

USING MICROSOFT MULTIPOINT TECHNOLOGY TO
ENHANCE COLLABORATIVE LEARNING IN PRIMARY
SCHOOLS

HUSSIN AHMED ABDELKADER

UNIVERSITI UTARA MALAYSIA

2010

USING MICROSOFT MULTIPOINT TECHNOLOGY TO ENHANCE COLLABORATIVE LEARNING IN PRIMARY SCHOOLS

A project report submitted to the Dean of Postgraduate and Research office in
partial fulfillment of the requirement for the degree Master of Science

(Information and Communication Technology)

Universiti Utara Malaysia

HUSSIN AHMED ABDELKADER



**KOLEJ SASTERA DAN SAINS
(College of Arts and Sciences)
Universiti Utara Malaysia**

**PERAKUAN KERJA KERTAS PROJEK
(Certificate of Project Paper)**

Saya, yang bertandatangan, memperakukan bahawa
(I, the undersigned, certify that)

HUSSIN AHMED ABDELKADER
(804062)

calon untuk Ijazah
(candidate for the degree of) **MSc. (Information Communication Technology)**

telah mengemukakan kertas projek yang bertajuk
(has presented his/her project paper of the following title)

**USING MICROSOFT MULTIPOINT TECHNOLOGY TO ENHANCE
COLLABORATIVE LEARNING IN PRIMARY SCHOOLS**

seperti yang tercatat di muka surat tajuk dan kulit kertas projek
(as it appears on the title page and front cover of project paper)

bahawa kertas projek tersebut boleh diterima dari segi bentuk serta kandungan
dan meliputi bidang ilmu dengan memuaskan.
(that the project paper acceptable in form and content, and that a satisfactory
knowledge of the field is covered by the project paper).

Nama Penyelia Utama
(Name of Main Supervisor): **ASSOC. PROF. DR. SUHAIDI HASSAN**

Tandatangan
(Signature)

: 

Tarikh
(Date)

: 20/5/2010

ASSOC. PROF. DR. SUHAIDI HASSAN
Assistant Vice Chancellor
College of Arts and Sciences
Universiti Utara Malaysia

PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a postgraduate degree from University Utara Malaysia, I agree that the University Library may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purpose may be granted by my supervisor or, in his absence by the Dean of the Academic Office. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to University Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or in part, should be addressed to

Dean of Postgraduate and Research Office

UUM CAS

Universiti Utara Malaysia

06010 UUM Sintok

Kedah Darul Aman

ABSTRACT

Researches in psychology, education and pedagogical practices show the stunning impact of collaboration in learning, particularly for young children. However, current design of Personal Computer Applications for collaborative learning is limited and poor. The objective of this research is to use Microsoft Multipoint technology in order to create collaborative quiz game for leveraging collaboration among primary school students. Merging prototyping with Interaction Design is very suitable for the purpose of gaining experience and it identifies new opportunities to customize the interface for collaborative software and make full use of Microsoft Multipoint technology. Measuring usability attributes; Usefulness, Ease of Use, Ease of Learning and Satisfaction is a core step to test the prototype system and approve the successfulness of research objectives. One limitation of this paper is that there is no text-based activity in the prototype. All data was collected via using USE Questionnaire in order to test usability attributes from perspective of users. The results of this research revealed that students found the prototype useful, easy to use, easy to learn and they attained high satisfaction. Most importantly, observations revealed that students were extremely excited and they could collaborate effectively. The value of this project is to leverage collaborative learning in primary schools and clarify the importance of merging Interaction Design and Microsoft Multipoint technology; which in return could encourage collaboration. Placing this project in the public domain will, hopefully enable other researchers and practitioners in similar situations to relate to my experience and gain insights.

ACKNOWLEDGEMENTS

In the Name of ALLAH, the Most Gracious and the Most Merciful

First of all, I give thanks to ALLAH for His guidance, His every blessing I know and His every blessing I don't know and His mercy throughout my life. Peace and Blessing to His last Prophet Muhammad (S.A.W), his household and his companions. My sincere appreciation goes to my beloved parents, my brother and my sisters for everything; their patience, prayers and all kinds of support they have given to me throughout my life.

