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Analyzing Preschoolers Requirements to the Integration of Game Based Learning in Tanzania

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Abstract
The Tanzanian preschoolers' experiences and skills of what they find pleasant and how they acquire knowledge in schools is a valuable source of inspiration for the blueprint of the language learning contents intended for them. In this paper, the researcher analyzes the preschoolers requirements that were gathered based on the available design of Tanzania Alphabetical Sound Quiz (TALSQ) prototype and the three approaches used in requirement gathering. Active involvement of the Tanzanian preschoolers on the use of the game based alphabetical sound quiz prototype is also explored. From the requirements gathering, the inputs of the preschoolers' capitulated constructive outcomes based on the graphical user interface and the contents of the English alphabetical sound articulation language learning settings under development. Further, issues related to the design association with preschoolers, particularly the preschoolers' feelings of possession over the ultimate result have also been addressed. The results further revealed preschoolers enthusiasm to use the gamified sound quiz prototype in learning and that attitudes to gamification are not homogenous and depict particular relation to preschool educational setting. The features of digital inhabitants don't apply to all preschoolers, which should be reflected in the subjects that employ the use of computers in preschools.
Keywords: Preschoolers, Requirements, Sound articulation; User Interface, TALSQ prototype

1. Introduction

Advances in digitized learning that involves gaming techniques in the current era have paved way to the exploration of Tanzania Alphabetical Sound Articulation Quiz Game based learning which is at the moment a standalone application that is looked forward to be embedded in mobile and web based environments to provide access to preschoolers all over Tanzania. TALSQ is a standalone game based learning application that targets learners in Montessori, Lower Kindergarten and Upper Kindergarten in Tanzania. The research seeks to address challenges preschoolers face with the second official language, English, particularly articulation of sounds that in the long run enables a child to read and communicate in English making it easy to adapt to comprehending other subjects that are also taught in English Language. It also provides a standardized format that will be adopted by all preschools so that children are not affected once they shift from one preschool to the other [6].The research applied game based learning techniques in the TALSQ prototype in a proposition to harmonize traditional learning of sounds articulation for these preschoolers and in the process, tried to alleviate challenges arising from the problems preschoolers experience with articulation of sounds that affect their on the whole learning of sound articulation for these preschoolers. The standalone TALSQ game application uses tone of voice tutoring techniques and pertinent graphics to display questions to the preschooler who in this case is the player then captures player responses through mouse touch input modus operandi and reward points in form of a tree as depicted in Figure 3 accordingly to make sound articulation more motivating and fun to the preschoolers [6, 17-18].

The current preschoolers are digital inhabitants that are featured by the use of technology. However, the present preschoolers' environment requires more skills on gamified learning. This paper aims to find out the kinds of aspects that influence attitudes and opinions of preschoolers on the use of the game based sound quiz prototype and provide valuable information to the teachers and management of preschools in Tanzania. The study was conducted in Tanzania in 2 preschools across Morogoro region, namely Holy Cross and Carmel Light Pre-Primary Schools during different periods in the year 2016, via interview and observation surveys to provide their opinions on the use of the gamified sound quiz prototype. Holy Cross school requirement gathering was done in the first six months of the year (first semester) while the latter Carmel Light from July to November (second semester).

Just as the contribution of teachers and other educational stakeholders expertise on the introduction of sound articulation gamified learning is critical in the design and development of the application [8] so is the potential of involving preschoolers as active contributors in the game based sound quiz prototype design is increasingly appreciated [10,22-23]. The preschoolers are no longer seen only as inert for the design and development of sound articulation gamified language learning application. Emphasis has been made by numerous researchers [3, 14] on the necessity to better comprehend preschoolers needs. This is because the digitized game users' way of interaction with digitized learning significantly differs from the adults, especially in terms of curiosity and tendency to explore, and the preference of studying together. Additionally, the preschoolers aspirations concerning the fun and motivating elements may not be an easy task for the teachers and

developer to visualize [14, 23]. The emerging standpoint to the designing and development of the TALSQ prototype in this paper has portrayed the application of Preschooler-Computer Interaction. This standpoint employs the participatory approaches to the design and development of the game based sound quiz prototype. Another approach that has brought together the principle is constructivism, Preschooler -Computer interaction, educational and development principles and Learner Centered Approach [12, 13].

