Using Microsoft Multipoint Technology and Interaction Design to Leverage Collaboration among Primary School Students

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ABSTRACT

The purpose of this paper is to combine Microsoft Multipoint and Interaction Design to create prototype for collaborative quiz game, among primary school students. The research evaluated the prototype via using USE Questionnaire, which stands for Usefulness, Satisfaction, and Ease of Use which separated into two factors, Ease of Learning and Ease of Use. The paper shows that students were satisfied and found the prototype useful, easy to use and easy to learn. One limitation of this paper is that there is no text-based activity in the prototype. The present study focuses on combining Microsoft Multipoint and Interaction Design to create collaborative quiz, and future work will be done to consider text-based as a new opportunity to leverage collaboration. The value of this paper is to validate relationship between Microsoft Multipoint and Interaction Design to leverage collaboration among primary school students.

Keywords
Collaboration, Interaction Design, Microsoft Multipoint

1.0 INTRODUCTION

Research in psychology and education has shown that working in groups have prodigious effects on development, learning, and acquiring new skills, particularly for young children (Stanton et al., 2002; Lai & Wong, 2009; Ikeda et al., 2009). Supportive learning environments resulted from a shift in learning trends that demonstrates learning becoming more social and exploratory. Thus, there is a need to make full use of new possibilities of learning using computers, in particular focusing on technologies to support collaboration and creativity, in learning environments (Wyeth, Diercke & Viller, 2006). In advanced pedagogical practices, using Computer supported collaborative learning (CSCL) has become an essential part of the whole learning environment and the culture of learning (Lipponen, 1999). Children can find it fun to play with others and become engaged when they have the opportunity to share experiences with friends. Hence, experiments show that if you offer five children five computers, within 10 minutes, two to three of those children will be gathered around one computer screen (Druin & Inkpen, 2001; Africano et al., 2004).

A limited number of computers in primary schools and an emphasis on group work means that, it is of high importance to discover how new technologies can support effectively to resource collaborative arrangements for learning (Stanton, Neale & Bayon, 2002). Collaboration and learning will only occur if the technology is designed to fit within the context of use for which it is intended (Neale et al., 2001). Otherwise, the interface may actually be a barrier to learning. In essence, collaboration encouragement is more meaningful than just enable collaboration (Benford et al., 2000).

2.0 COLLABORATIVE LEARNING

Collaborative Learning is considered as an instruction method where students at different performance level can work in a group to achieve mutual goal. In addition, every student will be responsible for his group mates' performance. Thus, collaboration will push learning forward among students and make them successful (see Figure 1) (Vicic, et al., 2007).

Figure 1: Effect of collaboration in learning (Vicic, et al., 2007).

Since a child's social identity is enhanced by collaborating in a group, involving children in a social intellectual activity can be a great incentive and can contribute to better learning than depending on individual work (Garzotto & Forfori, 2006). Thus, much effort has to be done to motivate learning by collaboration (Ratcliffe, et al., 2004).

3.0 RELATED WORK

Single Display Groupware (SDG) is different technology from traditional windowing systems which allows every user to have his or her own input device, gives the opportunity to all users to interact simultaneously with the common window. It is noticeable that, developing applications with SDG is hard to build, modify, maintain and excessive efforts have to be done in terms of interface design (Tse & Greenberg, 2004).

A study was done to address collaboration preference among children, via involving pairs of children through playing a puzzle-solving game using three various experimental set-ups: (1) a paper-based style of the game with physical pieces; (2) a computer-based style of the game with one cursor and one mouse, and (3) a computer-based version of the game with two cursors and two mice (Inkpen, et al., 1999). The software was developed using C++ and Microsoft DirectX and utilized input from one or more Universal Serial Bus (USB) mice.
The results of this study have shown that providing children with support for their collaborative interactions can enhance their performance of activity, engagement, and motivation.
Pal, et al. (2006) created prototype in order to allow multiple users with multiple inputs and stated that, it is vital to take into consideration that Human - Computer Interaction (HCI) design can extract beneficial aspects of interaction between children at each computer and make sure that a component of that is retained in a new system with a better individualized child-machine interaction (see Figure 2).