Secondly, my grateful thanks go to my supervisor, Prof. Dr. Suhaidi Hassan, who had given to me full support and contributed immensely towards the completion of this paper. He encouraged me to the extreme and pushed me forward to learn new things.

Lastly, I appreciate the efforts of all my friends, Staff of Information and Communication Technology, College of Arts and Sciences, University Utara Malaysia and those who contributed directly or indirectly towards the completion of this project. Thanks to all.

HUSSIN AHMED ABDELKADER

College of Arts and Sciences,

Universiti Utara Malaysia,

April 2010

TABLE OF CONTENTS

PERMISSION TO USE	I
ABSTRACT	II
ACKNOWLEDGMENTS	III
TABLE OF CONTENTS	IV
LIST OF FIGURES	VIII
LIST OF TABLES	IX
LIST OF APPENDIXES.....	X
CHAPTER ONE - INTRODUCTION	1
1.1 Introduction	1
1.2 Problem Statement	3
1.3 Research Questions	3
1.4 Research Objectives	4
1.5 Research Scope.....	4
1.6 Significance of the Study	6
1.7 Summary	6
CHAPTER TWO - LITERATURE REVIEW.....	7
2.1 Introduction	7
2.2 Single Display Groupware	9
2.3 Collaborative Puzzle Game	10

2.4 Multiple Users Prototype.....	13
2.5 Multimouse Technology.....	13
2.6 Multimouse Quiz System.....	17
2.7 Summary	19
CHAPTER THREE - RESEARCH METHODOLOGY.....	20
3.1 Introduction	20
3.2 Prototyping and Interaction Design	24
3.2.1 Scenario and Character.....	25
3.2.2 Sense and Pleasure.....	27
3.2.3 Technology and Structure.....	28
3.3 Flow of the Prototype System Usage	28
3.4 Data Collection... ..	31
3.5 Process of Conducting Usability Test.....	33
3.5.1 Develop the Test Plan.....	33
3.5.1.1 Purpose, goals and objectives of the Test	34
3.5.1.2 Identify Research Questions	34
3.5.1.3 Participants Characteristics.....	35
3.5.1.4 Method.....	35
3.5.1.5 Task List.....	35
3.5.1.6 Test environment, equipments and logistics.....	36
3.5.1.7 Test moderator role.....	36

3.5.1.8 Data to be collected and evaluation measures.....	36
3.5.1.9 Report contents and presentation.....	36
3.5.2 Set up a testing environment.....	37
3.5.3 Find and select Participants	37
3.5.4 Prepare test materials	37
3.5.5 Conduct test session	38
3.5.6 Debrief the participants and the observers	38
3.6 Summary.....	39
CHAPTER FOUR - RESULTS AND FINDINGS.....	40
4.1 Introduction.....	40
4.2 USE questionnaire analysis.....	41
4.2.1 Usefulness attribute analysis	41
4.2.2 Ease of use attribute analysis	43
4.2.3 Ease of learning attribute analysis.....	46
4.2.4 Satisfaction attribute analysis.....	48
4.3 Experiment observation	50
4.4 Summary.....	50
CHAPTER FIVE - CONCLUSION.....	51
5.1 Introduction	51

5.2 Overview.....	51
5.3 Limitation of collaborative quiz game.....	52
5.4 Recommendation for future work	52
REFERENCES	53
APPENDIX.....	61

