/Site/Welcome.html (Last accessed 2nd April, 2012)
15. The 2nd Workshop on Child, Computer and Interaction, ICMI'09 post-conference workshop, http://wocci2009.fbk.eu/ (Last accessed 2nd April, 2012)
16. International Journal of Child-Computer Interaction, http://www.journals.elsevier.com/international-journal-of-child-computer-interaction/ (Last accessed 2nd April, 2012)
17. Markopoulos, P. C., Read, J., MacFarlane, S., & Hoysniemi, J. (Eds.). (2008). Evaluating Children's Interactive Products: Principles and Practices for Interaction Designers: Morgan Kaufmann Publishers Inc.
18. Druin, A. (1999). The Design of Children's Technology. San Francisco, CA: Morgan Kaufmann.
19. Druin, A. (2009). Mobile Technology for Children. Boston, MA: Morgan Kaufman.
20. Gibbons, J. F., Kincheloe, W.R., and Down, K.S.(1977). Tutored videotape instruction: a new use of electronics media in education. Science. 195:1139- 1146.

21. Sipusic, M., Pannoni, R., Smith, R., Dutra, J., Gibbons., J., and Sutherland, W.(1999). Virtual Collaborative learning: A Comparison between Faceto- Face tutored Video Instruction and Distributed Tutored Video Instruction (DTVI). Sun Microsystems Laboratories, Inc. TR-99-72.
22. Smith, R., Sipusic, M., and Pannoni, R. (1999). Experiments Comparing Face-to-Face with Virtual Collaborative Learning. Sun Microsystems Laboratories, Inc. TR-99-0285.
23. Stone, H. R.(1990). Economic development and technology transfer: Implications for video-based distance education. In M.G.Moore(Ed.), Contemporary issues in American distance education(pp231-242). Oxford, England: Pergamon.
24. Rendon, L. I. (1994). Validating culturally diverse students: Toward a new model of learning and student development. Innovative higher education, 19(1), 33-51.
25. Jerome Bruner (1996) The Culture of Education, Cambridge: Harvard University Press.
26. Montessori, M. (1912). The Montessori Method. New York: Frederick Stokes Co.
27. Astin, A. W. (1984). Student involvement: A developmental theory. College Student Personnel, 25, 297-308.
28. Tim O'Shea. 1997. A typology for educational interfaces. In CHI '97 extended abstracts on Human factors in computing systems: looking to the future (CHI EA '97). ACM, New York, NY, USA, 119-120.
29. Freire, P. (1970). Pedagogy of the oppressed. New York : Herder & Herder.
30. Johnson, D., Johnson, R., & Smith, K. (1998). Cooperative learning returns to college: What evidence is there that it works? Change, 30(4), 26–35.
31. Vygotsky, L. S. (1978). Internalization of Higher Cognitive Functions. Mind in Society: The Development of Higher Psychological Processes. Harvard University Press
32. Evans, C., and Edwards, M. (1999). Navigational interface design for multimedia courseware. Journal of Computers in Mathematics and Science Teaching, 8(2), 151-174.
33. MediaSite Live, available at http://sonicfoundry.com/systems/mslive.asp (Last accessed on 7 April, 2012)
34. Stanford University's Stanford Online program, available at http://scpd.stanford.edu/scpd/about/delivery/stanfordOnline.htm (Last accessed on 7 April, 2012)
35. Just-In-Time Lecture (JIT), available at http://www.jitl.cs.cmu.edu/ (Last accessed on 7 April, 2012)
36. BMRC Lecture Browser, available at http://bmrc.berkeley.edu/frame/projects/ (Last accessed on 7 April, 2012)
37. Chapanis, A., Ochsman, R. B., Parrish, R.N., and Weeks, G.D. (1972). Studies in interactive communication: The effects of four communication modes on the behavior of teams during a cooperative problem solving. Human Factors, 14,487- 509.
38. Tognazzini, B. (1998). First principles. Ask Tog IOn-Line URL: http://www.asktog.com/basics/firstPrinciples.html (Last accessed on 7 April, 2012)
39. Acker, S. (1985). Redesigning the humml-machine interface for computer-mediated visual technologies. Journal of Educational Technology Systems, 14(1), 23
40. Goldes, H. (1983). Designing the human-computer interface. Educational Technology, 23, 9-15.
41. McFarland, R. (1995). Ten design points for the human interface to instructional multimedia. T.H.E. Journal, 22, 67-69.
42. Rana Al-Hajri, Salah Al-Sharhan, Ahmed Al-Hunaiyyan, and Tareq Alothman. 2011. Design of educational multimedia interfaces: individual differences of learners. In Proceedings of the Second Kuwait Conference on e-Services and e-Systems (KCESS '11). ACM, New York, NY, USA, Article 12 , 5 pages.
43. Piaget J. (1972) Intellectual evolution from adolescence to adulthood. Hum. Dev. 15, 1-12.
44. Bruckman A, Bandlow A (2003) Human–computer interaction for kids. In: Jacko J et al (eds) Handbook of human computer interaction. Lawrence Erlbaum Associates Inc., New Jersey, 428–440