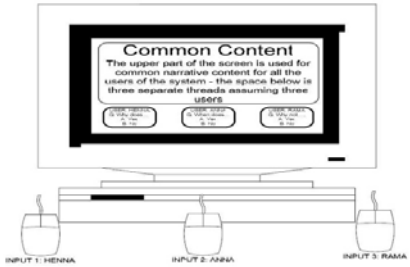

Figure 2: Sample prototype of multi-user content with multiple input (Pal, et al., 2006).

4.0 USING MICROSOFT MULTIPOINT AND INTERACTION DESIGN

4.1 Microsoft Multipoint

Microsoft Multipoint is a development framework that allows developers to build applications that enable multiple mouse devices to work simultaneously on a single computer. Developers can use Microsoft Multipoint Software Development Kit (SDK) to build educational applications for schools with limited technological infrastructure, hence, increasing time access to every student in order to maximize the benefit of computer. It is worth mentioning that there is no extra overhead cost, except for using multiple mice connecting via hub to successfully use the system (Microsoft Download Center, 2010).

4.2 Interaction Design

With the emergence of so many technologies that support collaboration in one PC, the question of customizing the interface has received a lot of attention.
Interaction design is a user-centered design process, which considers design of a series of interaction activities between users and software (Ma et al., 2009). In essence, Interaction Design tends to concern for the users' aesthetic needs, identification of value and other human emotional measures (Hua & Qiu, 2008), in addition to reduce users' cognitive load (Ma et al, 2009). By emphasizing the basic aspects of Interaction Design, designers would have clearer understanding of each of the objectives of prototyping, and hence, they would be able to make clear decision about which prototype to use. Such basic aspects include "scenario and character", "sense and pleasure" and "technology and structure" (Hua & Qiu, 2008).

4.2.1 Scenario and Character

Scenario has received big interest and attention of most designers. To review a design in an organized way, it is better to put it into a real and alive scenario instead of just independently analyze its various factors. Scenario is a process where all the stories unfolded on it. Through the software, designers can interact with other entities whether they are people or objects on the process. Thus, the concentration of the scenario would be the focus of design step. "Character" really involves two important parts: the persona related to the user of software, and the role the software plays in users' (persona) life. Persona is not an actual person, but being a hypothetical prototype of the actual user, it shows a real person in the design process. Particularly, persona identifies needs and tasks related to user to attain their goals. In Interaction Design, when suitable "scenario and character" are prototyped; designers will discover it easier to demonstrate a stay point, and to avoid deviation as the process of design progresses. To help this research makes persona real researcher shed light on personal attributes and personal goals of children. This could also help to creating intrinsic value for children regarding collaboration activity (Dantin, 2005).

Our daily life observations indicate that, children love to play and they can be oriented in a positive way if we provide to them fun. Hence, we can

make advantage of these attributes to be geared to educational purposes.

Students are bored by explicitly instructional material; hence, interactivity is so important in the Interaction Design of the educational software. For instance, if there is a tutorial video to watch, followed by a quiz, students generally love to go straight forward to the quiz (Pawar et al., 2007).

An objective of educational software for children is to provide an engaging learning environment, keeping children's attention by providing fun. This is usually achieved through games (MacFarlane, 2005). Moreover, Research demonstrates that the use of games in education is perceived as useful for learning and helped to engage students in educational experiences towards achieving specific learning goals and outcomes (Yue & Zin, 2009).

Experiments show that children have propensity to prefer the point-and-click interaction style. Moreover, a point-and-click interaction style, used in an interactive learning environment, can be more effective from the perspective of motivation and performance than drag-and-drop interaction style (Inkpen, 2001).

4.2.2 Sense and Pleasure

This step involves visual and sense related to touch and hearing in addition to other sensual interaction experience. Through prototyping process of these related issues, the design would be focusing on simulating the potential sensual requirements of the target user, to demonstrate or record the users' interactive experience in the scenario, and to discover sensual elements that may have been ignored. Ultimately, the design would have to build up a visualized prototype in order to simulate the various senses aroused by the software.