LIST OF FIGURES

Figure 2.1: Effect of collaboration in learning.....	8
Figure 2.2: Single Display Groupware.....	10
Figure 2.3: Sample Puzzle screen.....	11
Figure 2.4: This is fun. We are all best friends and we are all playing together.....	12
Figure 2.5: Sample prototype of multi-user content with multiple inputs.....	13
Figure 2.6: Eight boys crowded around one PC in rural India.....	14
Figure 2.7: Screenshot describes Multimouse Racing Mode.....	15
Figure 2.8: Screenshot describes Multiple-Mice Voting Mode.....	16
Figure 2.9: Screenshot of the prototype MMQ.....	18
Figure 2.10: Results of questionnaire whether MMQ was fun	19
Figure 3.1: System Prototyping.....	21
Figure 3.2: Initial screen of collaborative quiz game.....	29
Figure 3.3: Students start playing the game.....	30
Figure 3.4: Progress of playing the game.....	30
Figure 3.5: Final screen shows the winner of the game.....	31
Figure 4.1: Usefulness evaluation.....	43
Figure 4.2: Ease of use evaluation.....	45
Figure 4.3: Ease of learning.....	47
Figure 4.4: Satisfaction evaluation	49

LIST OF TABLES

Table 2.1: Number of children who preferred each collaborative setup.....	12
Table 3.1: Hardware Requirements	23
Table 3.2: Software Requirements.....	24
Table 4.1: Statistics of Usefulness Questions	42
Table 4.2: Statistics of Usefulness Questions	43
Table 4.3: Statistics of Ease of Use Questions	44
Table 4.4: Statistics of Ease of Use Attribute	45
Table 4.5: Statistics of Ease of Learning Questions	46
Table 4.6: Statistics of Ease of Learning Attribute.....	47
Table 4.7: Statistics of Satisfaction Questions.....	48
Table 4.8: Statistics of Satisfaction Attribute.....	49

LIST OF APPENDIXES

Appendix A: Project Gantt Chart.....	61
Appendix B: USE Questionnaire	62
Appendix C: USE Answer Sheet	71
Appendix D: Prototype Development Programming Code	76

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Personal computer (PC) is an indispensable tool in every school; it affects the learning performance to the extreme and allows students to access vast amount of educational resources. In particular, the advancement in the capability of PC in terms of high speed and large amount of storage facilitated the process of learning and empowered students' abilities immensely.

It is clear that, in many branches of human knowledge, a lot of problems can be solved by working in group. Particularly for children, who are sociable by nature and take advantage of every opportunity to collaborate with each other.

Collaboration among students has converted learning from traditional way to a new fruitful way that has been proved by education experts to be successful and direct all participants in learning to be fully aware about its impact, and hence, it is important to integrate collaboration in learning process. Lai et al. [1] observed that, there are general skills like collaboration and creativity can be identified as basic skills to support students in learning. Ikeda et al. [2] stated that, collaborative learning also allows students to gain different kinds of skills and leverage learning effectiveness as a whole. Moreover, observations on the use of computers in classrooms strongly clarified that children have

The contents of
the thesis is for
internal user
only

References

- [1] Y. Lai & T. Wong. "Developing creativity in computer lessons," *ACM*. 41(2), June 2009.
- [2] K. Ikeda et al. "Development of a Multiple User Quiz System on a Shared Display," *Creating, Connecting and Collaborating through Computing, 2009. C5 '09. Seventh International Conference*. 103-110, January 2009.
- [3] D. Africano, S. Berg, K. Lindbergh, P. Lundholm, F. Nilbrink & A. Persson. "Designing tangible interfaces for children's collaboration," *CHI '04 extended abstracts on Human factors in computing systems.ACM*. April 2004.
- [4] D. Stanton, H. Neale & V. Bayon." Interfaces to support children's co-present collaboration: multiple mice and tangible technologies," *Proceedings of the Conference on Computer Support for Collaborative Learning: Foundations for a CSCL Community. International Society of the Learning Sciences*. January 2002.
- [5] P. Wyeth, C. Diercke & Stephen Viller. "Design for inspiration: children, personal connections and educational technology," *Proceedings of the 18th Australia conference on Computer-Human Interaction: Design: Activities, Artefacts and Environments. ACM*. November 2006.
- [6] L. Lipponen. "The challenges for computer supported collaborative learning in elementary and secondary level: Finnish perspectives," *Proceedings of the 1999*

conference on Computer support for collaborative learning. International Society of the Learning Sciences. December 1999.