Requirement gathering of preschoolers' perspectives in the design and development phases has brought about useful comments into the expectations of preschoolers in the game based sound quiz application. The preschoolers involvement has portrayed on indications of sexual characteristics differences in terms of the use of gamified sound quiz prototype based on navigation skills, means of identifying the correct articulated sound , application-specific content –related preferences , elements to be included in user interfaces and their structures and preschoolers desire to personalize their applications.[4, 9-25]. It has been realized by Druin et al [11, 27] that children want control, variety, social interaction and creative tools which focus on the appearance, affluence of multimedia, learn ability and delicacy of the application

The purpose of this research work was first for the developer to design and develop a game-based sound quiz prototype for preschoolers that would enhance the problems faced by preschoolers in articulating sound for the second official language English and also to come up with a standardized format that can be used all over Tanzania in the preschool classroom setting. The second aim was to perform analysis of the development process from the perspectives of both the developer and the preschoolers.

The methodology that was followed to develop the sound quiz gamified application involved researching on gamification in learning, collecting of data through interview, analysis, and design of the game application, development of the game through Rapid Application Development prototyping, testing of the game and implementation of the game application.

By and large, the results suggested that it is feasible to take advantage of the increasing computers, mobile phone, web based and E-readers penetration in Tanzania together, the growing instill technology in fortification of language learning for preschoolers that can be used by learners as a study tool both in school and home settings. The results further revealed preschoolers enthusiasm to use the gamified sound quiz prototype in learning and attitudes to gamification are not homogenous and depict particular relation to preschool education setting. The features of digital inhabitants do not apply to all preschoolers, which should be reflected in the subjects that employ the use of computers in preschools.

This paper focuses on the analysis the Tanzanian preschoolers' requirements to integration the game based sound quiz prototype. The main features were to gather preschoolers' requirements and to conduct the sound quiz prototype in the classroom setting and use it with preschoolers in class using child centered approach. Focus is made on the three issues that yielded on the sound quiz prototype, namely graphical user interface sketch, TALSQ model chart and the assessment of the current learning contexts.

2. Review of Related Literature

2.1 Game-Based Learning in East Africa

Currently , the available games in East Africa particularly Tanzania is Ubongo Kids which is a creation of interactive edutainment for kids in Africa to enable learning and loving learning. KitKit School is another tablet-based open-source application that supports children to learn and practice, reading, writing and counting independently. All over the world, majority of children are without access to education or quality education. KitKit schools aims to provide children with the fundamentals of literacy and numeracy through a game-based learning platform that motivates and develops independence. It is currently available in English and Swahili however it does not specifically address the issues preschoolers face with articulation of sounds and the standardized format for all preschoolers [6].

Game based learning in a digitized setting enhances self-reliance and self-determination in terms of a preschooler's ability. This paper depicts how games actually help a preschooler progress within a demanding but incrementally staged environment while articulating alphabetical sounds. Moreover, game based learning and its benefits in the digitized Learning as compared to traditional way of delivering learning is also explored [6,17].

2.2 TALSQ Prototype

Tanzanian Alphabetical Sound Quiz Prototype (TALSQ) is standalone application software which preschoolers can articulate alphabetical sound, and play the educational articulation quiz working individually, in pairs or small groups; the preschoolers identify the correct articulated sound through images, texts and sounds provided as hints.

The main research approach in this study was development research. It is employed in studies of educational interventions, addressing either the intervention itself, the process of developing it, or both [1, 24-28]. Using the principles of development research and case study research [2], the study of the development processes of the game based learning environments or applications for preschoolers. The application discussed in

this paper is second revised version of TALSQ prototype and the views of the preschoolers on what they feel will be appropriate for them. On the basis of the available classroom objects, the preschoolers compose quizzes, create designs of the sound quiz game and collectively in class attempt to share and play the sound quiz games created by their mates.