Children's emotional state affects their skill acquisition. It is difficult to control over factors outside game environment that may affect children's emotional state, but using game elements to evoke emotions that may enhance skill development (Inkpen, 2001). Particularly, fun is a perfect way to make positive impact on emotional state of children.

Having fun by playing the game is a form of collaboration; players could not compete if there were no one to play with. Collaborations with friends lend the game sense of novelty, surprise, and variety (Nardi & Harris, 2006). It is worth mentioning that, fun is the most important goal for computer games. If players do not enjoy the game, they will not play it. Games create fun by challenging players, often testing out the limits of their memory and performance (Obrist et al., 2009). Moreover, by making a software fun, it is likely that children will effectively remain on task (Chiasson & Gutwin, 2005).

4.2.3 Technology and Structure

Some prototypes are specifically for giving answers to technical requirements of the future software. Using Microsoft Multipoint sheds light on discovering practical design specifications and attains great feedback from the interaction with potential users.

Ideally, the move from individual work to a world of collaboration work is driven by combining Microsoft Multipoint technology which allows physically using more than one mouse in one PC and Interaction Design which addresses users' needs to maximize the value of collaboration.

5.0 OVERVIEW OF PROTOTYPE SYSTEM

As target users of the prototype, the research considered children of elementary school level in the fifth year, in order to leverage collaboration among them. The prototype focuses on peer collaboration where two students sit on one PC and play simultaneously to solve the quiz. As quiz content, we assumed a series of questions each consists of a picture, and multiple choices. This system was implemented in Visual C# using Microsoft Multipoint SDK 1.1.

6.0 FLOW OF SYSTEM USAGE

Figures 3 through Figure 5 are screen shots of the prototype system. Figure 3 shows the initial screen waiting for players. Two mouse pointers are represented by two arrow cursors at this time, one is blue and the other is green. When any one click "Start Game" button on Figure 4, children begin to solve the quiz. Figure 5 is the final screen, where students will be notified about the winner of the game.

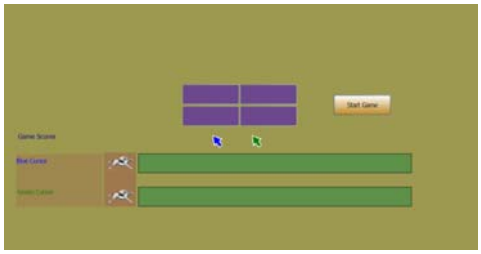

Figure 3: Initial screen of prototype system.

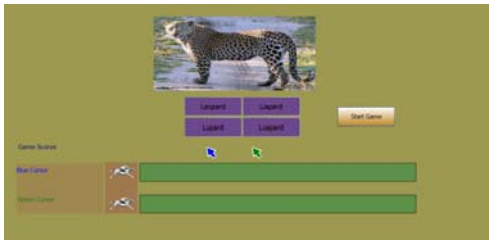

Figure 4: Students begin to solve the quiz.

Figure 5: Final screen of prototype system.

7.0 METHOD AND SETUP OF EXPERIMENT

We conducted an experiment at a local primary school in Malaysia, involving 36 students in the fifth year to test the prototype, in order to collaborate via playing the quiz game. As quiz content, we prepared multi choice questions in English, based partly on the practical need for English as a Second Language (ESL) instruction in developing regions to both teach and test English vocabulary (Pawar et al., 2007). Students have formed 18 groups; each group consists of 2 students.

In the experiment questionnaire, students answered questions to measure three attributes of usability; Usefulness, Ease of Use which we separated it to two factors; Ease of Use and Ease of Learning and the third attribute is Satisfaction. Students recognized their answer by clicking on smile faces according to their choice.

8.0 RESULTS AND FINDINGS

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The results considering Usefulness was mostly positive; 55.6 % of students (20 students) considered the prototype very useful, 30.6 %
(11 students) considered it useful and the rest of students (5 students) considered it quiet useful. The same happen with Ease of Use where 61.1 % (22 students) assumed that it is very easy to use and the rest (14 students) assumed that it is easy to use. Regarding Ease of Learning the result was absolutely positive where most of students; about 75% (27 students) have perceived it very easy to learn and 25 % of them (9 students) perceived it as easy to learn. The last attribute was satisfaction where 61.1 % (22 students) attained high satisfaction, 33.3 % (12 students) were satisfied and the rest (2 students) were quiet satisfied.
From the observation during play, students recognized their cursors easily, in addition to the flow of playing the game with just a simple explanation before they began the game. Most of them interacted with their friend's action, like clicking on the right answer so fast, in order to progress and to move their horses on track. Students expressed their opinions after playing the game; some examples of their opinions were "it teaches us spelling", "it is fun "and "it has animation". Some students suggested putting something else instead of the horse on the track; like smiley faces.