45. Edward Tse, Johannes Schöning, Yvonne Rogers, Chia Shen, and Gerald Morrison. 2010. Next generation of HCI and education: workshop on UI technologies and educational pedagogy. InProceedings of the 28th of the international conference extended abstracts on Human factors in computing systems (CHI EA '10). ACM, New York, NY, USA, 4509-4512.
46. Alsumait, A., Al-Osaimi, A. (2009). Guidelines for Designing E-learning Programs for Arab Children. The 4th International Conference on Interactive Mobile and Computer Aided Learning, IMCL2009. April 21 – 24 Amman, Jordan.
47. S. Livingstone, 2008. Taking risky opportunities in youthful content creation: Teenagers' use of social networking sites for intimacy, privacy and self-expression. New Media and Society, 10, 393–411.
48. J.Batchelor and A. Botha, Design criteria for mobile phones: a teenagers perspective, mobile government consortium international http://researchspace.csir.co.za/dspace/bitstream/10204/3967/1/Batchelor_2009.pdf (Last accessed 24March, 2012)
49. M. Faisal and A. Alsumait, 2011, Social Network Privacy and Trust Concerns, 13th International Conference on Information Integration and Web-based Applications & Services (iiWAS2011), Vietnam, Dec 2011
50. R. B. Cialdini, 2001. "The Science of Persuasion." Scientific American, February, pp: 62-67.
51. P. Lin, 2009. Social groups, social media, and civic participation of high school youth: concepts and methods for design implications. In Proceedings of 27th international conference extended abstracts on Human factors in computing systems, CHI ACM, USA, 3137-3140.
52. Lucia Vera, Gerardo Herrera, and Elias Vived. 2005. Virtual reality school for children with learning difficulties. In Proceedings of the 2005 ACM SIGCHI International Conference on Advances in computer entertainment technology (ACE '05). ACM, New York, NY, USA, 338-341.
53. Scruggs, T. E. and Mastropieri, M. A. (1995), 'Science and students with mental retardation: an analysis of curriculum features and learner characteristics'. Science Education, 79 (3), 251-271.
54. Taciana Pontual Falcão and Sara Price. 2010. Informing design for tangible interaction: a case for children with learning difficulties. In Proceedings of the 9th International Conference on Interaction Design and Children (IDC '10). ACM, New York, NY, USA, 190-193.
55. Kathryn Rounding, Kimberly Tee, Xiaomin Wu, Cheng Guo and Edward Tse : Evaluating Interfaces with Children http://www.dfki.de/EducationCHI2011/Site/Program_files/hcieducationchi11_submission_14.pdf (Last accessed on 4th April, 2012)
56. Ilse E. II . van Kesteren', Mathilde M. Bekker2, Arnold P.O.S . Vermeeren', Peter A. Lloyd'. Assessing usability evaluation methods on their effectiveness to elicit verbal comments from children subjects. ACM 2003 ISBN 1-58113-732-X/03/07.
57. Helen Edwards, Rachel benedyk. A Comparison of Usability Evaluation Methods for Child Participants in a School Setting. IDC 2007 Proceedings: Methodology. June 6-8, 2007, Aalborg, Denmark.
58. Benedikte S. Als, Janne J. Jensen, Mikael B. Skov. Comparison of Think-Aloud and Constructive Interaction in Usability Testing with children. IDC 2005, June 8-10, 2005, Boulder, Colorado, USA.
59. Janet Read, Emanuela Mazzone, Johanna Höysniemi. Wizard of Oz Evaluations with Children – Deception and Discovery. IDC 2005, June 6-8, 2005, Boulder.
60. Read., J., Fitton., D., Cowan.,B., Beale., R., Guo., Y. and Horton., M., 2011. Understanding and designing cool technologies for teenagers. In Proceedings of 2011 annual conference extended abstracts on Human factors in computing systems CHI, ACM, USA, 1567-1572.
61. M. Isomursu, P. Isomursu, and K. Still. 2002. Involving young girls in product concept design. In Proceedings of the 2003 conference on Universal usability (CUU '03). ACM, NY, USA, 98-105.

62. Alsumait, A., Al-Osaimi, A. & AlFedaghi, H. (2008). Use of Survey Techniques as Usability Evaluation for Child e-Learning Programs. In ICL - Interactive Computer Aided Learning 2008. September 24-29, Villach, Austria.
63. Al-Osaimi A., AlFedaghi, H. & Alsumait A. (2009). User Interface Requirements for E-Learning Program Designed for Deaf Children. In the second International Conference on ICT & Accessibility (ICTA 09). May 7-9, Hammamet – Tunisia.
64. World Fact Book, https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html (Last accessed 3 April, 2012)
65. Demographic trends for adolescents: Ten key facts http://www.unicef.org/sowc2011/pdfs/Demographic-Trends.pdf (Last accessed on 3 April, 2012)
66. Trends in the adolescent population , 1950-2050 http://www.unicef.org/sowc2011/pdfs/Figure-2.2-Trends-in-the-adolescent-population_12082010.pdf (Last accessed on 3 April, 2012)