The development of version one of the TALSQ prototype, was undertaken in academic year 2013-2014 in twelve preschools across Tanzania. A school class (59 children, ages 6-7) in each school participated in the requirements collection to the evaluation of the final result [6].

The current Version two of the TALSQ prototype is the modified sound articulation quiz, aiming to make preschoolers aware of how to articulate alphabetical sound correctly, to enable them to learn to read words in a proper way, and to share reading and discuss through a standardized format of communication in all subjects as they progress to high level of education. A group of preschoolers from Holy Cross and Carmel Light preschools of 3-7 years old took part in the project in different stages with the two terms in the year 2015-2016. The group size varied from five to ten students between sessions. Moreover, a brief interview was administered to a group of 20 preschoolers.

Experiences related to the development process were gathered both from the perspective of the preschoolers and that of developer. The data was analyzed using a framework consisting of several research questions as the basis of analysis. In terms of this paper, from the preschoolers' point of view, the research questions were predominantly related to whether they felt that their concepts had had an effect on the end result, how they perceived their own expertise in the development, and how they had experienced the participation activities in general. From the developer's perspective, it was examined how the preschoolers' participation and ideas aided their work and affected their development solutions. Moreover, design session results were compared to the final yield in order to examine how the suggestions provided by the preschoolers manifested in the final application. In each case, the data consisted of development documents, outcomes of the design processes, interviews and observations to the developer and the preschoolers' participants, and observation of the design process documentations.

3. Methodology

3.1 Preschoolers Requirements in the Game-Based TALSQ Prototype

The requirement gathering techniques adopted in the research work were plentiful. In this paper, the TALSQ prototype Graphical User Interface sketches, Concepts charts and assessment of current learning contexts are discussed by presenting issues revealed through these activities and how they guided the development of the second version of the TALSQ prototype. A representation of various methods to idea generation is revealed. In this work the sketches begin from scratch and provide a wide imagination space, the concepts charts involve teamwork and steady development of concepts. Additionally, the assessment of the learning context provides a collection of different existing solutions to draw upon. Supplementary ideas and feedback were obtained through the prototype evaluation and testing, but in this paper we focus on the ideas obtained from preschoolers during the development of the second version of the TALSQ prototype for articulation of alphabetical sounds.

3.2 Inputs from TALSQ Graphical User Interface Sketch

The inputs given by the preschoolers formed the main basis of designing and eventually developing the game based Tanzania alphabetical sound quiz articulation prototype. Before revealing the available TALSQ prototype the preschoolers were provided with an opportunity to express their ideas and concepts about the outward show and functionalities of the TALSQ prototype application by drawing graphical user interface sketches during English lessons. The preschoolers had an option to select whether they wanted to create a representation of what they felt the sound articulation game should look like and how it should be played. Each preschooler had to create his/her own concept on how the game based interface should look like so as to make a discovery of something new that might have been missing in the existing TALSQ prototype and the already provided professional expertise suggestions [17]. Sketching the TALSQ graphical user interface concepts by the preschoolers in Holy Cross and Carmel Light preschoolers during the English classes' suited the context well since the game based application was meant for the English subject however, there are certain challenges related to their use. Firstly, there is a risk that the preschooler concentrated to facts while overlooking the bigger picture, that is what the items in their drawings do and how they behave [3]. The second thing is that despite the assumption that expression by drawing is easy and natural for the preschoolers, they might have problems, for instance, with understanding the idea of drawing things that would be seen on the screen [19]. Some of these problems were also experienced with the TALSQ prototype in this research work. Despite recognizing the steady development of the TALSQ prototype, the preschoolers had experienced difficulties in picturing a bond between this change and their own personal concepts. The researcher however considered the TALSQ graphical user interface concepts sketches made by the preschoolers to be very significant to the research work. The researcher applied the use of the drawings by analyzing their main elements and placing them all on display on the office

notice board so as to be able to continually draw upon them for guidance in the design decisions. In problematic situations related to, for example, the choice of colours or layout, it was easy to turn to the drawings for clues and inspiration.