[7] A. Druin & K. Inkpen. “When are Personal Technologies for Children?,” *Personal and Ubiquitous Computing. Springer-Verlag.* 5 (3). January 2001.

[8] Microsoft News Center. “With Windows MultiPoint, Youths in Developing-World Classrooms Learn 21st-Century Skills”. Retrieved on 4 January 2010, from <http://www.microsoft.com/presspass/features/2006/dec06/12-14MultiPoint.mspix> .

[9] H. Neale et al. “Classroom collaboration in the design of tangible interfaces for storytelling,” *Proceedings of the SIGCHI conference on Human factors in computing systems. ACM.* March 2001.

[10] S. Benford et al. “Designing storytelling technologies to encouraging collaboration between young children,” *Proceedings of the SIGCHI conference on Human factors in computing systems.ACM.* 2000.

[11] D. Bäumer, W. R. Bischofberger, H. Lichter & H. Züllighoven. “User interface prototyping—concepts, tools, and experience,” *Proceedings of the 18th international conference on Software engineering. IEEE Computer Society.* May 1996.

- [12] M. Hua & H. Qiu. "The prototyping in Interaction Design," *Computer-Aided Industrial Design and Conceptual Design*. 468 – 471, 2008.
- [13] U. S. Pawar, J. Pal, R. Gupta & K. Toyama. "Multiple mice for retention tasks in disadvantaged schools," *Proceedings of the SIGCHI conference on Human factors in computing systems.ACM*. April 2007.
- [14] E. Mazzone, D. Xu & J. C. Read. "Design in evaluation: reflections on designing for children's technology," *Proceedings of the 21st British HCI Group Annual Conference on HCI. British Computer Society*. 2 . September 2007.
- [15] L. Hanna, K. Ridsen & K. Alexander. "Guidelines for usability testing with children," *ACM*. September 1997.
- [16] D. M. Hilbert & D. F. Redmiles. "Extracting usability information from user interface events," *ACM*. 32(4). December 2000.
- [17] A. A. Lund. "USE Questionnaire Resource Page". Retrieved on 23 May 2010, from <http://usesurvey.com/>.
- [18] J. Vicic, B. Kavsek, M. Kljun & Brodnik, A. "Extending Traditional Learning by Enforcing Collaboration and Self-Assessment," *Information Technology Interfaces, 29thInternationalConference*. 387 – 392, June 2007.

- [19] F. Garzotto & M. Forfori. "Hyperstories and social interaction in 2D and 3D edutainment spaces for children," *Proceedings of the seventeenth conference on Hypertext and hypermedia. ACM.* August 2006.
- [20] M. Ratcliffe, J. Holloway & W. Ellis. "Enhancing student learning through collaboration," *Proceedings of the 9th annual SIGCSE conference on Innovation and technology in computer science education. ACM.* June 2004.
- [21] K. Issroff, E. Scanlon & A. Jones. "Two empirical studies of computer-supported collaborative learning in science: methodological and affective implications," *Proceedings of the 2nd international conference on Computer support for collaborative learning. International Society of the Learning Sciences.* December 1997.
- [22] J. E. Stewart. "Single display groupware," *Extended abstracts on Human factors in computing systems: looking to the future. ACM.* March 1997.
- [23] J. Stewart, B. B. Bederson, A. Druin. "Single display groupware: a model for co-present collaboration," *Proceedings of the SIGCHI conference on Human factors in computing systems: the CHI is the limit. ACM.* May 1999.
- [24] K. M. Inkpen, W. Ho-Ching, O. Kuederle, S. D. Scott & G. B. D. Shoemaker. "This is fun! we're all best friends and we're all playing: supporting children's synchronous collaboration," *Proceedings of the 1999 conference on Computer support for collaborative learning. International Society of the Learning Sciences.* December 1999.