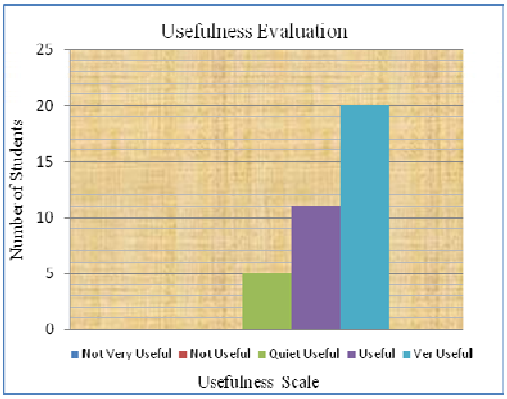

Figure 6: Usefulness Evaluation.

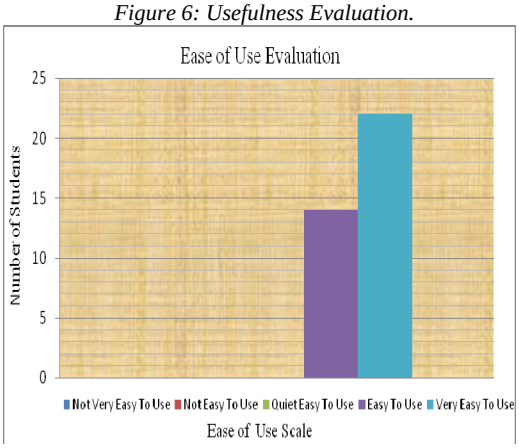

Figure 7: Easy To Use Evaluation.

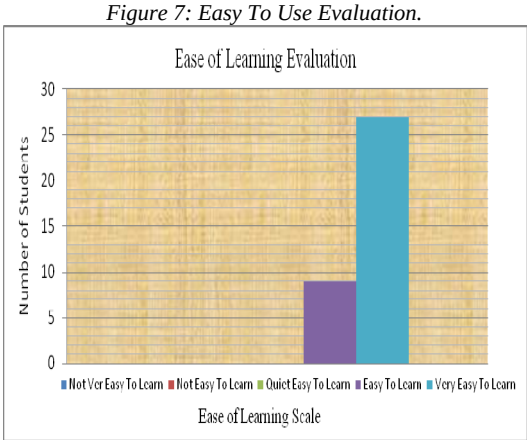

Figure 8: Easy To Learn Evaluation..

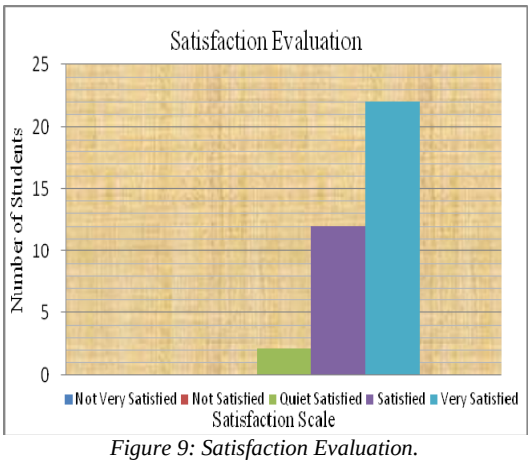

Figure 9: Satisfaction Evaluation.

9.0 CONCLUSION AND FUTURE WORK

This paper meant to combine Microsoft Multipoint and Interaction Design to encourage collaborative learning in primary schools. The results of the prototype system were positive and students were satisfied. Future studies to use text-based systems taken into account, to address different styles of collaboration among primary school students and to find new opportunity to encourage collaborative learning.

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