The developer realized that the TALSQ graphical user interface concepts included in the drawings and their locations portrayed the preschoolers' lack of skills on the computer usage. This suggested that the developer needed to provide training and familiarize preschoolers with the Windows, mobile and web based software applications in order to enhance the usability of the TALSQ prototype, creating a balance that exists between the TALSQ prototype as tool for learning and game at the same time. In accordance to [18], the preschoolers' are often prone to lose their interest unless they get in control of the game based TALSQ prototype swiftly [21]. Another observation made is that preschoolers wanted all the most essential options to be visible on the screen at all times in order to find them promptly. Figure 4 entails "Quit" and "Start" buttons at the bottom left and right corners respectively for choosing the actions when a preschooler needs to commence or quit the game. This reveals navigation related evident in the pictures where many tasks were performed using buttons instead of menus as depicted in Figure 3

Figure 1 and Figure 2: Examples of the Holy Cross and Carmel Light Preschoolers TALSQ Graphical User interface sketches

Figure 1: Preschoolers Alphabetical sound sketches

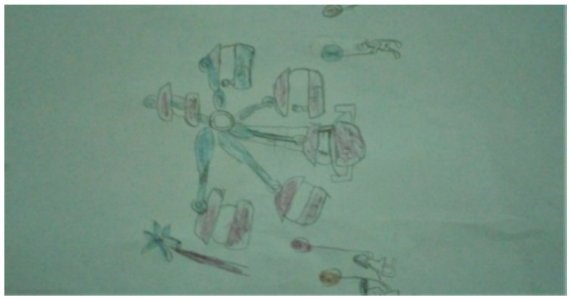

Figure 2:Gamified Sound Articulation User Interface

From the sketches drawn the preschoolers had varying ways of representing the concepts on the looks of the TALSQ prototype for sound articulation. However there were a common factors and elements that were portrayed. Firstly, is the information that was clearly visible and secondly, numerous formats of presenting the looks of the game based sound quiz was depicted and used.

In Figure 3, the status of the player in this case the preschooler is depicted in terms of different indicators: fruit points represented within the tree that bears fruits incase a sound is articulated well and progress bar chart that displays the percentage as the player progresses with the game. When interacting with the TALSQ game, the preschoolers desire for as much freedom of choice as possible became noticeable, which is line with observations made by Druin et al.[10] about preschoolers wanting a large variety of functions and something to explore. According to the drawings, the preschoolers wanted the TALSQ prototype to enable them, to construct sounds and characters on the articulated sounds, to select without restrictions the available alphabetical sounds and the number of fruits and the responses of correct sound to be articulated every time they touch or click on it, to get an opportunity to reattempt incase a sound is articulated wrongly and to add cartoon characters to the game for more interactivity.

3.3 Emerging Concerns with Concept Charts among Tanzanian Preschoolers

Guha et al.[22] reveal the need to realize specific techniques to make process of steadily merging concepts visible .In this study there was decrease in terms of the sense of possession of the concepts among the preschoolers as there was no visualization of the relationship between the graphical user interface sketches of the sound quiz application and the expected end result.

Meanwhile the approach adopted in this work attempted to make discussion groups sessions that were mainly focused on concept charts construction. The teamwork sessions commenced with preschoolers and teachers in both the Holy Cross and Carmel Light, together with developer creating concepts charts to initialize the concept about the content of the game based alphabetical sound quiz prototype and its model. It should be noted that this paper focuses on mainly analyzing Tanzanian preschoolers' requirements and opinions of the what they feel should be the looks and make of the sound articulation lesson during language lessons in their respective classes. The educational stakeholders are not addressed in this work. In the drawing plain paper charts provided to every participant preschooler , they first and foremost listed their concepts on how they thought sound articulation game based learning should include and based on them, suggested things to be included in a collective list of the ideas. Afterwards the preschoolers made suggestions by cycling the concepts on the list they considered the most important, and these were used as the basis of the concept charts. Taking a close look at both; the personal and group list, the preschoolers in both preschools highlighted pictures, sounds, cartoons,

computer graphics, tests and scores as the main critical way of learning sound articulation. From the list provided it is obvious that the preschoolers portrayed learning by seeing and hearing as important elements to take into account as one learns sound articulation.