- [25] U.S. Pawar, J. Pal & K. Toyama. "Multiple Mice for Computers in Education in Developing Countries," *Information and Communication Technologies and Development. ICTD '06. International Conference*. 64 – 71, 2006.
- [26] U. S. Pawar, J. Pal, R. Gupta & K. Toyama. "Multiple mice for retention tasks in disadvantaged schools," *Proceedings of the SIGCHI conference on Human factors in computing systems.ACM*. April 2007.
- [27] A. Dennis, B. H. Wixom & R. M. Roth. *Systems Analysis and Design*. John Wiley & Sons, Inc. 2010.
- [28] D. Bäumer, W. R. Bischofberger, H. Lichter & H. Züllighoven. "User interface prototyping—concepts, tools, and experience," *Proceedings of the 18th international conference on Software engineering. IEEE Computer Society*. May 1996.
- [29] **Microsoft Download Center**. Microsoft MultiPoint Software Development Kit (SDK) 1.1. Retrieved on 23 May 2010, from <http://www.microsoft.com/downloads/details.aspx?FamilyID=f851122a-4925-4788-bc39-409644ce0f9b&displayLang=en>
- [30] M. Hua & H. Qiu. "The prototyping in Interaction Design," *Computer-Aided Industrial Design and Conceptual Design*. 468 – 471, 2008.

- [31] J. Ma, X. Wang & F. Wang. "Research of interaction design method based on metaphor," *Computer-Aided Industrial Design & Conceptual Design, 2009. CAID & CD*. 142 – 145. 2009.
- [32] U. Dantin. "Application of personas in user interface design for educational software," *Proceedings of the 7th Australasian conference on Computing education. Australian Computer Society, Inc.* 42. January 2005.
- [33] S. MacFarlane, G. Sim & M. Horton. "Assessing usability and fun in educational software," *Proceedings of the 2005 conference on Interaction design and children.ACM.* June 2005.
- [34] J. A. Fails et al. "Child's play: a comparison of desktop and physical interactive environments," *Proceedings of the 2005 conference on Interaction design and children. ACM.* June 2005.
- [35] W. S. Yue & N. A. M. Zin." Usability evaluation for history educational games," *Proceedings of the 2nd International Conference on Interaction Sciences: Information Technology, Culture and Human. ACM.* November 2009.
- [36] L. Xie, A. N. Antle & N. Motamedi. "Are tangibles more fun?: comparing children's enjoyment and engagement using physical, graphical and tangible user interfaces,"

Proceedings of the 2nd international conference on Tangible and embedded interaction.

ACM. February 2008.

[37] K. M. Inkpen. "Drag-and-drop versus point-and-click mouse interaction styles for children," *Transactions on Computer-Human Interaction (TOCHI)*. ACM. 8(1). March 2001.

[38] H. Gelderblom & P. Kotzé. "Designing technology for young children: what we can learn from theories of cognitive development," *Proceedings of the 2008 annual research conference of the South African Institute of Computer Scientists and Information Technologists on IT research in developing countries: riding the wave of technology*. ACM. October 2008.

[39] B. Nardi & Justin Harris. "Strangers and friends: collaborative play in world of warcraft," *Proceedings of the 2006 20th anniversary conference on Computer supported cooperative work*. ACM. November 2006.

[40] M. Obrist et al. "'Now you need to laugh!': investigating fun in games with children," *Proceedings of the International Conference on Advances in Computer Entertainment Technology*. ACM. October 2009.

[41] S. Chiasson & C. Gutwin. "Testing the media equation with children," *Proceedings*

of the SIGCHI conference on Human factors in computing systems. ACM. April 2005.

[42] J. A. Polack-Wahl. "Game development, social responsibility, and teaching. Consortium for Computing Sciences in Colleges". 24(2). December 2008.

[43] B. S. Als, J. J. Jensen & M. B. Skov." Comparison of think-aloud and constructive interaction in usability testing with children," *Proceedings of the 2005 conference on Interaction design and children. ACM. June 2005.*

[44] J. Rubin & D. Chisnell. *Handbook of Usability Testing*. Wiley Publishing, Inc. 2008.

[45] J. Easton. Valerie & H. McColl. John. "Statistics Glossary". Retrieved from <http://www.stats.gla.ac.uk/steps/glossary/sampling.html#clustsamp>.