To identify more requirements from the preschoolers on the opinions on the sound quiz articulation application, the preschoolers were further put to conduct discussions in groups. In these sessions the preschoolers chose specific alphabetical sounds that they felt most easy to recall articulating and they identify objects, pictures and names that could begin a word with the aforementioned sounds. To enhance and get the most out held group sessions was the gamification of sound articulation learning that led to the formation of groups of interested preschoolers. In this session the preschooler counted the number of sounds and pictures a preschooler articulated well and then made counts of the number of times one had attempted the articulation right together with the words that began with that particular sound in question. This resulted to the spirit of competition which is a game mechanic. It was also observed that preschoolers get motivated when there are different tasks to be done in sessions hence the need for varieties in language learning.

Moreover, the developer took pictures and video clips of the various sessions held in the selected preschools. From the observations and interviews made during the group discussion sessions, it was revealed that the sound articulation learning context should provide preschoolers with varieties of tasks and activities to reduce sense of boredom during the teaching and learning process. The preschoolers also made constructive contributions through the concepts charts that created a room for the participation of preschoolers on the design of TALSQ prototype and that clearly depicts that a learners are not blank slates. In one way or the other, sense of possession has been enhanced among the preschoolers. Their contribution, perception, and open-mindedness have brought new ideas that led to the revision and further development of the TALSQ prototype focusing on the preschoolers' requirements. When comparing the preschoolers' experiences from version one of the prototype and version two the latter succeeded with conveying the feeling of belongingness better. As soon as the revised version of the TALSQ prototype was developed, inquiries were made to students via interviews on whether their requirements were met in the previously unrevised prototype that the researcher had when gathering requirements, it was realized that there were many off-putting answers in the former prototype and positive feedback on the revised TALSQ prototype which put into account the concept charts, and graphical user interface sketches. The distinction between the development of former and latter prototype was perceptible as depicted in Figure 3, Figure 4 and Figure 5 respectively. In the long run the preschoolers appreciated the fact that they had been granted authority to be able to formulate the alphabetical sound quiz and the words that start with the sounds.

Figure 3, Figure 4 and Figure 5: Examples Revised TALSQ prototype Graphical User interfaces

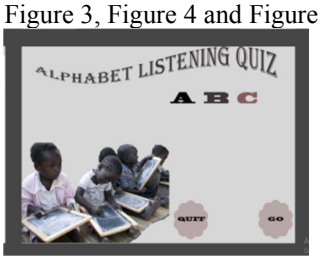

Figure 3: Starting the Quiz

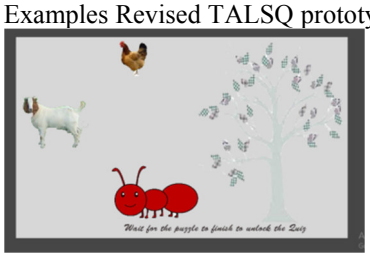

Figure 4: Voiced Instructions

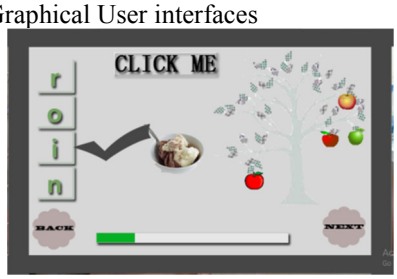

Figure 5: Screen of the sound quiz

3.4 Gathering Preschoolers' Concepts from Existing Learning Contexts

From the analysis and requirement gathering conducted at Holy Cross and Carmel Light preschools, it was visible that preschoolers embrace real life objects and enjoyment in learning. The anxiety for existence in the physical world was depicted by the tangible objects being visualized in the digitized gamified arena. Additionally, the preschoolers related and explored the pictures and tangible objects comprehensively, that goes hand in hand with preschoolers love for performing various activities and tasks in specified sessions. The preschoolers liked the concept of "CLICK ME" and Tree that bore fruits as the preschooler attempted the TALSQ prototype and the animated pictures that show hints if the preschooler didn't articulate the right sound, that appeared throughout the TALSQ prototype.

The preschoolers' criticisms on the original version of the TALSQ prototype established a more interactive and gamified design for the revised version of the TALSQ prototype [19-21]. The positive and off-putting inputs on the first version of the prototype has enlightened the researcher to comprehend the preschoolers mode of connecting with digitized learning, alleviate sound articulation problems and led to development of the revised version based on the preschoolers inputs and observations from the concept charts[19]. The preschoolers were given the two available versions of the TALSQ prototype in which they gave their feedback on their likes and dislikes on the available applications. The preschoolers' observations and inputs resulted to a bar graph to show the percentage of the number of sounds articulated right and the aspect of timing of the game to limit addiction of the game especially when they need to play in turns. The preschoolers' ability for active participation and

interactivity has been considered as well. However, the preschoolers didn't appreciate clicking the next button and back buttons. Numerous research and observations made by other researchers [15, 21] confirms that preschoolers appreciate and are motivated where a variety of tasks and activities are administered giving the ability to recognize and construct things on their own. This was realized and adopted in this work

4. Discussion and Conclusion

There was active participation of the preschoolers in various problems that were being addressed. The first concern was collective design conduction, followed by the development processes that dealt with the characteristics of the preschoolers learning conduct.

4.1 Preschoolers Discovery through Discussion groups

Giving an opportunity to the Tanzanian preschoolers to provide their views in the design phase of the TALSQ prototype led to the realization of numerous concerns that were valuable to put into consideration during the development of the revised version of the game based TALSQ prototype application. The opinions of the preschoolers provided a guideline to design of the graphical user interface, navigation, timing and usability of the TALSQ prototype application. Through the view point of the preschoolers, developer understanding of the preschoolers requirements was made clear. This led to the enhancement by adding game mechanics such as the points that were scored in form of a tree bearing fruit and progress bar graph showing the percentages increased motivation and fun when attempting the sound quiz articulation quiz. Hence, both the developer and preschoolers views created a hybrid of the TALSQ prototype application.

Further, during the discussion groups sessions held in Holy Cross and Carmel Light preschools, it was noted that the sessions that involved individual preschoolers listing their knowledge on what they felt the TALSQ prototype should look like did not work well. This because not all students were able to contribute effectively which became a challenge. The developer then formulated the discussion groups that brought in constructive ideas and concepts of the learners. It also led to the creation of the game elements in the design of TALSQ prototype since all preschoolers within the groups were now fully involved leading to motivation and sense of belongingness.

Through the preschoolers active participation in the requirement gathering phase , they were able to get new inspirational experiences such as the significance of group discussion, they were able to provide inputs, make plans ,draw and design the looks of a game based digitized sound articulation quiz based on the different activities they were involved in.

Having varying activities and tasks during the group sessions created motivation and fun on the side of preschoolers, while the developer received massive data to analyze before implementation of the revised version of the TALSQ prototype. The activities followed sequential steps that permitted the preschooler to understand the flow of the TALSQ prototype design and development process and visualization of their concepts.

4.2 Development Factors of Preschoolers Learning Environment

Among the concerns pin pointed by the preschoolers in the development of the TALSQ prototype application are the TALSQ prototype graphical user interface that involved problems to do with timing of the quiz, click back and forth buttons and the general façade of the TALSQ prototype. Another concern was on the formulation of the number of sounds to be included in each question and the word and pictures that start with articulated alphabetical sound and the voice projection that did not portray the natural African voice, making it difficult to comprehend articulated sounds. Table 1 depicts the summary of the observations made.

Table 1: Preschoolers observations and comments made in the requirement gathering phase

School	TALSQ graphical User Interface	Sounds Quiz Formulation
Holy Cross Preschool	✓ It is my turn to use say the sounds ✓ The next button is not working. ✓ The voice is not like our teachers	✓ How many sounds did we get right ✓ When will you finish saying all the sound?
Carmel Light Preschool	✓ What is the picture of sound "d" ✓ I can't go back to sound "c" ✓ What did say the sound is?	✓ The pictures are not moving ✓ Real –life objects illustrations in digitized arena ✓ That's a ship found is in the sea ✓ How many sounds did you say correctly

The preschoolers crave for attempting the sound quiz in turns calls for timing of the game so as to permit rotation and avoidance of addiction that might arise. Navigation and the neutrality of the voice were other observations since the preschoolers found it difficult to click on the forth and back buttons and the sound was

difficult to hear as the voice wasn't natural. The interface of the first version of the TALSQ prototype didn't permit realizing the total number of points the preschoolers had scored in articulating the sounds and the percentage they had reached in articulating the 26 six alphabetical sounds. During the sound articulation formulation the critical concern is observed to be the flexibility and adequacy of all the 26 alphabetical sounds being incorporated and permitting availability of numerous numbers of activities within each quiz and ability to select the choices freely.

Looking into other related literature conducted on gamification [15, 21], it was also realized that in this work preschoolers need varieties of interactive content to work with and also to make their own creations and revise the elements of the TALSQ application. The observation made is that the preschoolers would like to connect the tangible objects that exist in the physical world to that of the digitized game based environment. The interest of having animation and cartoons was also observed. In future the integration of cartoons will be taken into account.

References

A.Druin (1999), "Cooperative inquiry:developing new technologies for children withchildren," *in Proceedings of the SIGCHI Conference on Human factors in Computing Systems* (CHI'99),pp.592-599, Pittsburgh,Pa,USA.

A.Druin (2005), "What children can teach us: developing digital libraries for children with children." *Library Quarterly*, vol.75, no.1, pp.20-41.

Bruckman and A.Bandlow (2003), "HCI for Kids," in the Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications, J.Jacko and A.Sears, Eds.,pp.428-440, Lawrence Erlbaum, Mahwah, NJ, USA.

C.Dindler, E.Eriksson,O.S.Iversen, A.Lykke-Olesen, and M.Ludvigssen (2005), "Mission from Mars-a method for exploring user requirements from children in narrative space," in Proceedings of the 4th International Conference on Interaction Design and Children (IDC'05), pp.40-47, Boulder, Colo,USA.

C.Jones, L.Mclver,L.Gibson, and P.Gregor (2003), *"Experiences Obtained from designing with children,"* in Proceeding of the 2nd International Conference on Interaction Design and Children (IDC'03), pp. 69-74, Preston, UK.

C.Ongoro and J.Mwangoka (2014), Using Game-Based Approach for Enhancing Language Learning for Preschoolers in Tanzania, IEEE Xplore.

Clark and P.Moss (2001), *Listening to Young Children: The Mosaic Approach,* National Children's Bureau, London, Uk.

D. Schuler and A.Namioka (1993), "Preface," in Participatory Design: Principles and practices, D.Schuler and A. Namioka, Eds., Lawrence Erlbaum, Hillsdale, NJ, USA.

D.Bilal (2003), "*Draw and tell: children as designers of web interfaces*," in Proceedings of the 66th Annual Meeting of the American Society for Information Science and Technology(ASIST'03), PP.135-141, Long Beach, Calif, USA.

Druin (2002), *"The role of children in the design of new technology*," Behaviour and Information technology, vol.21, no.2,pp.1-25.

Druin, B.Bederson, A. Boltman, A .Miura, D.Knotts-Callahan, and M.Platt (1999), *"Childen as our technology design partners," in the Design of Children's Technology*, A.Druin, Ed., pp.51-72, Morgan Kaufmann, San Francisco, Calif, USA.

J. Good and J. Robertson (2006), "*CARSS: a framework for learner-centred design with children,"*Internatonal Journal of Artificial Intelligence in Education, vol.16,no.4, pp.381-413.

J.A.Rode, M. Sringer, E.F.Toye, A.R. Simpson, and A.F.Blackwell (2003), "Curriculum focused design," in Proceeding of the 2nd International Conference on the Interaction Design and Children (IDC, 03), pp.119-126,Preston, UK.

J.Read (2005), "The ABC of CCI(Child Computer Interaction)," Interfaces 62,pp.8-9.

J.van den Akker (1999), "Principles and method of development research," in DesignApproaches and Tools in Education and Training, J.Van denAkker,R.M.Branch, K.Gustafsson,N.Nieveen and T.Plomp, Eds.s pp.1-14, Kluwer Academic Publishers, Dordrecht, The Netherlands.

J.Verhaegh, I. Soute, A. Kessels, and P. Markopoulos (2006), "On the design of Camelot, an outdoor game for children," in Proceeding of the 5th International Conference on Interaction Design and Children (IDC'06), pp.9-16, Tampere, Finland.

Kafai Y.B. (1995), Minds in play: Computer game design as a context for children's learning Routledge.

Kirikkaya E.B., *et al.* (2010), A Board Game about Space and Solar System for Primary School Students. Turkish Online Journal of Educational Technology-TOJET **9**:1-13.

L. Hall, S. Woods, K. Dautenhahn, and P. Sobreperez(2004), "Using storyboards to guide virtual world design," in Proceeding of the 3rd International Conference on Interaction Design and Children (IDC'04),pp.125-126.

College Park, Md, USA.

M. Scaife and Y. Rogers (1999), "Kids as informant: telling us what we didn't know or confirming what we knew already?" in The Design of Children's Tehnology, A.Druin, Ed.,pp.27-50, Morgan Kaufmann, San Francisco, Calif, USA.

M.Bekker, J.Beusmans, D.Keyson, and P.Lloyd (2003), "KidReporter: a user requirements gathering technique for designing with children,"Interacting with Computers,vol.15,no.2, pp.187-202.

M.L. Guha, A.Druin, G. Chipman,J.A. Fails, S.Simms, and A. Farber (2005), "Working with young children as technology design partners," Communications of the ACM, vol.48, no.1, pp. 39-42.

M.Scaife, Y.Rogers,F.Aldrich, and M.Davies (1997), "Designing for or Designing with? Informant design for interactive learning environments," in Poceedings of the SIGCHI Conference on Human Factors in Computing Systems(CHI'97), pp.343-350, Atlanta, Ga, USA.

R,K.Yin (1994), Case Study Research:Design and Methods, Sage, Thousand Oaks, Calif, USA, 2nd edition.

R. Oosterholt,M.Kusano, and G.de Vries (1996), "Interaction design and human factors support in the development of personal communicator for children," in Proceedings of the SISCHI Conference on Human Factors in Computing Systems (CHI'96), pp.450-457, Vancouver, Canada.

R.A.Hart (1997), Children's Participation: The Theory and Practice of Involving Young Citizens in Community Development and Environmental Care, Earthscan, London, Uk.

R.C.Richey, J.D.Klein, and W.A.Nelson (2004), "Developmental research: studies of instructional design and development," in Handbook of Research for Educational Communications and Technology, D.Jonassen, Ed,pp. 1099-1130,Lawrence Erlbaum, Mahwah,Nj,USA,2nd edition.

Tuula Nousiainen1 and Marja Kankaanranta1 (2008), Exploring Children's Requirements for Game-Based Learning Environments Volume 2008 Article ID 284056,

V.Nesset and A. Large (2004),"Children in the information technology design process: a review of theories and their applications," Library & Information Science Research, vol.26, no.2, pp. 140-161.